Series 1949, No. 5 Issued June 1958

SOIL SURVEY

Ontario and Yates Counties New York

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

How to Use THE SOIL SURVEY REPORT

THIS SURVEY of Ontario and Yates Counties will help you plan the kind of farming that will protect your soils and provide good yields. It describes the soils, shows their location on a map, and tells what they will do under different kinds of management.

How the Soil Survey Is Made

To make a detailed soil survey, the soil scientist walks over the survey area and digs or bores many holes in the soil. He observes and records the different soil layers and other characteristics that affect the suitability of the soil for agriculture or other uses. He measures the steepness of slopes with a hand level. He notices the lay of the land, the kinds of crops or wild plants and their manner of growth, the characteristics of exposed rocks, and any other external evidences of the nature and extent of each kind of soil. On an aerial photograph, he draws boundary lines between the areas with different soils. He samples and describes each layer of each soil that he finds in the area, and studies the color, texture, consistence, structure, and other internal characteristics of each one.

From the information that the soil scientist gathers during the field survey and from the results of laboratory analysis of soil samples, the detailed soil descriptions that are part of each soil survey report are prepared. These data are also the basis on which soils are classified into soil series and into the higher orders of soil classification.

How To Use the Report

In the back of this book are 76 aerial photographs, which together make up a map of Ontario and Yates Counties. On these photographs are shown in red the boundaries of each kind of soil. Roads, streams, houses, and other landmarks that show on the photographs make it easy to locate any area in which you may be interested. An inch on this aerial map represents about 1,667 feet on the ground, and a square inch includes about 64 acres.

Within each soil boundary on the map is a letter symbol that represents the soil name. For example, Hd is the symbol for Honeoye fine sandy loam, 0 to 3 percent slopes. All areas on the map that are marked with this symbol are the same kind of soil. When you have located on the map, by reference to landmarks, the farm or other tract of land in which you are interested, and have noted the soil symbols, look in the map legend to find the name of the soils that the symbols represent. Then you can refer to the section of the report, Soils of Fields and Farms, for a detailed description of each of the soils. You can look in the section, Soil Management Systems, for information about the fertility of each soil, its use suitability, and its management needs.

The section, Soils of Farming Communities, and the colored map of soil associations at the back of the report, give a general picture of the soils of larger areas than those marked on the detailed maps. Other parts of the report provide information about types of agriculture in the counties, and on other industries, transportation, markets, and other subjects that have a bearing on land-use planning. If you want a general idea of how the soils of these counties were formed and how they are related to one another, see the section on Relationships Among Soils.

This publication on the soil survey of Ontario and Yates Counties, New York, is a cooperative contribution from the—

SOIL CONSERVATION SERVICE

and

CORNELL UNIVERSITY AGRICULTURAL EXPERIMENT STATION

U. S. GOVERNMENT PRINTING OFFICE: 1958

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

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SOIL SURVEY OF ONTARIO AND YATES COUNTIES, NEW YORK

Report by C. S. PEARSON and M. G. CLINE, Cornell University Agricultural Experiment Station

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United States Department of Agriculture in Cooperation with Cornell University Agricultural Experiment Station

THIS survey of the soils of Ontario and Yates Counties, N. Y., was made jointly by the United States Department of Agriculture and the Cornell University Agricultural Experiment Station. Soil scientists from these agencies made a detailed survey of soils in these two counties. The information in this report of the soil survey will help farmers to plan how to use the soils on their farms. It will also help others who are concerned in any way with use and management of the soils.

The fieldwork for this survey was begun in 1943 and completed in 1948. Unless otherwise specifically stated, all statements in this report refer to conditions at the time the survey was in progress.

Relationships Among Soils

This section tells about the broad relationships among soils of the area and something about the soils themselves. First, the factors that influenced soil formation are discussed briefly. Then, the major kinds of profiles are described and their similarities and differences are shown. Finally, the relationships of the soil series, which are the basic units of soil classification used in mapping, are presented.

Factors That Influenced Soil Formation

The rock formations beneath these counties are the source of the parent material for the soils. The physiography, drainage, and glacial history of the area determined how these parent materials were formed and deposited over the counties and in this way directly influenced the composition and properties of the present soils. The present depth of the soils and their porosity, density, texture, reaction, and some other characteristics are partly the result of the qualities of the parent material. Many other characteristics of the soils in this area are the effects of the climate, the vegetation, and the time since the parent material began to develop into soil.

Additional information on geology and soil formation can be found in literature by Cline (*2*),[1] Fairchild (*3*), Frei (*5*), McCaleb (*7*), and Miller (*8*).

Physiography and drainage

The southern parts of both Ontario and Yates Counties are in the glaciated part of the Allegheny Plateau (*3*). The northern parts are on the Till Plain of the Great Lakes section of the Central Lowland physiographic province. These two sections are separated by the Portage Escarpment as shown in figure 1.[2]

The plateau section, particularly of Ontario County, is a geologically eroded region. It has level to rolling uplands and a remarkable series of narrow steep-walled parallel valleys running north and south. Many of these valleys contain lakes. From west to east these lakes are: Hemlock, Canadice, Honeoye, Canandaigua, Keuka, and Seneca. Seneca Lake is the eastern boundary of both Ontario and Yates Counties.

Elevations in the plateau section range from a maximum of 2,256 feet above sea level (at Gannett Hill in the Town of Bristol, Ontario County) to 800 to 1,000 feet in the valleys. The general elevation of the high flat-topped hills in the southern part of the area is 1,800 to 2,000 feet. It is highest in Ontario County and gradually becomes lower in Yates County toward Seneca Lake.

The Portage Escarpment separates the Allegheny Plateau section from the lower lying till plain of the Central Lowland. It is a broad northward slope that merges with the plain near the line shown in figure 1. The northern part of these counties is in the lower lying Central Lowland. This is an undulating plain. Its elevation is 1,100 feet at Benton Center in Yates County, 600 feet at Geneva, and 692 feet at Canandaigua. At the northern edge of Ontario County the average elevation above sea level is about 550 feet.

Many long low hills known as drumlins lie in the northern part of the Central Lowland Till Plain in Ontario County. These long hills vary from 20 feet to about 100 feet in height above the intervening valleys and gravel plains. Between the drumlin region and the southern plateau is an undulating to rolling upland that gradually increases in elevation toward the south.

Kames (*2*), or hills of water-sorted sand and gravel, cover a fairly large area in the northwestern corner of Ontario County. These sand-and-gravel hills are irregular in outline and elevation and have a complex topography.

[1] Italic numbers in parentheses refer to Literature Cited, page 116.

[2] Physiographic terms used are from Fenneman (*4*).

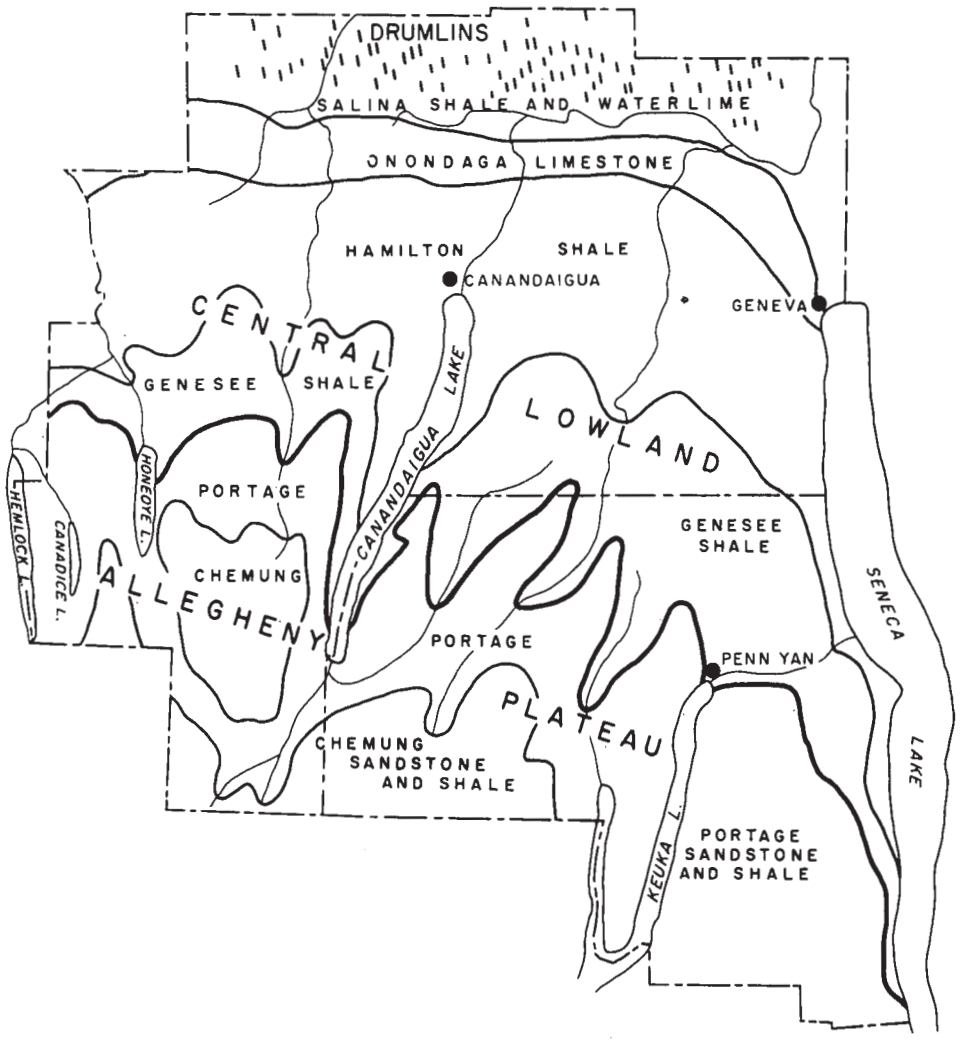

***Figure 1.*—Physiography and bedrock geology of Ontario and Yates Counties, New York. The heavy black line between the Central Lowland and the Allegheny Plateau marks the Portage Escarpment.**

Nearly all of these two counties drains toward Lake Ontario. The western part, including Honeoye, Canadicé, and Hemlock Lakes, drains through the Genesee River. The eastern part drains through Seneca Outlet into the Clyde River and from that into the Oswego River. A small section in the southwestern part of Naples Town in Ontario County and 4 or 5 square miles near Italy Hill in southwestern Yates County drain into the Susquehanna River through the Cohocton River.

Parent material

Ontario and Yates Counties are underlain by nearly horizontal beds of sedimentary rocks (*5*). The soft alkaline Silurian shales and limestones of the Salina formation underlie the drumlin area in the northern part of Ontario County. South of this a belt of Devonian limestone 4 to 5 miles wide crosses the county. This Onondaga limestone formation has furnished much of the parent material for the belt of high-lime soils south of it.

Soft alkaline shales of the Hamilton formation occupy a broad belt south of the limestone. South of this and continuing to the Portage Escarpment, the bedrock is Genesee shale of the upper Devonian period. This is a very dark bituminous formation that is alkaline or calcareous (*4*). The Portage formation consists mainly of shales and fine-grained dense sandstone. It occupies a broad belt that includes all of the Allegheny Plateau section of these counties except the higher hills (fig. 1). The resistant sandstones of these Portage beds form a broad poorly defined escarpment between the Allegheny Plateau and the Central Lowland. The Chemung formation, consisting of shales and thin-bedded sandstones, forms the cap rock of the higher parts of the plateau in the southernmost parts of the area. Except for a few layers of weakly calcareous shale or sandstone, the rocks of the Portage and Chemung formations are acid.

After the major features of the topography of this area had been cut by streams, the region was invaded by glacial ice from the north. Ice of the Late Wisconsin stage (probably Cary) covered the whole area. The

preglacial topography still determines the most important features of the present land surface. Ice erosion acting on this landscape rounded the existing hills, deepened the valleys, and steepened the valley walls in the southern parts of the area. The general picture was one of smooth flat-topped hills and steep-sided valleys. Glacial deposits added the drumlins and kame moraines.

As the ice receded from the uplands, a mantle of mixed stones, sand, silt, and clay was left over the bedrock. This is known as glacial till. The melting ice produced a large volume of water, which carried large amounts of sand and gravel. Sand and gravel were deposited in stratified layers known as glacial outwash. Both the till and the outwash are called glacial drift.

The layer of glacial till on the broad upland surfaces of the northern parts of the counties and on the hills and ridges of the southern plateau section covers by far the largest part of the area. This till ranges from a few inches to 10 feet or more in depth on the hills of the Allegheny Plateau. In the valleys the till may be very deep. Stratified outwash deposits left by glacial streams are also in these valleys. Good examples of this valley filling occur at Naples in Ontario County and between Friend and Guyanoga in Yates County. The glacial drift in the Central Lowland section is generally deeper than on the plateau uplands but shallower than in the valleys of the Allegheny Plateau.

The ice carried the debris only short distances on the higher uplands. On most of the highlands the till mantle material came from the underlying bedrock. On lower lying areas, material was carried greater distances. In western Ontario County the influence of the Onondaga limestone which outcrops in the northern part of the area is most pronounced immediately south of the outcrop and disappears within 8 to 12 miles south of that. In the eastern part along Seneca Lake, where the lower land surface offered less resistance to the moving ice, limestone was carried south of the outcrops for distances up to 25 miles. Similarly, the limestone material extends well into the Allegheny Plateau province along each of the north-south valleys where ice movement was greatest.

When the ice receded, lakes were formed in the northward draining valleys. The southern ends of these valleys were blocked by glacial drift or rock divides and the ice served as a temporary dam on the north (*1*). In these temporary glacial lakes, of which the Finger Lakes are the present remnants, large amounts of sand, silt, and clay were deposited. The large areas of clayey gravel-free soil north of Canandaigua and Honeoye Lakes have developed from such materials. The large sand plain north of Geneva is a delta built into the predecessor of Seneca Lake.

Other factors

Summers are warm but rarely hot in these counties; winters are moderately cold. The average annual precipitation is about 30 inches. About half of this falls during the growing season, which lasts 150 to 160 days (see table13). More information on climate is given in the section, General Information About the Area, from data by Mordoff (*9*).

The native vegetation of this area was a forest dominated by sugar maple. On the acid materials of the southern parts of the counties, beech, hemlock, and white pine were the chief species associated with the sugar maple. In the north the soil materials were calcareous, and hickory, basswood, and ash were more common among the sugar maple.

In both climate and vegetation, this area is a transition zone between the great region of Podzol soils to the north and the region of Gray-Brown Podzolic soils to the south. Both great soil groups occur in these two counties.

The active forces of climate and vegetation, as they work on the parent material of the soils, definitely affect the development of the soil. The strength of such development depends on how long the soil-forming forces have been allowed to work

In terms of geologic time the soils are very young, but genetic profiles are well expressed. The time since glaciation is probably less than 15,000 years, though no precise estimates had been made for this area at the time of the soil survey. The time is short enough that lime has been leached to only shallow depths in some high-lime materials. This lime appears to have prevented the development of Podzol soils throughout most of the northern parts of the counties. It is believed that the lime and the low acidity have permitted the clayey subsoil of the Gray-Brown Podzolic soils to develop.

Variations Among Soils of the Area

Soils are formed through the interaction of climate, living organisms, parent materials, topography, and time. The nature of the soil at any point on the earth depends upon the combination of these five major factors at that point. The importance of each factor differs from place to place. In extreme cases, one factor may dominate in the formation of a soil and fix most of its properties.

In Ontario and Yates Counties differences among soils result mainly from differences in parent materials and topography. The differences among soils resulting from parent materials can be attributed mainly to the variation in amount of lime those materials contain. Likewise, differences among soils caused by topography can be attributed mainly to differences in drainage, which is a result of topography. The remaining three factors of soil formation—climate, living organisms, and time—are relatively uniform throughout the counties and therefore do not account for important differences among the soils.

Since parent material and drainage have caused most of the differences among soils in these counties, development of soils will first be explained in relation to these two factors. Then, the kinds of soil profiles represented in Ontario and Yates Counties will be discussed.

Effect of differences in parent materials on well-drained soils

The parent materials of the soils of these counties all came from sedimentary rocks—sandstone, limestone, and shale. Figure 2 shows how differences in parent material cause differences in soils, when drainage, the other important variable factor in these counties, remains constant.

Figure 2 shows that the parent materials have a rather uniform progressive decrease in lime southward across the

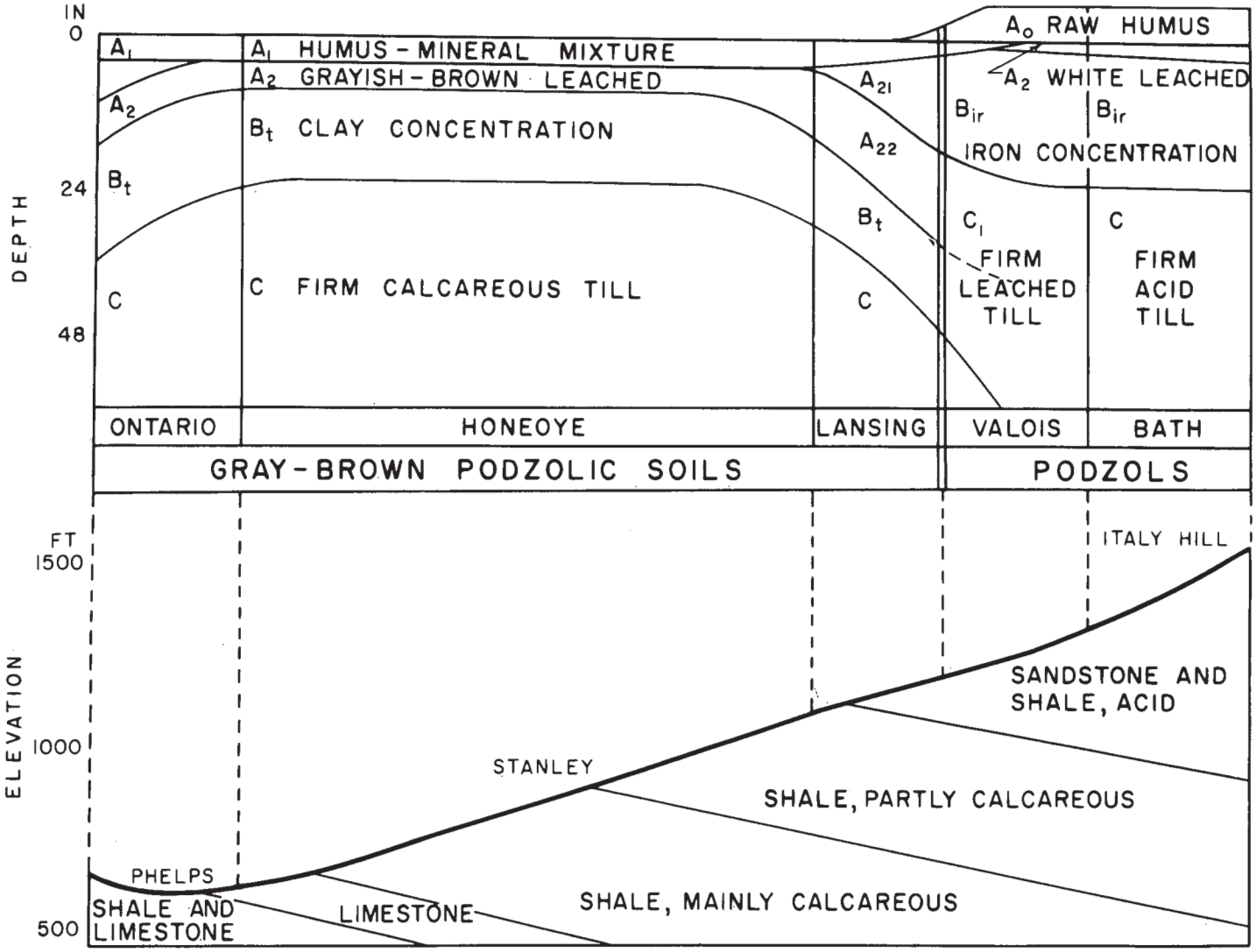

***Figure 2.*—Cross section from Phelps in northern Ontario County to Italy Hill in southern Yates County, showing relationship of parent materials to kinds of soil profiles that develop where drainage is good. As shown in this figure, the low-lime soils are in the south, the medium-lime soils in the central part, and the high-lime soils in the north. The effect of this lime on the well-drained soils is shown in figure 3.**

counties. The effect of this difference in lime content on soil profiles is more clearly brought out in figure 3.

On the limestone areas in the northern part of the area, the glacial deposits in a few places were originally very high in lime. The Brown Forest soils shown in the first column of figure 3 developed in these places. The top (A_1) layer of these soils is very high in organic matter. The soils are nearly neutral in reaction throughout. The lime has been leached to depths of 18 to 24 inches. Clays have begun to accumulate above the layer containing free lime, but the clays and organic matter in these profiles still hold large supplies of bases. Such soils are very productive. In Ontario and Yates Counties, the individual areas of such soils were so small that they could not be separated consistently from the associated soils in the survey. They are not shown separately on the detailed soil map but are included with areas of Honeoye soils, which are in the Gray-Brown Podzolic group.

Throughout most of the northern part of the area are the high-lime Gray-Brown Podzolic soils, which have profiles like those shown in the second column of figure 3. In these soils the lime has been leached to depths ranging from 20 to more than 30 inches, but still the clays and organic matter hold large supplies of plant nutrients. These soils are nearly neutral or only medium acid, even in the upper part. In these soils, the clay layer, which had begun to form in the Brown Forest soils shown in the first column of figure 2, has been moved downward. As a result there is a grayish-brown leached horizon (A_2) at the bottom of the plow layer and a layer high in clay (B_t) just above the zone of free lime (C). This clayey layer restricts water movement moderately. Among the soils of New York, these soils rank in the upper 10 percent in productivity. The Honeoye and the Palmyra soils have this kind of profile.

South of the limestone area (fig. 1) the amount of limestone in the glacial deposits decreases. It is mixed with material from the more acid bedrock that underlies this

section of the county. The well-drained soils of this part of the area gradually become more acid at the top, although the lower subsoil and parent material still contain lime. The lime has been leached to depths of 30 or 40 inches. These medium-lime soils have a profile like that shown in the third column of figure 3. Increased leaching has decreased the fertility of these soils, and organic-matter content has also decreased. The leached zone is thicker than that of the normal Gray-Brown Podzolic soils. It consists of two distinct layers (A_{21} and A_{22}). In the A_{21}, iron has been released, and iron compounds coat the primary soil particles to give a yellowish color. The A_{22} is gray, or of a color similar to the leached horizon (A_2) of the soil diagrammed in the second column.

Below the leached zone is the zone of clay accumulation (B_t). The clay layer is much deeper in the profile of these soils than in the profile of high-lime soils, and it seems to be degraded. Gray material like that in the leached horizon above extends downward among the aggregates as if the clay layer were being destroyed from the top downward. These soils are much lower in content of plant nutrients than the soils having profiles like that shown in the second column of figure 3. However, they respond to lime and fertilizer, and they are productive under proper management. It takes more management and more amendments to get as good yields on these soils as on those of the higher lime areas. The Lansing and the Howard soils have this "medium lime" kind of profile.

Still further southward the parent materials are low in lime, and the soils have profiles like that in the fourth column of figure 3. In these soils, free lime is leached to depths of 4 feet or more. The upper part of the soil is very acid. Where the forest litter has not been seriously disturbed, raw acid humus (A_o) has accumulated on the surface. Immediately under this raw humus layer is the beginning of an almost white leached horizon (A_2). The strongly acid solutions from the raw humus above have leached almost everything from this layer except the white quartz grains. This leached layer is commonly masked by some infiltration of humus from the layer above.

Below this intensively leached layer is a yellowish-brown layer (B_{1r}), which owes its color to an accumulation of iron compounds as coatings on the soil particles. This layer extends to a depth of 2 feet in many places. The next layer below is a grayish-brown leached-appearing layer (C_{11}) similar to the leached zones in the Gray-Brown Podzolic profile in the second column in figure 3. This leached-appearing layer is medium acid or strongly acid. In the lower part (C_{12}) of it are remnants of what appear to be clays like those in the subsoil of the Gray-Brown Podzolic soils. This layer is commonly quite dense and it may restrict downward movement of water. The acidity of the profile decreases with depth. Neutral soil material commonly lies at depths near 3½ feet. The underlying material (C) may be calcareous at depths below 6 to 8 feet. The Valois series has this "low lime" kind of profile.

On the higher elevations of the Allegheny Plateau, the glacial deposits originally contained little or no free lime. Here the profiles are like those shown in the fifth column of figure 3. These are normal Podzols on which 2 to 4 inches of raw acid humus (A_o) has accumulated. Beneath the raw humus is a distinct white bleached layer (A_2), commonly 2 to 4 inches thick. Below that is a bright yellowish-brown layer where iron compounds have accumulated (B_{1r}). The color of this layer is less intense with increasing depth. It grades into strongly acid parent material (C) at depths of about 2 feet. The entire soil in these places is acid. The upper part of the soil is extremely acid where it has not been artificially limed.

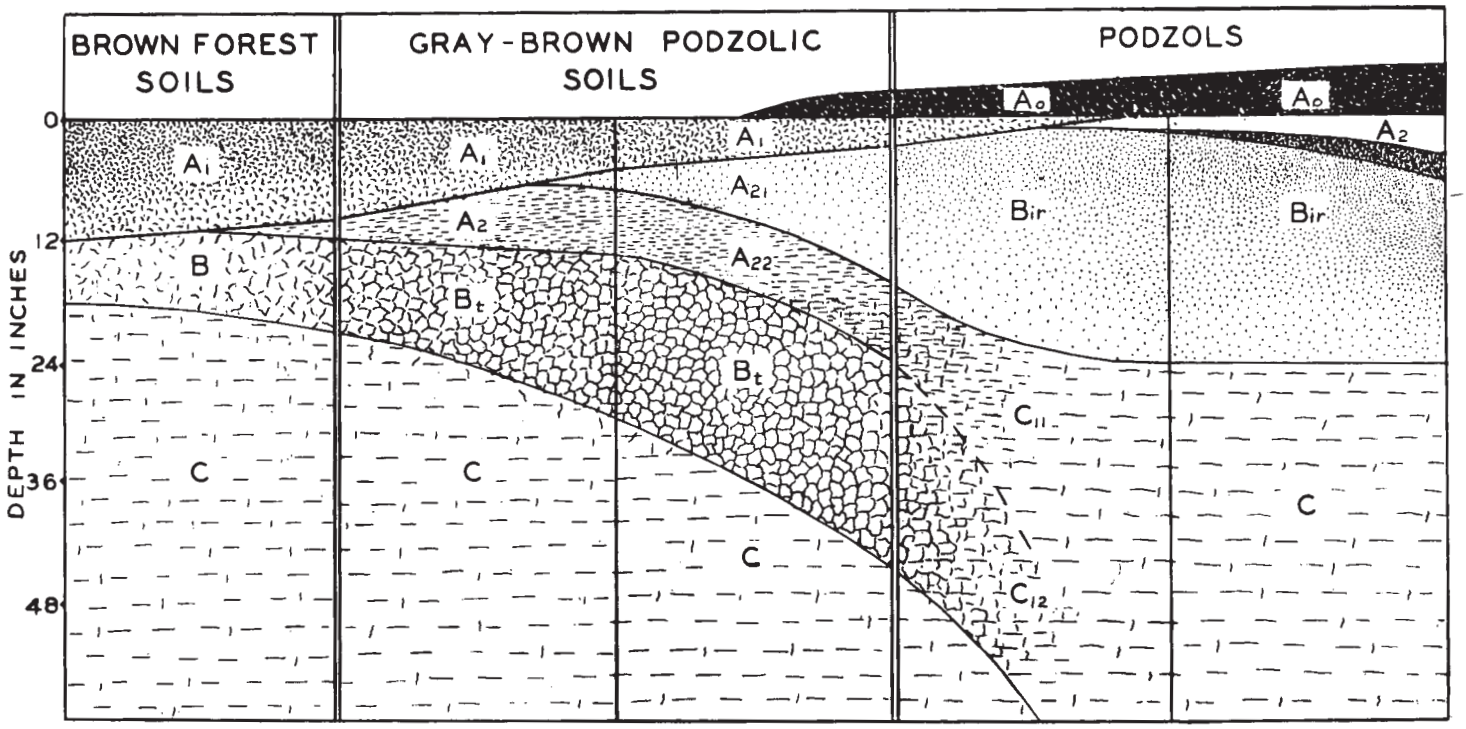

Figure 3.—**Differences among soil profiles and associated differences in lime content of the parent materials.**

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The parent material itself at 2 or 3 feet is somewhat weathered. The relatively unweathered material is normally at depths greater than 10 feet. The Bath and Woostern soils are examples of soils that have this kind of profile in Ontario and Yates Counties.

A sixth kind of well-drained profile, in addition to the five kinds diagrammed in figure 3 and described in the preceding paragraphs, is common in Ontario and Yates Counties. This profile is typical of soils on first bottoms along streams where floodwaters deposit fresh material nearly every year. These soils are so young that, except for some accumulation of organic matter in the surface layer, soil-forming processes have not affected them. The alluvium underlying these soils may range from low to high in lime content. Textures of the material may also range from sand to clay, although most alluvial material in these counties is medium textured. Textures vary both vertically in the soil sections and horizontally across the areas, as they depend on accidents of deposition. The Genesee and Chagrin soils have this kind of profile.

Effect of differences in drainage on soils from similar parent materials

The major kinds of profiles in these counties are the Brown Forest, the Gray-Brown Podzolic, the Podzol, and the Alluvial. Profiles typical of these four great soil groups already have been discussed, as they are the groups that develop in well-drained areas (see fig. 3). Naturally, however, not all the soils in the counties are well drained. Associated with the well-drained areas are areas where drainage is restricted. Where drainage is poor, this factor outweighs all the other factors of soil formation, including parent material. Therefore, poorly drained soils are much alike throughout the counties, regardless of the parent material from which they developed.

Because of differences in drainage, we have catenas, or chains, of soils that have developed from the same kind of parent material. All the soils of a catena are in a rather small area, and they may represent three different great soil groups. That is, in one catena, there may be the well-drained to imperfectly drained Gray-Brown Podzolic soils, the poorly drained Low-Humic Gley soils, and a very poorly drained Humic Gley soil. In another catena, the well-drained to imperfectly drained members may be of the Podzol great soil group, but the poorly and very poorly drained members will again be in the Low-Humic Gley and Humic Gley groups. In fact, in each catena, the soils developed under restricted to very poor drainage will be in the Low-Humic Gley and Humic Gley groups, because drainage has dominated over parent material and the other factors of soil formation.

The Kinds of Soil Profiles in Ontario and Yates Counties

In this survey area the basic differences between the soils of one locality and the soils of another result from differences in the amount of lime in their parent materials. These basic kinds of soil profiles are those already described for the Brown Forest, Gray-Brown Podzolic, Podzol, and Alluvial great soil groups (see fig. 3). Then, in addition, there are the Low-Humic Gley and Humic Gley profiles that develop where drainage so strongly influences soil formation as to override the effects of parent material.

Soils that developed from parent materials medium in lime content

On the uplands in the high-lime region are associations of soils developed from the same kind of material that are different because of differences in drainage. Figure 4 shows a catena, or chain, of soil profiles that owe their differences to drainage. The first profile is characteristic of soils on low rounded hills, and the last is characteristic of soils in depressions in the uplands.

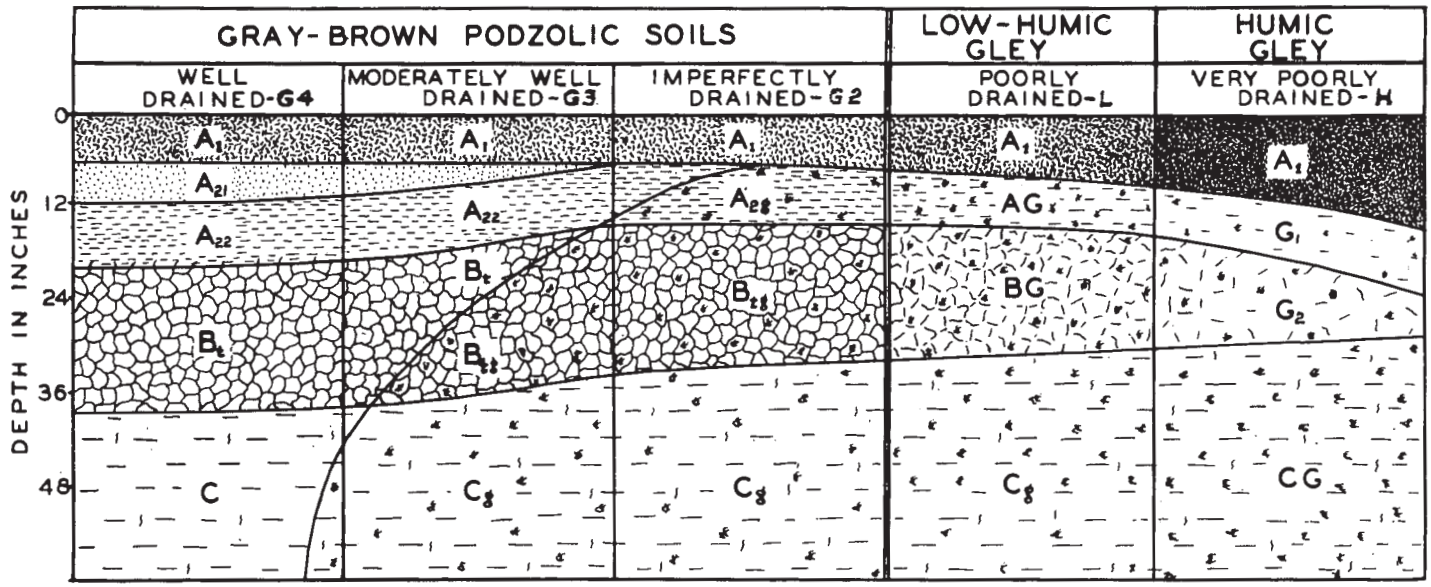

Figure 4.—**Profiles of a catena of soils developed from parent material having a medium lime content.**

The soil near the top of the hill receives only the water that falls on it, and it will probably be well drained. It will have a Gray-Brown Podzolic profile.

Farther down the hillside the soil receives not only the water that falls on it but also runoff or seepage from the higher land. If the slope at this place is slightly convex, the soil will be moderately well drained and will be mottled only in the subsoil. This mottling is in the clayey B horizon. In contrast, if the slope is concave or uniform, the leached grayish-brown A_2 horizon may also be mottled. If the A_2 horizon is mottled, the soil is considered to be imperfectly drained.

On the slightly concave lower part of a hillside, the soil receives much more water than falls on it. Runoff from this soil is not rapid. In these places, the color of the surface horizon is dark gray rather than grayish brown. The layer immediately beneath is dull gray. The subsoil is not appreciably higher in clays than the surface soil or substratum. Soils in this position have so little in common with the better drained soils on these high-lime uplands that they are put into another great soil group—the Low-Humic Gley soils. The water table is so high that the choice of crops is drastically restricted.

In a concave depression at the foot of a hillside, the soil receives extra water from higher land and there is little opportunity for the water to run off. A soil in this position is very poorly drained and waterlogged to the surface most of the year. Organic matter accumulates in the upper part, and the lower part is very strongly reduced. The surface soil is very dark gray or black, and the subsoil is a neutral gray, or sometimes almost bluish gray. Such a soil is called a Humic Gley soil, because it has a high organic-matter content and has a gray (gleyed) layer in the subsoil. It cannot be used for agriculture unless it is artificially drained.

Associations of some or all of the soils whose profiles have just been described are common in the regions of Gray-Brown Podzolic soils.

Soils that developed from parent materials low in lime content

In the southern part of the area, where the parent materials are more acid, there is another catena of soils. The profiles vary according to drainage. The sequence of profiles from the crest of a hill to an adjoining flat or depression is shown in figure 5. A soil near the crest of a hill receives only the water that falls on it, and it is a well-drained Podzol. It has a raw humus mat (A_o) in forested areas, an almost white, intensely leached, very acid layer (A_2), and an accumulation of iron in the subsoil (B_{1r}).

On a convex slope a little way down the hillside, mottling appears in the subsoil. It shows against the yellowish-brown background color typical of the iron-bearing B horizon of a Podzol soil. This kind of site is moderately well drained, and the upper part of the soil looks just like the upper part of the well-drained Podzol. Farther down the slope the mottling appears closer to the surface.

If the slope is concave or uniform rather than slightly convex, the horizon of iron accumulation in the subsoil is more brown than yellow and the white leached horizon is masked by organic matter. Mottling may be weak, but the darkening of the entire subsoil by organic matter shows that water stands near the surface for much of the year and reaches up to the leached horizon late in spring. At this kind of site, drainage has influenced soil formation and the profile is that characteristic of an imperfectly drained Podzol.

Near the base of the hill, where slopes are uniform or slightly concave, another distinct kind of profile develops. The raw humus is lacking or is only a thin layer on the surface. The first important layer is the A_1 horizon, in which humus is mixed with mineral soil. This A_1 horizon was lacking or very thin in the Podzols. Below the layer of mixed humus and mineral soil is a gray horizon somewhat like the leached (A_2) horizon of the Podzol but less

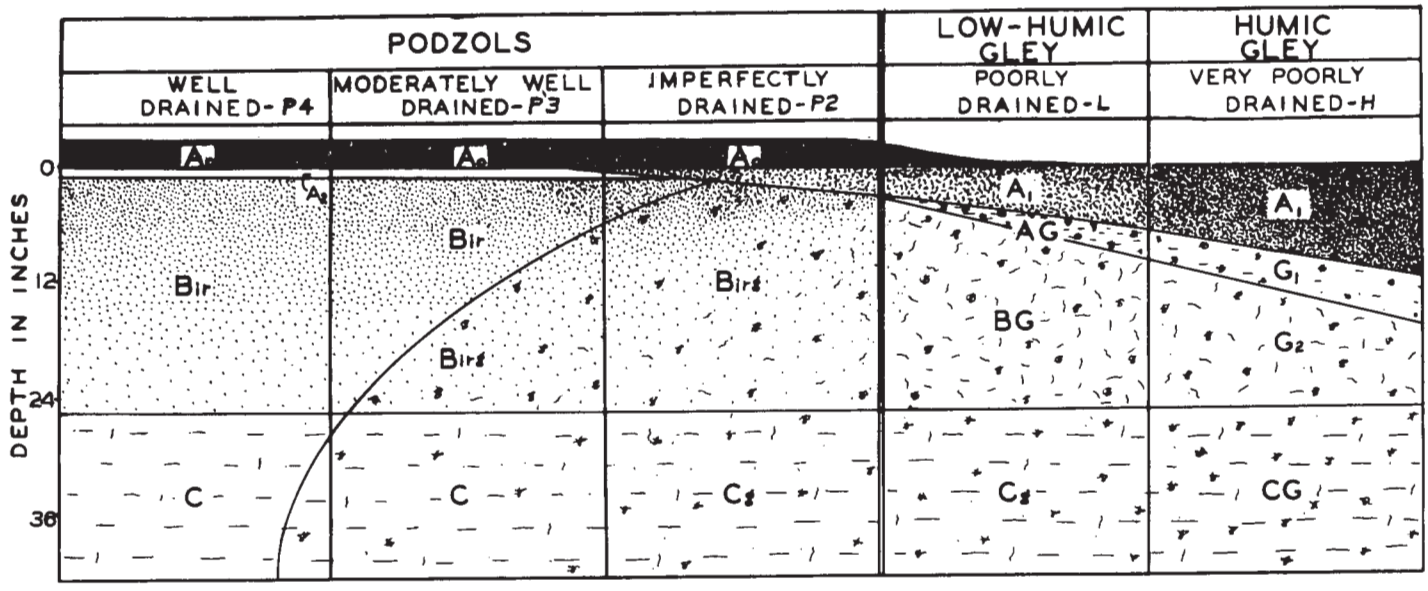

Figure 5.—**Profiles of a catena of soils developed from parent materials having a low content of lime.**

bright in color. The color of this horizon is caused more by poorly oxidized iron compounds than by leaching. Below the layer of oxidation is a layer that has much prominent yellowish-brown mottling on a gray base. A soil having the profile just described is a Low-Humic Gley soil. The Low-Humic Gley in the "low lime" areas is much like the Low-Humic Gley profile in the "medium lime" areas.

In places low on the hillside slopes where seepage water accumulates, or in depressions that have very slow external drainage, the surface soil (A_1) is commonly dark gray. Below the surface layer are the neutral gray or bluish-gray intensely reduced layers (G_1 and G_2) typical of the Humic Gley soils. In some places a raw humus mat may cover the surface, but it is generally thin or absent. This is the profile of Humic Gley soils. They are wet most of the year, and, unless drained, are not used for agriculture.

Soils that developed from mixed alluvial parent materials

On the first bottoms along the larger streams differences in soil profile are very pronounced because of differences in level of the ground-water table. A cross section of the soils between a stream and the nearby uplands would show a succession of profiles like those shown in figure 6.

Usually the drainage is best nearest the stream. This land is slightly higher than the land near the uplands. When floods deposit alluvium over the bottom lands, the coarsest material is dropped first as the current loses speed. This builds up "natural levees" next to the stream channel. The finer material is carried to the outer edges of the flooded bottom land. Less alluvium is added at this distance from the stream, and the material is less permeable to water.

The soil on the natural levee near the stream is a well-drained member of the Alluvial great soil group. Farther from the stream, rust-brown mottling begins to appear in the deep substratum. Such mottling shows that the water table fluctuates within this soil material for long periods of the year. The higher the mottling appears in the profile, the higher the water table has been during such periods. This soil is a moderately well drained member of the Alluvial great soil group. Some distance from the stream the mottling may extend up into the grayish-brown mixture of organic matter and mineral soil at the surface. This pattern of mottling indicates that the soil is an imperfectly drained member of the Alluvial great soil group.

Soils from alluvial materials that have even poorer drainage have a surface soil that is more gray than brown. A lighter gray layer lies just below it. These colors show prolonged waterlogging. The iron in the soil material is less well oxidized, and its compounds are gray in color. Organic matter accumulates in larger quantities than on well-drained soils. These poorly drained soils are called Low-Humic Gley soils. They are wet so much of the time that cropping is uncertain. The late planting dates and the high water table limit the choice of crops.

The lowest lying places, which are generally nearest the uplands, have black or very dark gray surface soil. Below this is a neutral, gray, mottled horizon several feet thick. Water stands at the surface for much of the year. Organic matter decomposes slowly, and its accumulation darkens the soil. Reduced iron compounds give the neutral gray color to the subsoil. In some places the subsoil may be mottled with strongly contrasting rust brown. This is especially likely along root channels, which may penetrate to moderate depths. The iron compounds in the subsoil are much less well oxidized than those in the Low-Humic Gley soils. When the subsoil is exposed, it commonly loses some of its grayness and changes color as the iron is oxidized. Soils of the kind just described contain a much larger amount of organic matter than the Low-Humic Gley soils. They are called Humic Gley soils. They are so wet that they cannot be used for agriculture without artificial drainage.

The Relationships Among Soil Series

In table 1 the soils are arranged according to the major kinds of soil profiles discussed in the preceding section. Each kind of profile is subdivided according to the lime content of the surface soil and subsoil. These subdivisions are not the same throughout the table because

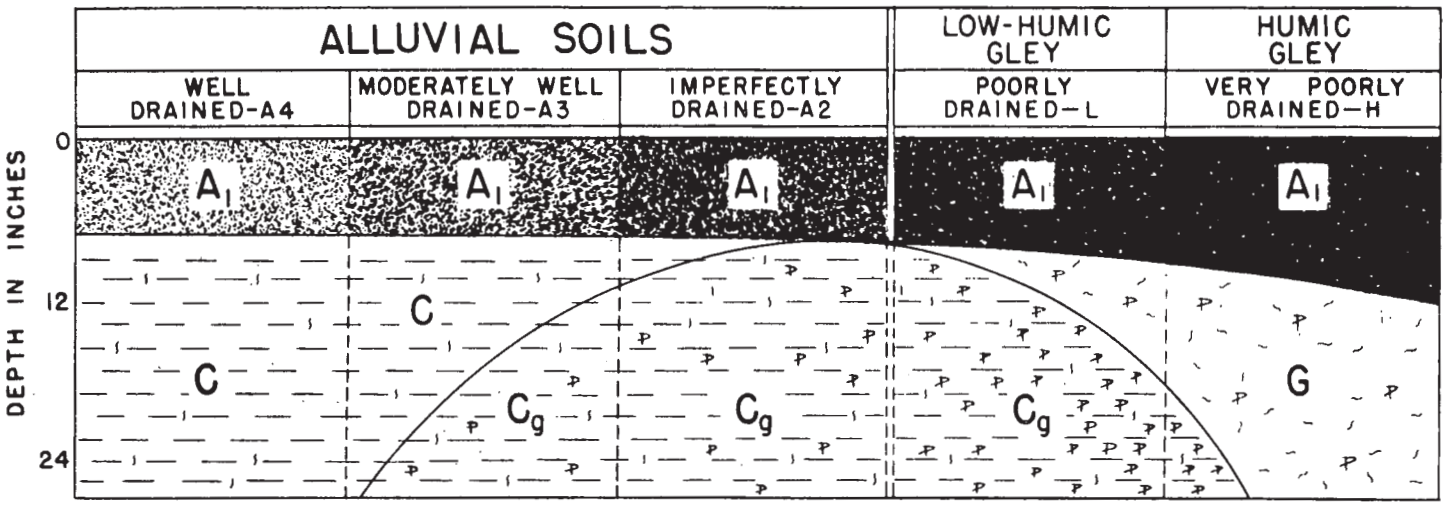

Figure 6.—**Profiles of a catena of soils formed on mixed alluvial materials.**

TABLE 1.—*Key to the soils and miscellaneous units*

Important characteristics	Parent material	ALLUVIAL SOILS (little profile development) AND GLEY ASSOCIATES (prolonged waterlogging)				
		Alluvial soils			Low-Humic Gley soils	Humic Gley soils
		Well drained [1] (A4)	Moderately well drained (A3)	Imperfectly or somewhat poorly drained (A2)	Poorly drained (L)	Very poorly drained (H)
Medium-lime—nearly neutral throughout but noncalcareous:						
Medium-textured profiles	Alluvium	Genesee	Eel		Wayland	Sloan.
Low-lime—acid soil over neutral but noncalcareous substratum:						
Medium-textured profiles	Alluvium	Chagrin	Lobdell		Wayland	Sloan.
Very low lime—acid throughout:						
Medium-textured profiles	Alluvium	Tioga [2]	Middlebury		Holly	
		GRAY-BROWN PODZOLIC SOILS (clays concentrated in subsoil) AND GLEY ASSOCIATES (prolonged waterlogging)				
		Gray-Brown Podzolic soils			Low-Humic Gley soils	Humic Gley soils
		Well drained (G4)	Moderately well drained (G3)	Imperfectly or somewhat poorly drained (G2)	Poorly drained (L)	Very poorly drained (H)
High-lime—medium-acid to neutral soil over calcareous substratum:						
Moderately coarse textured profiles.	Glacial outwash—limestone, shale, and sandstone.	Palmyra	Phelps		Homer	Westland.
Medium-textured profiles	Glacial till—limestone and gray shale.	Honeoye	Lima		Kendaia	Lyons.
Medium-textured profiles	Glacial till—limestone and gray shale, shallow over limestone bedrock.	Farmington	Lima		Kendaia	
Medium-textured profiles	Glacial till—limestone, red sandstone, and shale.	Ontario	Lima		Kendaia	Lyons.
Moderately fine textured profiles.	Lake clays, shallow over limestone till.	Cayuga		Ovid	Kendaia	Lyons.
Moderately fine textured profiles.	Glacial till—reworked lake clay and limestone.	Cazenovia				
Fine-textured profiles	Lake sediments—brown and reddish-brown clays and silts.	Schoharie	Schoharie	Odessa	Lakemont	Poygan.
Fine-textured profiles	Lake sediments—gray clays and silts.			Fulton	Fulton	Toledo.
Medium-lime—strongly acid soil over calcareous substratum:						
Coarse-textured profiles	Glacial lake sands and silt.	Arkport	Galen		Junius	Granby.
Moderately coarse textured profiles.	Glacial outwash—shale, sandstone, and limestone.	Howard	Phelps		Homer	Westland.
Medium-textured profiles	Glacial till—shale, sandstone, and limestone.	Lansing			Kendaia	Lyons.

See footnotes at end of table.

TABLE 1.—*Key to the soils and miscellaneous units*—Continued

Important characteristics	Parent material	GRAY-BROWN PODZOLIC SOILS (clays concentrated in subsoil) AND GLEY ASSOCIATES (prolonged waterlogging)				
		Gray-Brown Podzolic soils			Low-Humic Gley soils	Humic Gley soils
		Well drained (G4)	Moderately well drained (G3)	Imperfectly or somewhat poorly drained (G2)	Poorly drained (L)	Very poorly drained (H)
Medium-lime—strongly acid soil over calcareous substratum—Continued						
Medium-textured profiles	Glacial till—olive shale, shallow over shale bedrock.	Camillus				
Medium-textured profiles	Glacial lake sediments—silts and very fine sands.	Dunkirk		Collamer	Canandaigua	Colwood.
Moderately fine textured profiles.	Glacial till—reworked lake clay, shale, sandstone, and limestone.	Nunda		Burdett		
Moderately fine textured profiles.	Glacial till—dominantly soft gray shale.	Danley [3]		Darien	Romulus	Lyons.
Fine-textured profiles	Glacial lake clays			Caneadea		
		PODZOLS (iron concentrated in subsoil) AND GLEY ASSOCIATES (prolonged waterlogging)				
		Podzols			Low-Humic Gley soils	Humic Gley soils
		Well drained (P4)	Moderately well drained (P3)	Imperfectly or somewhat poorly drained (P2)	Poorly drained (L)	Very poorly drained (H)
Low - lime — very strongly acid soil over neutral substratum:						
Medium-textured profiles	Glacial till—mostly sandstone and shale.	Valois	Langford		Erie	Alden.
Moderately fine textured profiles.	Glacial till—mostly gray shale, shallow over shale bedrock.			Aurora	Angola	
No lime—very strongly to strongly acid throughout:						
Coarse-textured profiles	Glacial lake sands, more than 3 feet deep.	Ottawa	Berrien		Morocco	Newton.
Coarse-textured profiles	Glacial lake sands, less than 3 feet deep over clay.				Allendale	
Moderately coarse textured profiles.	Glacial outwash—sandstone and shale.	Chenango	Braceville		Red Hook	Atherton.
Medium-textured profiles	Friable glacial till from sandstone and shale.	Woostern				
Medium-textured profiles	Firm glacial till from sandstone and shale.	Bath	Mardin	Fremont	Volusia	Chippewa.
Medium-textured profiles	Shallow glacial till from sandstone and shale.	Lordstown				
Moderately fine textured profiles.	Glacial till—mostly shale.	Manlius		Hornell	Allis	

See footnotes at end of table.

TABLE 1.—*Key to the soils and miscellaneous units*—Continued

Important characteristics	Parent material	ORGANIC SOILS				
		Well drained	Moderately well drained	Imperfectly or somewhat poorly drained	Poorly drained	Very poorly drained
Neutral to slightly acid:						
Deep profiles	Woody peat					Carlisle.
Shallow profiles over marl	Organic material from deciduous trees.					Edwards.
Very shallow profiles over clay.						Bono.
Strongly acid	Sedge peat					Muck, acid.
		MISCELLANEOUS LAND UNITS				
		Well drained	Moderately well drained	Imperfectly or somewhat poorly drained	Poorly drained	Very poorly drained
Mildly alkaline soil over calcareous substratum:						
Medium-textured profile	Silty alluvium over shell marl.					Warners.
Neutral to acid soils:						
Medium-textured profiles	Alluvium	Alluvial soils, undifferentiated.	Alluvial soils, undifferentiated.		Alluvial soils, undifferentiated.	
Steep broken land	Limestone, sandstone, and shale	Steep broken land				
Fresh-water marsh						Fresh-water marsh

[1] The soil series in each column have profiles similar to those diagrammed in the corresponding columns of figures 3, 4, and 5.
[2] Tioga soils were mapped only in an undifferentiated group with Chenango soils.
[3] Danley soils were mapped only in undifferentiated groups with Lansing soils.

certain characteristic distributions of lime content are typical of each kind of profile. Lime content, as used in the table, also applies primarily to the well, moderately well, and somewhat poorly drained members of each group of soil series listed on one line. Typically, the poorly and very poorly drained soils are less leached and are higher in lime than the associated better drained soils listed on the same line.

Some of the soil groups, according to content of lime, are further subdivided on the basis of their texture. The following terms have been used to describe texture:

1. Coarse-textured profiles—those that are mostly sand or gravel and that normally contain no horizon finer textured than very fine sandy loam.
2. Moderately coarse textured profiles—those that are mostly loam to fine sandy loam in the upper part and mostly sand or gravel in the lower part. The upper part of these soils is commonly medium textured, and the lower parts of the subsoil and substrata are usually coarse.
3. Medium-textured profiles—those that are mostly loams or silt loams throughout the profile and underlying material. In the Gray-Brown Podzolic soils, the B horizon may be a clay loam.
4. Moderately fine textured profiles—those that are mostly clay loam or silty clay loam in the subsoil and substratum. The texture of the surface soil may be silt loam.
5. Fine-textured profiles—those that have a silty clay or clay subsoil and substratum.

In table 1 the kind of parent material from which the soils were derived is given for each of these texture classes. Different kinds of parent material may result in the same textural class. The very poorly drained and poorly drained soils may be somewhat finer textured than the better drained soils listed on the same line.

Each group of soils that have the same lime content, have the same texture of profile, and were derived from the same parent material can be still further subdivided according to drainage. In table 1 the drainage classes are shown in the 5 columns at the right. These drainage classes are the same as are shown in figures 3, 4, and 5. The soil series named in these columns can be matched to the profiles shown in the figures by matching the letters A4, A3, G4, etc., in table 1 to the same letters in the figures.

Soils that have the same drainage, lime content, general texture of profile, and parent material are similar enough in their profile and in most characteristics to be grouped together in a series. The soil series is the basic unit of soil classification. Within the series the soil may vary enough that different parts of it require different management for agriculture. The texture of the surface soil is a basis for dividing the series into soil types. These types can be further subdivided into phases on the basis of properties that affect use and management but do not change the basic soil profile. Such properties might be slope, degree of erosion, topographic position, and depth to bedrock. The use, management, and productivity of the soil within a single phase is uniform enough that

suggestions for use and predictions of yields can be made with reasonable accuracy.

Table 2 gives the distribution of the area's soils by some of the important characteristics that determine the use, management needs, and productivity. Detailed information about the individual soil phases is given in the section on Soils of Fields and Farms.

TABLE 2.—*Distribution of soils by selected characteristics*

Characteristic of soil	Ontario County		Yates County	
	Acres	*Percent of county*	*Acres*	*Percent of county*
Topography:				
Level and gently sloping	27, 180	65	141, 185	64
Sloping	81, 504	20	44, 877	21
Moderately steep	31, 612	8	15, 924	7
Steep	29, 472	7	18, 174	8
Drainage:				
Good	218, 066	53	104, 553	47
Moderately good	122, 895	30	61, 308	28
Imperfect and poor	53, 629	13	43, 842	20
Very poor	19, 519	4	10, 457	5
Erosion—thickness of soil lost:				
Less than 2 inches	175, 673	43	56, 442	25
2 to 5 inches	166, 544	40	106, 747	49
5 inches or more	71, 980	17	56, 991	26
Thickness of soil over bedrock:				
Less than 40 inches	43, 715	11	25, 890	11
More than 40 inches	369, 926	89	194, 270	89

Soils of Farming Communities, or Soil Associations

This section will help those who are interested in areas larger than an average-sized farm. The map of the counties in the back of the report shows the soil associations of Ontario and Yates Counties. This map can be used to judge suitable uses and management for areas that include several farms, or in other words, farming communities.

Shown on the map are 21 soil associations. A soil association is a constantly repeated pattern of soils. It ordinarily contains the mapping units of two to four soil series. Each association is named for the series that dominate in the soil pattern. For example, the Honeoye-Lima association is made up mostly of Honeoye and Lima soils but includes soils of other series, among which are the Kendaia and Lyons.

In table 3 the 21 soil associations have been placed in seven groups, or farming communities, to show relative suitability for crops. Following is a discussion of these groups, and of the soil associations in them.

Associations Dominated by Good and Excellent Soils for Crops

Three soil associations consist dominantly of soils good and excellent for crops. Most farms within these associations are made up mainly of soils of high quality for crops. Soils not suitable for cropping occur in only a few small areas.

Carlisle muck association (CM)

The only large area of organic soils in the two counties occurs southeast of Rushville, and most of it consists of Carlisle muck. About 30 percent of this area is shallow muck over clay or marl. A smaller area of this soil association lies at the south end of Canandaigua Lake, but fresh-water marsh makes up nearly half of this area, and the marsh cannot be drained because it lies next to the lake.

The association is rated good and excellent for crops on the basis of that part of the large area that has been drained. Where muck soils have been drained, the deeper areas are extremely productive of vegetable crops. Undrained muck soils are seldom used for hay or pasture and support mainly forest.

TABLE 3.—*Soil associations and percentage of soils of specified suitability for crops in each*

Map symbol	Name	Good and excellent soils for crops	Fair soils for crops	Poor soils for crops	Soils not suited to crops
	ASSOCIATIONS DOMINATED BY GOOD AND EXCELLENT SOILS FOR CROPS				
		Percent	*Percent*	*Percent*	*Percent*
CM	Carlisle muck	[1] 60–100	0	0	0–40
HL	Honeoye-Lima	60– 80	0–30	0–30	0–20
PO	Palmyra-Ontario	40– 60	0–30	0–40	10–30
	ASSOCIATIONS DOMINATED BY FAIR AND GOOD SOILS FOR CROPS				
CO	Cayuga-Ovid	15– 40	10–55	0–30	10–20
HO	Howard	20– 40	10–50	10–40	10–20
	ASSOCIATIONS DOMINATED BY FAIR SOILS FOR CROPS				
FA	Farmington	0– 20	30–80	0–40	10–25
LD	Lansing-Darien	10– 20	30–60	0–40	10–30
OS	Odessa-Schoharie	0– 10	65–90	0–20	5–20
	ASSOCIATIONS DOMINATED BY FAIR OR GOOD AND POOR SOILS FOR CROPS				
DR	Darien-Romulus	0– 10	20–50	20–60	10–30
EL	Erie-Langford	0– 10	10–40	35–70	10–25
LK	Lima-Kendaia	20– 40	0–30	25–55	5–25
LW	Lobdell-Wayland	0– 15	60–80	10–30	0–10
MF	Mardin-Fremont-Volusia.	0– 10	10–50	25–70	10–25
OK	Ovid-Kendaia	0– 10	10–50	20–70	10–30
VE	Valois-Erie	0– 20	10–50	20–60	10–30
VH	Valois-Howard, hilly	5– 20	0–35	20–60	20–40
	ASSOCIATIONS DOMINATED BY POOR SOILS FOR CROPS				
AD	Arkport-Dunkirk	0– 20	0–30	10–60	30–60
AL	Aurora-Lansing	0– 5	5–20	30–70	20–50
BA	Berrien-Allendale	0– 5	5–30	10–60	30–60
VM	Volusia-Mardin	0– 10	0–20	50–80	10–30
	ASSOCIATIONS DOMINATED BY SOILS NOT SUITED TO CROPS				
LM	Lordstown-Manlius	0– 5	0–30	0–40	60–90

[1] When artificially drained.

In this association, the chief management problems are providing adequate drainage and maintaining the water table during the dry periods of the year. Complete fertilizers high in potassium are needed for intensive production of vegetables.

Honeoye-Lima association (HL)

About half of this soil association consists of the fertile, well-drained, high-lime Honeoye soils. About 30 percent is occupied by the associated moderately well drained Lima soils. The rest is composed of poorly drained Kendaia soils, very poorly drained Lyons soils, and a few small areas of soils derived from glacial outwash, recent alluvium, or glacial lake clays. The Honeoye and Lima soils dominate and largely support the prosperous agriculture of this soil association.

More than 80 percent of this association consists of gently undulating soils suited to crops. Less than 20 percent is unsuited to tilled crops, and this percentage is made up of wet soils or very strongly sloping soils that border the stream valleys. On most farms 60 to 80 percent of the acreage is good to excellent for many kinds of crops, including hay and pasture at one extreme, and fresh vegetables at the other.

This association is cropped intensively. Most of the acreage is used for vegetables and other tilled crops. Maintenance of organic matter and keeping the soils in good tilth are important problems under this kind of use. For most of the association, the supply of organic matter in the surface soil is about one-half to one-third of what it was originally. Soil structure has been damaged by long cropping and by loss of organic matter.

Most of the soils are nearly neutral in reaction. Liming is important only in the southernmost parts of the association. Except for nitrogen, the supply of all plant nutrients is generally high. Potassium deficiency may occur under intensive cropping, but under the fertilization normally practiced in the region, phosphorus appears to be maintained at a level satisfactory for efficient crop production.

Drainage is an important problem in some places. Most of the poorly drained soils in this association can be artificially drained by tile. The dominant soils of the association are suited to most vegetable crops, corn, small grains, and hay. Alfalfa is the best legume for most areas.

Palmyra-Ontario association (PO)

In this association drumlins are the most conspicuous features of the landscape. These drumlins are separated by extensive areas of nearly level glacial outwash terraces on which Palmyra soils are most common. The Palmyra soils occupy about 50 percent of the association. The sloping or moderately steep Ontario soils on the drumlins occupy about 35 percent. Small areas of the moderately well drained Lima or Phelps soils and a few small areas of the very poorly drained Lyons or Westland soils make up most of the remaining 15 percent of the association.

Soils not suited to crops cover 10 to 30 percent of the association. Most of these occupy small areas on the sides of drumlins, but they may be a fairly large part of some farms. From 70 to 90 percent of the association is suited to crops. One-third to one-fourth of this is only fair cropland, as it consists of sloping or moderately steep Ontario soils on the sides of drumlins. The nearly level Palmyra soils between the drumlins are good to excellent for most crops; they cover 30 to 60 percent of the area suitable for cropping.

The better soils are used intensively for crops. Maintenance of organic matter and good tilth are among the foremost problems. On the strongly sloping sides of the drumlins, soil erosion is serious under cropping. Many of these drumlin soils should be retired from cultivation. Drainage is generally good throughout the association. Crops are more likely to be damaged from too little water than from too much.

Soils of this association have plenty of lime. Generally, they all need nitrogen. Need for potassium may limit yields. The soils should have regular applications of phosphorus, but need for this element is not serious.

The gently sloping and nearly level areas of Ontario and Palmyra soils are suited to many crops; the range is from intensively grown vegetables to hay crops. Alfalfa is the best legume for most areas.

Associations Dominated by Fair and Good Soils for Crops

In this group are two soil associations, both of which consist mostly of soils suitable for crops. But the percentage of excellent and good cropland in these associations is lower than in the associations previously described. The soil associations of this group are fair to good for crops, but restricted internal drainage or strong slopes somewhat limit use.

On most farms more than 70 percent of the acreage is judged suitable for crops, but of this amount, 50 to 70 percent consists of soils of moderate suitability, and 20 to 40 percent consists of soils of good and excellent suitability.

Cayuga-Ovid association (CO)

This association occurs on the slopes bordering Seneca Lake where a thin layer of glacial lake clays overlies calcareous glacial till. The soils are moderately fine textured. Most of the slopes range from 3 to 15 percent.

About 50 percent of the association consists of well-drained Cayuga soils, and about 25 percent of imperfectly drained Ovid soils. The rest consists of about 10 percent of poorly and very poorly drained Kendaia and Lyons soils, about 10 percent of Honeoye and Lima soils, and small areas of various alluvial soils.

From 70 to 80 percent of this association is suited to crops, but only 15 to 40 percent of any area is good cropland. Most of this good cropland is on the smoother areas of Cayuga soils where slopes are less than 5 percent. The greater part of the association is fair cropland, which is mainly on Cayuga or Ovid soils having slopes of 5 to 15 percent.

Control of runoff is one of the principal problems. The generally uniform slopes are suited to stripcropping and diversion terraces. On most areas rotations should include at least 2 years of sod crops and not more than 1 year of an intertilled crop.

The soils are acid in the upper part and should be limed regularly. The supply of potassium is better than in most of the surrounding soils, but regular applications of phosphorus are needed. Maintaining the supply of organic matter is important. These moderately fine textured soils need organic matter to keep them in good tilth and to supply nitrogen. Alfalfa is among the best legumes for stands to be kept 3 years or less. For longer stands and for pasture a better legume is birdsfoot trefoil.

Howard association (HO)

This is a small association. Howard soils occupy about 60 percent of the total area, and of this about half is on nearly level slopes, and the rest is on irregular slopes greater than 8 percent. About 15 percent of the association consists of the moderately well drained Phelps soils, and about 10 percent of poorly and very poorly drained soils. Lansing, Lima, and Langford soils make up the remaining 15 percent.

From 80 to 90 percent of this association is suited to cropping, but only 20 to 40 percent of this can be considered good for crops. Another 20 percent, consisting mainly of Howard and associated soils on gently rolling topography, is fair cropland. From 20 to 30 percent of the acreage that can be used for crops is poor for that purpose because slopes are steep. Some farms may occur entirely on the nearly level Howard soils, and some may be entirely on the gently rolling or hilly areas.

The nearly level Howard soils are suited to very intensive rotations in which intertilled crops may be grown for several years in succession. The rolling areas require longer rotations that have 2 or more years of sod crops and not more than 1 year of an intertilled crop.

Drainage generally is not a serious problem, but control of runoff is important on the rolling soils. The slopes are commonly irregular and poorly suited to stripcropping or contour cultivation. Rotations that have a high proportion of sod crops must be used on these slopes.

These soils contain lime in their substratum, but their surface soil and subsoil are acid and need lime at regular intervals. Phosphorus fertilizer should be applied regularly. If these soils are cropped intensively, they will also need potassium.

The smoother areas are suited to a wide range of crops including intensively grown vegetable crops. Alfalfa is generally the best legume for stands to be left 3 years or less. Birdsfoot trefoil is a better legume for longer stands.

Associations Dominated by Fair Soils for Crops

This group consists of three soil associations, each of which has a large acreage that can be considered suitable for cropping. Little or none of the acreage, however, can be judged as good cropland. Use is limited by very fine texture, shallow depth to bedrock, or moderately strong slopes.

Farmington association (FA)

Most of the Farmington soil association occurs in an area between Phelps and Manchester where the Onondaga limestone is overlain by a very thin layer of glacial till. About 70 percent of this association is made up of shallow or moderately deep Farmington soils, which range from less than 20 to about 40 inches deep over limestone. The rest of the association consists of the gravelly Palmyra soils, the moderately well drained Lima soils, and alluvial soils along streams.

From 75 to 90 percent of the total area is suited to crops, but 50 to 80 percent of this is only fair cropland and most of the rest is poor for crops. Vegetable crops can be grown on the deeper soil areas, but most of the association is better suited to hay and pasture.

Lack of moisture commonly limits use throughout the area, because so many of the soils are shallow and have a moderately low water-holding capacity. Conservation of water is important. The very gentle slopes help somewhat in conserving water. Simple conservation practices like contour cultivation, with proper rotation of crops, are usually enough in many places. The shallow depth of the soils prevents construction of diversion terraces.

Most of these soils are moderately high in lime, but some lime should be added. The soils are generally fertile. They all need phosphorus regularly. Some may not have enough potassium when intensively cropped.

Corn, small grains, and hay are moderately well suited. Alfalfa is probably the best legume for stands to last 3 years or less, but for longer stands, birdsfoot trefoil should be considered.

Lansing-Darien association (LD)

This association is along the lower edge of the Portage Escarpment where slopes are moderately strong and where clay shales are part of the parent material. About 40 percent of the total area consists of the well-drained medium-textured Lansing soils derived from glacial till. About 40 percent is made up of moderately fine textured imperfectly drained Darien soils derived mostly from clay shales. The rest of the association consists mainly of poorly and very poorly drained soils on glacial till. Some small areas of soils are from alluvium, glacial outwash, and lake clays.

From 70 to 90 percent of the total area is suited to crops, but only 10 to 20 percent of this is good cropland. The best cropland is mostly on the small widely separated areas of gently sloping Lansing soils. Fair cropland covers most of the association. It consists of moderately fine textured Darien soils on slopes of 3 to 15 percent and medium-textured well-drained Lansing soils on slopes of 8 to 15 percent.

Control of water and maintenance of soil tilth are important management needs. Runoff is rapid on these moderately strong slopes. Rotations should include at least 2 years of sod crops for each year of tilled crop. If even a few tilled crops are included in the rotation, stripcropping and diversion terraces will be needed for much of the area.

These soils are medium in lime content. They have calcareous substrata, but their surface soils and subsoils are acid. They should be limed at regular intervals. Fertility is moderate. Both potassium and phosphorus are needed for best yields. The soils generally need leg-

umes, manure, or fertilizer to provide nitrogen and to increase the organic-matter content.

Alfalfa is well suited to the well-drained Lansing soils. It may be used on the imperfectly drained Darien soils, but clover should be seeded at the same time. For stands to last 3 years or more, birdsfoot trefoil is the best legume for the Darien soils.

Odessa-Schoharie association (OS)

This association occurs on areas of glacial lake clays. Slopes are mainly less than 10 percent, but next to the larger streams such as Honeoye Creek the clays have been eroded, and slopes may range up to 45 percent. Odessa and Schoharie soils constitute 85 percent of the total area and are mainly on slopes between 2 and 10 percent. The proportion of these two soils varies from place to place. Schoharie soils dominate near the stream valleys and on the stronger relief, and Odessa soils dominate on the smoother relief. About 15 percent of the association consists of poorly drained Lakemont soils and very poorly drained Poygan soils.

From 80 to 95 percent of the area is suited to crops, but less than 10 percent of this is good cropland. Most of the area suited to crops is fair for that purpose and consists of very fine textured Schoharie and Odessa soils. Fine textures and poor tilth limit the choice of crops. Vegetables can be grown, but they are not well suited. Grain and forage crops are better suited.

On this association, management of water and maintenance of good tilth are the principal problems. Tilth deteriorates rapidly if these clayey soils are cropped intensively. Rotations consisting of at least 2 years of a sod crop and not more than 1 year of an intertilled crop are needed to maintain good tilth. The soils erode easily, even on gentle slopes. If intertilled crops are grown most of the time, most slopes need stripcropping and diversion terraces. Diversion ditches would help dispose of excess surface water in some areas.

The soils are high in lime; only a few places need additional lime. The fertility of this association is generally high. Potassium content is generally high, but phosphorus is needed. Alfalfa is the best legume for the Schoharie soils, but for the Odessa, Lakemont, and Poygan soils, the clovers or birdsfoot trefoil are better legumes.

Associations Dominated by Fair or Good and Poor Soils for Crops

This group is made up of eight soil associations. Considering these associations as a whole, a large part of the acreage is suitable for cropping, but most of the soils are only fair to poor for this purpose. Only minor areas of good cropland occur in any of the associations, and some of them have no good cropland. Most of the associations, however, have cropland of fair quality in acreages large enough to support a stable agriculture. Restricted internal drainage or strong relief is the main factor limiting use of the soils.

Darien-Romulus association (DR)

In this association are moderately fine textured soils on glacial till that was derived primarily from clay shales. Slopes are gentle. About 65 percent of the total area consists of imperfectly drained moderately fine textured Darien soils on gentle slopes. Another 25 percent consists of the poorly drained associate of the Darien soils, that is, Romulus soils on nearly level or gentle slopes. About 10 percent is composed of very poorly drained Lyons soils or other soils such as those of the Honeoye series.

There is almost no good cropland in this association. Fair cropland, mainly on Darien soils with slopes of 3 to 15 percent, covers 30 to 50 percent of the association. The rest is poor cropland consisting mainly of poorly drained Romulus soils or Darien soils on stronger slopes.

The control of water is the chief management problem. Drainage is important, but most of the soils are difficult to drain artificially. The soils erode easily, even those on gentle slopes. Stripcropping or diversion ditches are needed if intertilled crops are grown.

Although the substratum is calcareous, liming is needed because the surface soils and subsoil are commonly acid. Fertility is moderate. Phosphorus is needed regularly. The potassium supply may not be enough for intensive growing of vegetables, but it is greater than the supply in the coarser textured soils.

Since these soils are not highly responsive to management, they should not be used for crops that require large amounts of labor and materials. Most of the association is best suited to forage and grain crops. Rotations made up of 2 or 3 years of sod crops and not more than 1 year of an intertilled crop are best. The best suited legumes are birdsfoot trefoil and the clovers. Alfalfa will grow in some places, but in most areas clover should be added to the seeding mixture.

Erie-Langford association (EL)

This association occurs south of Penn Yan on glacial till that has little lime. It has about equal areas of poor and moderately good drainage. The poorly drained Erie soils cover about 40 percent of the acreage, and the moderately well drained Langford soils cover another 30 percent. The rest of the association consists mainly of the more acid Mardin and Volusia soils. Slopes range from 3 to 15 percent, but most of them are less than 8 percent.

There is almost no good cropland in this association. Nevertheless, from 75 to 90 percent of the acreage can be used for crops, and of this about 20 to 40 percent is fair cropland. The fair cropland is mainly on moderately sloping Langford soils. The rest of the cropland is poor and consists primarily of Erie soils, or of Langford or Mardin soils on moderate to strong slopes. All the soils of this association need regular liming because they are acid to depths of 2½ or 3 feet. They are more fertile than soils of the Mardin-Fremont-Volusia association but their fertility is low in comparison with that of the Honeoye soils. The soils of this association are all deficient in phosphorus, and most of them become short of potassium when they are heavily cropped.

Maintenance of fertility and control of water are the principal management problems. Rotations should include 2 or 3 years of sod crops and not more than 1 year of an intertilled crop. If intertilled crops are grown, diversion terraces are needed to improve drainage of the poorly drained soils, and stripcropping for control of runoff is required on the stronger slopes. The soils are poorly suited to artificial drainage by tile. Alfalfa is not a good legume for soils of this association; the clovers and birdsfoot trefoil are better.

Lima-Kendaia association (LK)

This is an association of medium-textured soils on glacial till. It occurs where poor and moderately good drainage are most common. The association contains very little well-drained soil. About 40 percent of the association consists of the moderately well drained and productive Lima soils on 3 to 8 percent slopes. About 35 percent is occupied by the poorly drained Kendaia soil on slopes of mainly less than 3 percent. The remaining 15 percent is made up of the very poorly drained Lyons soils or various soils from other catenas.

On most farms, 75 to 95 percent of the acreage is suited to crops, and of this, 40 to 60 percent is fair to good cropland, and most of the rest is poor for crops. The fair cropland is mainly on the Lima soils.

Control of water is one of the principal problems. The restricted drainage limits the choice of crops and cuts down on the response to good management. Many areas stay wet until so late in the spring that planting may be delayed. Some of the farms need diversion terraces to dispose of excess surface water. Where sloping areas have restricted internal drainage, the runoff may be excessive, and stripcropping, diversion terraces, and cover crops may be necessary.

Much of the acreage on most farms shows only fair response to management. Hay, small grains, and corn grown in support of dairying are the best suited crops. On the Lima soils that have the best degree of drainage and on the Kendaia soils that are drained artificially, intensively grown crops are well suited.

Soils of this association need little lime except in a few places. Fertility is moderately high. Phosphorus should be applied regularly, and potassium may be needed after intensive cropping. The organic-matter content is quite high, but the organic material decomposes slowly in spring. Because the slowly decaying organic material releases little nitrogen, spring corn and small grains respond well if commercial nitrogen is applied.

Alfalfa does well on the Lima soils, but it is not well suited to the Kendaia soils unless they have been artificially drained. Clovers should be included in most seeding mixtures because they will persist after the alfalfa fails. If long stands of hay are wanted, birdsfoot trefoil is the best legume.

Lobdell-Wayland association (LW)

In this association are the areas of alluvial soils large enough to be shown on a soil association map. Many small areas of alluvial soils have been included in other soil associations. This association lies north of Naples on the alluvial flats near the south end of Canandaigua Lake. The moderately well drained Lobdell soils are dominant, but large areas of poorly drained Wayland soils and smaller areas of well-drained Chagrin soils are present.

Drainage is the principal management problem, and it is very difficult to improve the drainage. The water tables cannot be lowered much because the soils lie near Canandaigua Lake. About one-third of the area is too wet for crops, and most of the rest is suited to only a few crops because of its high water table.

Generally this association is best suited to hay or pasture. A few areas can be used for rotations that include intertilled crops. Clovers or birdsfoot trefoil are probably the best legumes for most of these soils. Only moderate amounts of lime are usually needed, and fertilizer requirements are lower than for most of the upland soils.

Mardin-Fremont-Volusia association (MF)

This soil association is on the summits of the broader plateau remnants in the Allegheny Plateau section. It lies above the steep valley sides on which Woostern or Lordstown soils are dominant. The broad smooth hilltops of this association have slopes mostly less than 15 percent. Most of the soils are moderately well drained or imperfectly drained. In most places the moderately well drained Mardin soils and the imperfectly drained Fremont soils compose 60 to 80 percent of the area, and of this 30 to 50 percent is Mardin soils, and the rest is Fremont soils. Moderately large areas of poorly drained Volusia soils occupy 20 to 30 percent of most farms. Areas of well-drained Woostern soils are present in some places.

There is very little good cropland in the association. Nevertheless, 75 to 90 percent of the area can be used for crops, and of this about equal parts are fair cropland and poor cropland. Most of the fair cropland is on the gently sloping Mardin soils, but part of the Fremont acreage also is fair for crops. Most of the poor cropland is on the poorly drained Volusia soils or the more strongly sloping Mardin or Fremont soils.

Maintaining fertility and drainage are the principal problems. All of the soils are very strongly acid, and all need lime regularly. Phosphorus should be applied regularly. Potassium is likely to become deficient under intensive cropping.

On the poorly drained soils, drainage-type diversion terraces may help dispose of excess water. Stripcropping can control water on some slopes. Rotations that have at least 2 or 3 years of sod crops for each year of intertilled crop are best on most soils of this association.

Few legumes are presently grown in the meadows, but it would be good management to grow them. Alfalfa is poorly suited to most of the soils, but it can be used in mixtures with clovers on the Mardin soils. The clovers or birdsfoot trefoil are the best legumes for these soils. Whatever legume is used, large amounts of fertilizer are needed for successful seeding. Potatoes may be profitable in a few places on Mardin soils, but for most of these soils the best suited crops are grain and forage for dairy cattle.

The agriculture on most of this association is poor because the areas are generally distant from good roads and markets. If roads and markets are developed, these

soils can support a stable agriculture if they are well managed.

Ovid-Kendaia association (OK)

The soils of this association are on long uniform slopes ranging from 5 to 15 percent, and much water from higher land flows across them. They occur east of Dundee and facing Seneca Lake. Most of the soils are imperfectly or poorly drained and were derived from moderately fine textured glacial till. About 55 percent of the association consists of imperfectly drained Ovid soils, and about 30 percent of poorly drained Kendaia soils. Most of the rest of the association is made up of well-drained Cayuga soils, but some medium-textured soils on till are included.

Most of this soil association can be cropped, but almost none of it is good cropland. The moderately sloping Ovid soils are fair for crops, and they cover 30 to 50 percent of the area. The rest of the association is poor cropland consisting of poorly drained Kendaia soils or of strongly sloping Ovid soils.

Control of water and maintenance of fertility are the principal management problems. The soils receive so much runoff from the long slopes above them that erosion control is a serious problem. Most of the slopes are well suited to stripcropping and drainage-type diversion terraces. Rotations that include at least 2 years of sod crops and not more than 1 year of an intertilled crop are best.

Most of the soils are high in lime, but a few areas may be acid and need liming. Phosphorus should be supplied regularly, but the potassium supply is usually sufficient unless the soils are cropped intensively.

This soil association is not well suited to crops that require large amounts of labor or materials. Grain and forage crops grown in support of dairying are better. Alfalfa can be used on some of the Ovid soils, but generally clovers or birdsfoot trefoil are better suited legumes.

Valois-Erie association (VE)

This association occurs west of Penn Yan. The soils are strongly acid and overlie a neutral or very weakly calcareous substratum. Most of the soils have slopes ranging from 3 to 15 percent, but some have slopes of 15 to 30 percent. In a few places the soils are shallow over bedrock. About 30 percent of the area consists of well-drained Valois soils, which usually are on moderately strong slopes. Another 30 percent consists of poorly drained Erie soils. Small areas of Howard soils on glacial outwash cover another 15 percent. The rest of the area consists of Langford soils of the Valois catena, and there are some soils from acid material, such as the Volusia, Mardin, and Woostern soils.

Most of the association can be used for crops, but almost none of it is good cropland. Valois or Howard soils on slopes of less than 15 percent cover 30 to 50 percent of the area, and they are fair for crops. Most of the rest of the association is poor cropland consisting of Valois and Howard soils on slopes greater than 15 percent and of the poorly drained Erie soils on slopes of 3 to 15 percent.

Maintaining fertility and controlling water are important on this soil association. Most of the soils do not respond well enough to management to justify use of intensively grown crops. Crops of the kind needed on a dairy farm are more suitable. A large part of the area is best suited to long-term sod crops. For most of this association, the best rotations are those that include at least 2 years of sod crops and not more than 1 year of an intertilled crop. Stripcropping and diversion terraces can be used to control runoff for much of the area. Drainage-type diversion terraces may help control runoff on the Erie soils.

All of the soils of this association are acid and need lime regularly. Phosphorus is also needed regularly. Potassium will be needed if high yields are to be obtained from the soils. Alfalfa is the best legume for the well-drained Valois and Howard soils. Alfalfa is very poorly suited to the Erie soils, so clovers or birdsfoot trefoil should be used.

Valois-Howard, hilly, association (VH)

This association of soils is on morainic topography near Naples. The slopes are complex and range mainly from 8 to 25 percent. Most of the area is rolling to hilly, but a few small areas are undulating or nearly level. The ice front of the glacier stood for a long time in this area. It left a complex pattern of glacial outwash and deep glacial till and in some places deposited reworked clays.

About 30 percent of the total area consists of the well-drained low-lime Valois soils on glacial till, and about 40 percent of the well-drained medium-lime Howard soils on glacial outwash. The imperfectly drained Burdett soils on reworked glacial-lake silts and clays make up another 20 percent of the area. The remaining 10 percent of the association consists of miscellaneous units, such as alluvial soils and small areas of sands or lake clays.

Crops can be grown on 60 to 80 percent of the total area, but very little of this association is good cropland. The good cropland is mainly in small areas of nearly level or gently undulating soils that are isolated by large areas of rolling land. Fair cropland on moderate but complex slopes covers 20 to 40 percent of the area. Another 30 to 40 percent is poor cropland on strong slopes and is not suited to intertilled crops.

Control of runoff and maintenance of fertility are the principal management needs. The complex and moderately strong slopes limit the choice of crops because stripcropping and diversion terraces are not practical on such topography. Rotations containing at least 2 years of sod crops and not more than 1 year of an intertilled crop are best. Grain, forage, and long-term sod crops are most suitable.

Fertility of these soils is moderate. Most of them require lime, and all of them need phosphorus regularly. Potassium becomes deficient wherever legumes are grown. When rotations consist mainly of legume sod crops, the organic matter can be maintained and runoff can be controlled. Alfalfa is probably best for stands intended to last 3 years or less. For longer stands birdsfoot trefoil is better suited on most farms.

Associations Dominated by Poor Soils for Crops

The four soil associations in this group are dominantly poor for crops, because they are made up of soils that are

strongly sloping, shallow to bedrock, low in fertility, or poorly drained. These limitations drastically restrict choice of crops and the response to management. These associations contain large areas that can be used as cropland, but they are poor for this purpose.

Arkport-Dunkirk association (AD)

This association consists of sandy soils and silty soils derived from glacial-lake materials. They lie in intricate patterns on a complex topography. About 50 percent of the association consists of the sandy well-drained moderately acid Arkport soils, which are mainly rolling and hilly. Another 20 percent is occupied by gravelly Palmyra soils, which are also rolling and hilly. About 15 percent of the association is made up of Dunkirk and Collamer silt loam soils, which were derived from glacial-lake silts, and are undulating to gently rolling. In some places there are moderately large areas of the Palmyra soils and of the Dunkirk and associated soils.

One of the principal factors limiting use of the soils is the complexity of slopes. From 40 to 70 percent of the total area can be used for crops, but many farms contain almost no good cropland. The sloping Arkport and Dunkirk soils are fair for crops and make up 10 to 30 percent of the association. Most of the rest of the acreage is poor for crops, because it is on complex strongly sloping topography or is unsuited to crops because it is hilly. In some places there are areas of good or fair cropland large enough to support a good farm business.

This soil association contains mostly well-drained soils, and conservation of water is needed. The soils are permeable and strongly sloping, so they usually lack moisture in the middle of the summer. On most of the association stripcropping and diversion terraces are not practical, because the slopes are complex. Little of the association is well suited to intensive cropping. Vegetable crops can be produced successfully on a few areas of the Dunkirk or Arkport soils. In most places the soils of this association need a rotation that includes at least 2 years of sod crops and not more than 1 year of an intertilled crop. Many areas of these soils are best suited to long-term hay or pasture.

Most of the soils of this association require some liming. Their slightly to medium acid upper layers overlie neutral or calcareous substrata. They need regular applications of phosphorus, and most of them also need potassium. Maintenance of organic matter and nitrogen is important, and this can best be done in most areas by growing sod crops. Alfalfa is well suited to most soils of the association. On some stronger slopes that require long stands of hay or pasture, birdsfoot trefoil is a better legume.

Aurora-Lansing association (AL)

This association covers a small area on the slopes facing Seneca Lake east of Dundee. Most of the soils are shallow. About 40 percent of the association consists of imperfectly drained Aurora soils, which are moderately fine textured and have slopes of 8 to 20 percent. Shallow Lansing soils on slopes between 8 and 25 percent occupy about 35 percent of the association. The rest of the area consists mainly of shallow Manlius and Hornell soils that overlie acid material.

From 20 to 50 percent of this association is not suited to cropping. Of the 50 to 80 percent that can be used for crops, very little is even fair for crops. Shallow depth to bedrock, restricted internal drainage, strong slopes, or some combination of these, impose severe limitations on the use of most of the soils.

Water control is important. The soils are likely to lack moisture in midsummer. Stripcropping and diversion terraces can be used to conserve moisture on the deeper soils that have uniform slopes. In most parts of the association moisture will have to be conserved by selecting suitable crop rotations. Generally intertilled crops are poorly suited. Sod crops for hay and pasture are best. Alfalfa can be used in a few places, but for most of the soils birdsfoot trefoil or the clovers are the best legumes for seeding mixtures.

Small quantities of lime are in the deep substratum, or in some places even in the bedrock itself, but the soils are acid and require regular liming. Phosphorus should be applied at regular intervals. Response to potassium has been small in the past, probably because the grass meadows, for which the soils have been most commonly used, did not utilize much potassium. Legumes feed more heavily and are more exacting; when they are grown more potassium will be needed. Organic matter can best be maintained by growing legume-grass mixtures most of the time. This association can support only a mediocre agriculture. The best use of this soil probably would be grass pasture.

Berrien-Allendale association (BA)

This soil association is on an area of acid sands north of Geneva. The moderately well drained nearly level to strongly rolling Berrien soil covers about 40 percent of the area. About 30 percent consists of the poorly drained Allendale soil. Small areas of imperfectly drained sandy soils make up the remainder. Some of these sandy soils have a neutral substratum.

Low fertility and wetness limit the use of this soil association. Much of it is idle. The poor drainage and complex topography make 30 to 60 percent of the area unsuited to crops. Of the 30 to 70 percent that can be used for crops, very little is even fair cropland. The rolling Berrien soil is apt to be rather dry. The very poorly drained level Allendale soil is suited to very few crops.

The soils of this association are strongly acid and need liming regularly. Fertility is very low. Phosphorus should be applied regularly, and the soils will need large amounts of potassium under most cropping systems.

In a few places small fruits and vegetable crops have been grown successfully. Where the poorly drained soils can be drained artificially, vegetables and fruits may produce good yields. Birdsfoot trefoil is the best legume on the Berrien soil, and Ladino clover is best on the Allendale soil.

Volusia-Mardin association (VM)

Acid poorly drained soils are most common in this association. About 60 percent of the area consists of

Volusia soils on slopes of 3 to 15 percent, and about 20 percent consists of Mardin and Fremont soils on slopes between 8 and 15 percent. All of the slopes are long, smooth, and uniform.

Most of this association can be used for crops, but almost none of it is good cropland, and very little is even fair. Soils suitable for cropping cover 70 to 90 percent of the association, but 60 to 80 percent of this is poor cropland because of poor internal drainage.

Water control is probably the most important management need. The soils have a very hard substratum and are not suited to tile drainage. Drainage-type diversion terraces may be helpful.

Fertility must be maintained for successful crop production. All of the soils are low in fertility. They require regular liming and regular applications of phosphorus. Under previous cropping systems, the potassium supply was enough, but if legumes are grown regularly the soils will need potassium.

These soils respond poorly to management. Crops that require large amounts of labor and material do not pay on this association. Grain and forage crops are more suitable. Rotations should include at least 2 to 3 years of sod crops for each year of intertilled crop. Alfalfa is not suited to this association, but birdsfoot trefoil and clover are suitable legumes for hay or pasture. Most areas of this association are probably best used for grass.

Associations Dominated by Soils Not Suited to Crops

Only one soil association in Ontario and Yates Counties is not suited to cropping. Steep slopes prevent cultivation in most places. These soils used for crops give very poor yields.

Lordstown-Manlius association (LM)

Steep, shallow, acid Lordstown or Manlius soils make up 60 to 80 percent of this soil association. Moderately steep or sloping Woostern, Volusia, and Mardin soils, covering 20 to 40 percent of the area, occur as small areas among the steeper Lordstown or Manlius soils.

The best use for most of this association is forestry. Some areas are used for pasture, but results are very poor. Native pastures cannot be improved because slopes are steep. Grapes are grown to some extent near Canandaigua Lake. Grape culture has led to very serious erosion. In many places the grapes are now growing in broken shale.

Soils of Fields and Farms

This section describes each of the soil units that appear on the soil map. The soil properties that affect the use and management of the soil are given, and suitable crops and practices for the soil are suggested. Requirements for lime and fertilizer are mentioned.

The soils are arranged alphabetically by series name. Under each series name is a detailed description of that series and a complete profile description of the most important soil type within it. This is followed by a brief description of each map unit in the soil series. Information on rotations, fertilizers, and other special practices suitable for each soil is given in table 12. Several basic systems of management that will maintain organic matter and good tilth and control erosion are listed in table 10.

Tables 4 and 5 give the total area of each mapping unit in the two counties and the amount used for crops, pasture, and woods, left idle, or used as residential sites in the period 1941 to 1943, the time when the survey was made.

TABLE 4.—*Approximate acreage, proportionate extent, and use of soils mapped in Ontario County*

Soil	Area	Percent of county	Distribution according to use for—				
			Crops	Pasture	Idle land	Woods	Residential
	Acres	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Alden silty clay loam, 0 to 1 percent slopes	130	(1)	14	37	25	24	0
Allendale fine sandy loam, 0 to 2 percent slopes	600	0.1	70	9	15	6	0
Allis channery silt loam, 12 to 20 inches deep, eroded, 15 to 25 percent slopes	350	.1	15	14	39	32	0
Allis silt loam, 36 inches or more deep, 3 to 8 percent slopes	775	.2	15	32	29	24	0
Allis silt loam, 12 to 20 inches deep, 3 to 8 percent slopes	725	.2	15	31	43	11	0
Allis silt loam, 12 to 20 inches deep, eroded, 8 to 15 percent slopes	900	.2	11	20	43	26	0
Alluvial soils, undifferentiated, 0 to 2 percent slopes	2,700	.6	13	47	14	25	1
Angola silt loam, 0 to 3 percent slopes	275	.1	47	23	25	5	0
Arkport-Dunkirk fine sandy loams, 6 to 12 percent slopes	550	.1	71	19	9	1	0
Arkport-Dunkirk fine sandy loams, eroded, 12 to 20 percent slopes	900	.2	57	28	10	4	1
Arkport fine sandy loam, 0 to 5 percent slopes	5,300	1.2	77	8	6	6	3
Arkport fine sandy loam, 6 to 12 percent slopes	3,900	.9	69	12	9	8	2
Arkport fine sandy loam, eroded, 12 to 20 percent slopes	1,650	.4	58	9	16	16	1
Arkport loamy fine sand, 0 to 5 percent slopes	150	(1)	40	1	59	0	0
Arkport soils, 20 to 45 percent slopes	1,600	.4	29	40	29	1	1

See footnote at end of table.

TABLE 4.—*Approximate acreage, proportionate extent, and use of soils mapped in Ontario County*—Continued

Soil	Area	Percent of county	Distribution according to use for—				
			Crops	Pasture	Idle land	Woods	Residential
	Acres	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Atherton silt loam, 0 to 1 percent slopes	250	0.1	13	18	14	52	3
Aurora silt loam, 3 to 8 percent slopes	725	.2	51	20	15	12	2
Aurora silt loam, eroded, 3 to 8 percent slopes	100	(1)	50	10	39	1	0
Aurora silt loam, 8 to 15 percent slopes	325	.1	64	16	3	17	0
Aurora silt loam, eroded, 8 to 15 percent slopes	400	.1	30	53	14	2	1
Aurora silt loam, eroded, 15 to 30 percent slopes	500	.1	13	22	43	22	0
Bath channery silt loam, 5 to 15 percent slopes	2,600	.6	13	3	22	62	0
Bath channery silt loam, 15 to 25 percent slopes	1,750	.4	8	7	25	60	0
Berrien fine sandy loam, 0 to 6 percent slopes	2,900	.7	64	11	15	9	1
Bono silty clay, 0 to 1 percent slopes	200	(1)	35	12	2	51	0
Braceville gravelly silt loam, 0 to 5 percent slopes	450	.1	43	24	21	12	0
Burdett silt loam, 0 to 6 percent slopes	150	(1)	45	41	11	3	0
Camillus silt loam, 0 to 8 percent slopes	900	.2	92	3	2	3	0
Camillus silt loam, imperfectly drained variant, 0 to 5 percent slopes	575	.1	77	12	5	5	1
Canandaigua silt loam, 0 to 3 percent slopes	350	.1	50	21	10	19	0
Caneadea silty clay loam, 0 to 6 percent slopes	100	(1)	56	20	19	0	5
Caneadea silty clay loam, eroded, 6 to 15 percent slopes	6	(1)	0	67	33	0	0
Carlisle muck, 0 to 1 percent slopes	3,600	.8	11	9	7	73	0
Carlisle muck, shallow, 0 to 1 percent slopes	1,550	.4	14	26	12	48	0
Cayuga silt loam, 3 to 8 percent slopes	5,900	1.4	69	12	4	4	11
Cayuga silt loam, eroded, 3 to 8 percent slopes	80	(1)	65	15	0	20	0
Cayuga silt loam, 8 to 15 percent slopes	950	.2	48	8	14	10	20
Cayuga silt loam, eroded, 8 to 15 percent slopes	1,150	.3	61	14	15	5	5
Cayuga silt loam, eroded, 15 to 25 percent slopes	600	.1	32	11	25	23	9
Cazenovia silt loam, 3 to 10 percent slopes	750	.2	78	10	3	8	1
Cazenovia silt loam, 10 to 20 percent slopes	575	.1	76	10	6	8	0
Chagrin silt loam, 0 to 2 percent slopes	190	(1)	38	25	15	6	16
Chagrin silt loam, alluvial fan, 2 to 8 percent slopes	675	.2	65	16	2	2	15
Chagrin shaly silt loam, alluvial fan, 2 to 8 percent slopes	1,800	.4	57	13	12	4	14
Chenango and Tioga gravelly silt loams, alluvial fan, 2 to 5 percent slopes	1,200	.3	44	15	21	20	0
Chenango gravelly loam, 0 to 5 percent slopes	225	.1	56	28	7	9	0
Chenango gravelly loam, 5 to 15 percent slopes	225	.1	50	13	15	22	0
Chenango soils, 15 to 25 percent slopes	300	.1	49	14	14	23	0
Chenango soils, 25 to 45 percent slopes	120	(1)	16	37	0	47	0
Chippewa silt loam, 0 to 1 percent slopes	750	.2	11	29	38	22	0
Chippewa silt loam, 3 to 8 percent slopes	375	.1	8	31	29	32	0
Collamer silt loam, 0 to 6 percent slopes	2,600	.6	75	14	6	2	3
Collamer silt loam, 6 to 12 percent slopes	375	.1	44	8	22	15	11
Colwood silt loam, 0 to 1 percent slopes	1,300	.3	17	38	8	37	0
Darien silt loam, 0 to 3 percent slopes	3,100	.7	86	9	3	2	0
Darien silt loam, 3 to 8 percent slopes	8,400	2.0	74	11	10	5	0
Darien silt loam, 8 to 15 percent slopes	2,100	.5	42	22	10	26	0
Darien silt loam, eroded, 8 to 15 percent slopes	2,300	.5	37	30	28	5	0
Dunkirk fine sandy loam, 0 to 6 percent slopes	400	.1	69	16	4	9	2
Dunkirk fine sandy loam, 6 to 12 percent slopes	325	.1	73	11	10	6	0
Dunkirk silt loam, 0 to 6 percent slopes	1,900	.4	78	11	3	6	2
Dunkirk silt loam, 6 to 12 percent slopes	1,250	.3	64	19	4	9	4
Dunkirk silt loam, eroded, 12 to 20 percent slopes	600	.1	40	41	4	13	2
Dunkirk silt loam, eroded, 20 to 45 percent slopes	250	.1	41	45	6	6	2
Edwards muck, 0 to 1 percent slopes	350	.1	22	10	14	54	0
Eel silt loam, 0 to 2 percent slopes	5,100	1.2	35	41	14	9	1
Eel silty clay loam, 0 to 2 percent slopes	350	.1	34	45	13	6	2
Erie gravelly silt loam, 0 to 3 percent slopes	150	(1)	41	18	30	11	0
Erie gravelly silt loam, 3 to 8 percent slopes	500	.1	44	30	16	10	0
Erie gravelly silt loam, 8 to 15 percent slopes	400	.1	26	33	31	10	0
Farmington loam, 12 to 30 inches deep, 2 to 8 percent slopes	3,600	.8	71	12	10	3	4
Farmington loam, 0 to 12 inches deep, 2 to 15 percent slopes	625	.1	44	37	17	1	1
Fremont channery silt loam, 0 to 3 percent slopes	225	.1	24	17	40	19	0
Fremont channery silt loam, 3 to 8 percent slopes	475	.1	31	14	37	18	0
Fremont channery silt loam, 8 to 15 percent slopes	150	(1)	12	29	39	20	0
Fresh water marsh, 0 to 1 percent slopes	1,150	.3	0	1	30	69	0
Fulton silt loam, 0 to 3 percent slopes	3,400	.8	49	31	8	7	5

See footnote at end of table.

TABLE 4.—*Approximate acreage, proportionate extent, and use of soils mapped in Ontario County*—Continued

Soil	Area	Percent of county	Distribution according to use for—				
			Crops	Pasture	Idle land	Woods	Residential
	Acres	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Galen fine sandy loam, 0 to 6 percent slopes	1,400	0.3	74	9	6	7	4
Genesee fine sandy loam, 0 to 2 percent slopes	225	.1	59	26	12	3	0
Genesee silt loam, 0 to 2 percent slopes	650	.2	53	26	15	5	1
Genesee silt loam, high bottom, 0 to 2 percent slopes	625	.1	65	17	7	9	2
Granby fine sandy loam, 0 to 1 percent slopes	2,400	.6	18	26	21	35	0
Homer sandy loam, 0 to 3 percent slopes	2,100	.5	56	25	10	8	1
Honeoye fine sandy loam, 0 to 3 percent slopes	2,200	.5	87	6	1	4	2
Honeoye fine sandy loam, 3 to 10 percent slopes	8,800	2.1	86	7	2	4	1
Honeoye fine sandy loam, 10 to 20 percent slopes	800	.2	69	11	6	9	5
Honeoye fine sandy loam, eroded, 10 to 20 percent slopes	1,050	.2	78	13	4	3	2
Honeoye silt loam, 0 to 3 percent slopes	950	.2	60	5	3	6	26
Honeoye silt loam, 3 to 10 percent slopes	12,300	2.9	82	8	4	3	3
Honeoye silt loam, 10 to 20 percent slopes	1,550	.4	47	15	13	21	4
Honeoye silt loam, eroded, 10 to 20 percent slopes	3,200	.8	80	10	6	2	2
Honeoye soils, eroded, 20 to 30 percent slopes	1,100	.3	47	24	14	15	0
Hornell silt loam, 36 inches or more deep, 3 to 8 percent slopes	160	(1)	32	2	19	47	0
Hornell silt loam, 12 to 20 inches deep, 3 to 8 percent slopes	1,750	.4	23	16	43	18	0
Hornell silt loam, 36 inches or more deep, 8 to 15 percent slopes	275	.1	6	18	34	42	0
Hornell silt loam, 12 to 20 inches deep, eroded, 8 to 15 percent slopes	1,800	.4	20	24	33	23	0
Hornell silt loam, 36 inches or more deep, eroded, 8 to 15 percent slopes	350	.1	32	19	21	28	0
Howard gravelly loam, 0 to 5 percent slopes	1,650	.4	64	11	10	5	10
Howard gravelly loam, 5 to 15 percent slopes	2,100	.5	62	15	11	8	4
Howard soils, 15 to 25 percent slopes	1,700	.4	39	20	16	25	0
Junius fine sandy loam, 0 to 2 percent slopes	2,800	.7	54	17	14	14	1
Kendaia loam, 0 to 3 percent slopes	2,100	.5	55	23	7	14	1
Kendaia silt loam, 0 to 3 percent slopes	9,400	2.2	52	23	7	18	0
Kendaia silt loam, 3 to 8 percent slopes	1,100	.3	45	34	12	9	0
Lakemont silty clay loam, 0 to 2 percent slopes	3,400	.8	28	32	17	12	11
Langford gravelly silt loam, 3 to 8 percent slopes	1,150	.3	62	11	17	10	0
Langford gravelly silt loam, 8 to 15 percent slopes	2,200	.5	34	25	27	14	0
Lansing and Danley silt loams, 12 to 20 inches deep, 3 to 8 percent slopes	190	(1)	92	3	5	0	0
Lansing and Danley silt loams, 12 to 20 inches deep, eroded, 8 to 15 percent slopes	300	.1	33	14	47	6	0
Lansing and Danley silt loams, 12 to 20 inches deep, eroded, 15 to 25 percent slopes	650	.2	18	4	28	46	4
Lansing silt loam, 3 to 10 percent slopes	3,400	.8	63	11	11	14	1
Lansing silt loam, 10 to 20 percent slopes	1,550	.4	35	24	11	30	0
Lansing silt loam, eroded, 10 to 20 percent slopes	2,800	.7	58	24	14	4	0
Lansing silt loam, 20 to 30 percent slopes	625	.1	10	15	5	70	0
Lansing silt loam, eroded, 20 to 30 percent slopes	1,250	.3	28	37	26	9	0
Lima fine sandy loam, 0 to 3 percent slopes	7,300	1.7	81	7	3	8	1
Lima fine sandy loam, 3 to 10 percent slopes	7,900	1.9	78	10	3	7	2
Lima silt loam, 12 to 20 inches deep, 0 to 3 percent slopes	325	.1	52	24	21	1	2
Lima silt loam, 0 to 3 percent slopes	9,800	2.3	83	6	4	5	2
Lima silt loam, 3 to 10 percent slopes	16,400	3.8	77	11	5	6	1
Lima silt loam, 10 to 20 percent slopes	775	.2	52	21	12	9	6
Lobdell silt loam, 0 to 2 percent slopes	900	.2	70	16	10	3	1
Lordstown and Manlius soils, 25 to 45 percent slopes	7,700	1.8	7	8	9	76	0
Lordstown channery silt loam, 5 to 15 percent slopes	3,100	.7	6	4	11	79	0
Lordstown channery silt loam, 15 to 25 percent slopes	3,400	.8	2	8	4	86	0
Lordstown channery silt loam, eroded, 15 to 25 percent slopes	500	.1	14	35	37	14	0
Lordstown soils, 45 to 70 percent slopes	8,200	1.9	0	1	3	96	0
Lyons silt loam, 0 to 1 percent slopes	2,700	.6	11	38	10	41	0
Manlius shaly silt loam, 36 inches or more deep, 5 to 15 percent slopes	40	(1)	3	28	69	0	0
Manlius shaly silt loam, 12 to 20 inches deep, eroded, 15 to 25 percent slopes	70	(1)	8	41	51	0	0
Manlius shaly silt loam, 36 inches or more deep, eroded, 15 to 25 percent slopes	190	(1)	10	15	35	40	0

See footnote at end of table.

TABLE 4.—*Approximate acreage, proportionate extent, and use of soils mapped in Ontario County*—Continued

Soil	Area	Percent of county	Distribution according to use for—				
			Crops	Pasture	Idle land	Woods	Residential
	Acres	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Mardin channery silt loam, 3 to 8 percent slopes	3,800	0.9	34	17	23	26	0
Mardin channery silt loam, 8 to 15 percent slopes	4,100	1.0	23	11	21	45	0
Mardin channery silt loam, eroded, 8 to 15 percent slopes	2,600	.6	23	25	44	8	0
Mardin channery silt loam, eroded, 15 to 25 percent slopes	3,900	.9	12	16	31	41	0
Mardin silt loam, 12 to 20 inches deep, 3 to 15 percent slopes	1,050	.2	0	4	63	33	0
Mardin and Langford soils, 25 to 45 percent slopes	700	.2	5	23	15	57	0
Morocco fine sandy loam, 0 to 2 percent slopes	190	(1)	18	5	44	33	0
Muck, acid (unclassified), 0 to 1 percent slopes	700	.2	13	5	2	80	0
Newton fine sandy loam, 0 to 1 percent slopes	190	(1)	20	17	12	51	0
Nunda silt loam, 0 to 6 percent slopes	150	(1)	82	5	4	9	0
Nunda silt loam, 6 to 12 percent slopes	350	.1	58	11	17	14	0
Nunda silt loam, eroded, 6 to 12 percent slopes	150	(1)	45	42	13	0	0
Nunda silt loam, eroded, 12 to 20 percent slopes	600	.1	54	25	13	8	0
Nunda silt loam, eroded, 20 to 45 percent slopes	950	.2	37	26	21	16	0
Odessa silt loam, 0 to 6 percent slopes	13,200	3.1	72	14	6	4	4
Odessa silty clay loam, eroded, 6 to 12 percent slopes	775	.2	54	20	20	2	4
Ontario fine sandy loam, 3 to 10 percent slopes	6,100	1.4	85	6	3	5	1
Ontario fine sandy loam, 10 to 20 percent slopes	525	.1	50	13	4	33	0
Ontario fine sandy loam, eroded, 10 to 20 percent slopes	1,700	.4	73	14	11	2	0
Ontario gravelly loam, 3 to 10 percent slopes	1,250	.3	90	4	2	1	3
Ontario gravelly loam, eroded, 10 to 20 percent slopes	325	.1	86	6	7	0	1
Ontario, Lansing and Honeoye soils, 30 to 60 percent slopes	2,200	.5	18	33	19	30	0
Ontario loam, 3 to 10 percent slopes	6,400	1.5	82	8	4	5	1
Ontario loam, 10 to 20 percent slopes	600	.1	53	17	4	25	1
Ontario loam, eroded, 10 to 20 percent slopes	1,800	.4	69	19	9	2	1
Ontario soils, eroded, 20 to 30 percent slopes	1,800	.4	41	32	14	12	1
Ottawa loamy fine sand, 0 to 6 percent slopes	850	.2	62	12	12	8	6
Ottawa loamy fine sand, 6 to 12 percent slopes	450	.1	51	8	34	5	2
Ovid silt loam, 0 to 3 percent slopes	2,200	.5	77	10	5	5	3
Ovid silt loam, 3 to 8 percent slopes	2,500	.6	70	19	6	3	1
Ovid silty clay loam, eroded, 3 to 8 percent slopes	120	(1)	63	10	19	9	0
Ovid silty clay loam, eroded, 8 to 15 percent slopes	375	.1	65	14	10	6	5
Palmyra and Howard soils, 25 to 35 percent slopes	3,300	.8	19	24	19	38	0
Palmyra cobbly loam, 0 to 5 percent slopes	3,800	.9	78	14	3	3	2
Palmyra fine sandy loam, 0 to 5 percent slopes	1,800	.4	69	8	4	7	12
Palmyra gravelly loam, 0 to 5 percent slopes	8,700	2.0	83	6	4	3	4
Palmyra gravelly loam, 5 to 15 percent slopes	2,900	.7	76	10	5	8	1
Palmyra gravelly loam, 15 to 25 percent slopes	2,800	.7	46	24	14	14	2
Palmyra gravelly sandy loam, 0 to 5 percent slopes	3,100	.7	80	6	4	5	5
Palmyra gravelly sandy loam, 5 to 15 percent slopes	2,000	.5	74	10	9	4	3
Phelps gravelly silt loam, 0 to 5 percent slopes	6,100	1.4	71	14	7	6	2
Poygan silty clay loam, 0 to 1 percent slopes	900	.2	35	29	8	26	2
Red Hook gravelly silt loam, 0 to 3 percent slopes	100	(1)	64	12	5	18	1
Romulus silt loam, 0 to 3 percent slopes	1,600	.4	60	18	15	7	0
Romulus silt loam, 3 to 8 percent slopes	700	.2	31	20	46	3	0
Romulus silty clay loam, 0 to 3 percent slopes	1,000	.2	64	22	2	12	0
Schoharie silt loam, 0 to 6 percent slopes	2,300	.5	76	6	7	6	5
Schoharie silt loam, 6 to 12 percent slopes	300	.1	43	23	16	14	4
Schoharie silty clay loam, 0 to 6 percent slopes	16,600	3.9	72	18	5	3	2
Schoharie silty clay loam, 6 to 12 percent slopes	1,200	.3	61	15	4	16	4
Schoharie silty clay loam, eroded, 6 to 12 percent slopes	4,100	1.0	69	24	5	1	1
Schoharie silty clay loam, 12 to 20 percent slopes	550	.1	4	20	10	65	1
Schoharie silty clay loam, eroded, 12 to 20 percent slopes	2,500	.6	36	50	8	6	0
Schoharie silty clay loam, eroded, 20 to 45 percent slopes	1,450	.3	17	48	10	25	0
Sloan silt loam, 0 to 1 percent slopes	375	.1	11	22	41	23	3
Steep broken land, 35 to 60 percent slopes	4,200	1.0	1	2	1	96	0
Toledo silty clay loam, 0 to 1 percent slopes	1,100	.3	8	48	15	25	4
Valois gravelly silt loam, 5 to 15 percent slopes	750	.2	66	17	11	6	0
Valois gravelly silt loam, 15 to 25 percent slopes	190	(1)	39	23	30	8	0
Valois gravelly silt loam, eroded, 15 to 25 percent slopes	300	.1	47	17	31	3	2

See footnote at end of table.

TABLE 4.—*Approximate acreage, proportionate extent, and use of soils mapped in Ontario County*

Soil	Area	Percent of county	Distribution according to use for—				
			Crops	Pasture	Idle land	Woods	Residential
	Acres	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Volusia channery silt loam, 0 to 3 percent slopes	750	0. 2	18	19	38	24	1
Volusia channery silt loam, 3 to 8 percent slopes	4, 400	1. 0	26	21	32	18	3
Volusia channery silt loam, 8 to 15 percent slopes	2, 500	. 6	12	19	38	27	4
Volusia channery silt loam, eroded, 8 to 15 percent slopes	1, 000	. 2	38	22	32	6	2
Volusia channery silt loam, eroded, 15 to 25 percent slopes	600	. 1	15	5	34	46	0
Warners loam, 0 to 1 percent slopes	350	. 1	30	19	11	39	1
Wayland silt loam, 0 to 1 percent slopes	5, 200	1. 2	17	43	24	16	0
Wayland silty clay loam, 0 to 1 percent slopes	1, 000	. 2	18	49	18	15	0
Westland silt loam, 0 to 1 percent slopes	1, 100	. 3	7	40	17	36	0
Woostern, Bath, and Valois soils, 25 to 45 percent slopes	3, 900	. 9	8	10	21	61	0
Woostern gravelly loam, 5 to 15 percent slopes	3, 300	. 8	54	15	4	25	2
Woostern gravelly loam, eroded, 5 to 15 percent slopes	400	. 1	22	2	74	1	1
Woostern gravelly loam, 15 to 25 percent slopes	2, 400	. 6	15	13	30	42	0
Woostern gravelly loam, eroded, 15 to 25 percent slopes	1, 750	. 4	45	16	29	10	0
Gravel pits, quarries, etc	1, 100	. 3					
Water surface	12, 000	2. 8					
Total	425, 591	99. 6					

[1] Less than 1/10 of 1 percent.

TABLE 5.—*Approximate acreage, proportionate extent, and use of soils mapped in Yates County*

Soil	Area	Percent of county	Distribution according to use for—				
			Crops	Pasture	Idle land	Woods	Residential
	Acres	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Allis channery silt loam, 12 to 20 inches deep, eroded, 15 to 25 percent slopes	250	0. 1	19	22	48	11	0
Allis silt loam, 36 inches or more deep, 3 to 8 percent slopes	900	. 4	42	21	10	26	1
Allis silt loam, 12 to 20 inches deep, 3 to 8 percent slopes	2, 100	. 9	27	49	10	13	1
Allis silt loam, 12 to 20 inches deep, eroded, 8 to 15 percent slopes	725	. 3	22	48	19	11	0
Alluvial soils, undifferentiated, 0 to 2 percent slopes	1, 550	. 7	5	41	13	29	12
Angola silt loam, 0 to 3 percent slopes	110	(1)	36	33	20	11	0
Arkport fine sandy loam, 0 to 5 percent slopes	500	. 2	61	10	13	8	8
Arkport fine sandy loam, 6 to 12 percent slopes	800	. 4	60	22	0	17	1
Arkport fine sandy loam, eroded, 12 to 20 percent slopes	300	. 1	26	50	2	11	11
Arkport soils, 20 to 45 percent slopes	40	(1)	0	0	51	49	0
Atherton silt loam, 0 to 1 percent slopes	140	. 1	8	16	51	25	0
Aurora silt loam, 3 to 8 percent slopes	1, 450	. 6	54	25	9	10	2
Aurora silt loam, eroded, 3 to 8 percent slopes	1, 100	. 5	75	9	12	3	1
Aurora silt loam, 8 to 15 percent slopes	350	. 2	9	22	15	54	0
Aurora silt loam, eroded, 8 to 15 percent slopes	1, 050	. 5	50	32	14	3	1
Aurora silt loam, eroded, 15 to 30 percent slopes	400	. 2	34	27	18	21	0
Bath channery silt loam, 5 to 15 percent slopes	170	. 1	27	0	35	38	0
Bath channery silt loam, 15 to 25 percent slopes	60	(1)	35	30	21	12	2
Berrien fine sandy loam, 0 to 6 percent slopes	160	. 1	30	21	8	0	41
Braceville gravelly silt loam, 0 to 5 percent slopes	250	. 1	91	0	3	6	0
Canandaigua silt loam, 0 to 3 percent slopes	15	(1)	80	20	0	0	0
Caneadea silty clay loam, 0 to 6 percent slopes	110	(1)	44	14	26	16	0
Caneadea silty clay loam, eroded, 6 to 15 percent slopes	110	(1)	32	37	21	2	8
Carlisle muck, 0 to 1 percent slopes	3, 500	. 5	1	2	5	92	0

See footnote at end of table.

TABLE 5.—*Approximate acreage, proportionate extent, and use of soils mapped in Yates County*—Continued

Soil	Area	Percent of county	Distribution according to use for—				
			Crops	Pasture	Idle land	Woods	Residential
	Acres	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Cayuga silt loam, 3 to 8 percent slopes	2,000	0.9	83	2	2	6	7
Cayuga silt loam, eroded, 3 to 8 percent slopes	1,200	.5	75	11	5	2	7
Cayuga silt loam, 8 to 15 percent slopes	100	(1)	32	16	0	51	1
Cayuga silt loam, eroded, 8 to 15 percent slopes	1,200	.5	61	14	15	5	5
Cayuga silt loam, eroded, 15 to 25 percent slopes	800	.4	52	20	14	10	4
Chagrin silt loam, alluvial fan, 2 to 8 percent slopes	900	.4	66	10	6	2	16
Chagrin shaly silt loam, alluvial fan, 2 to 8 percent slopes	1,600	.7	67	9	5	4	15
Chenango and Tioga gravelly silt loams, alluvial fan, 2 to 5 percent slopes	2,600	1.1	68	13	10	4	5
Chenango gravelly loam, 0 to 5 percent slopes	450	.2	72	11	10	5	2
Chenango gravelly loam, 5 to 15 percent slopes	750	.3	52	18	11	17	2
Chenango soils, 15 to 25 percent slopes	850	.4	47	18	19	10	6
Chenango soils, 25 to 45 percent slopes	550	.2	22	17	35	22	4
Chippewa silt loam, 0 to 1 percent slopes	1,800	.8	14	31	21	34	0
Chippewa silt loam, 3 to 8 percent slopes	650	.3	14	38	20	28	0
Dunkirk fine sandy loam, 0 to 6 percent slopes	170	.1	75	1	0	13	11
Dunkirk fine sandy loam, 6 to 12 percent slopes	20	(1)	78	0	0	22	0
Dunkirk silt loam, 0 to 6 percent slopes	600	.3	56	14	9	1	20
Dunkirk silt loam, 6 to 12 percent slopes	525	.2	70	12	0	18	0
Dunkirk silt loam, eroded, 12 to 20 percent slopes	80	(1)	32	33	11	2	22
Dunkirk silt loam, eroded, 20 to 45 percent slopes	8	(1)	88	0	0	0	12
Edwards muck, 0 to 1 percent slopes	60	(1)	28	38	0	34	0
Eel silt loam, 0 to 2 percent slopes	950	.4	34	49	7	6	4
Erie gravelly silt loam, 0 to 3 percent slopes	1,350	.6	47	15	26	12	0
Erie gravelly silt loam, 3 to 8 percent slopes	3,900	1.7	47	20	13	20	0
Erie gravelly silt loam, 8 to 15 percent slopes	80	(1)	49	20	14	17	0
Fremont channery silt loam, 0 to 3 percent slopes	475	.2	64	7	29	0	0
Fremont channery silt loam, 3 to 8 percent slopes	7,200	3.2	48	17	24	10	1
Fremont channery silt loam, 8 to 15 percent slopes	1,000	.4	20	10	44	26	0
Fresh water marsh, 0 to 1 percent slopes	575	.3	0	5	81	7	7
Fulton silt loam, 0 to 3 percent slopes	1,550	.7	52	11	7	0	30
Galen fine sandy loam, 0 to 6 percent slopes	20	(1)	100	0	0	0	0
Genesee silt loam, 0 to 2 percent slopes	150	.1	50	30	0	16	4
Genesee silt loam, high bottom, 0 to 2 percent slopes	100	(1)	75	23	0	0	2
Holly silt loam, 0 to 1 percent slopes	900	.4	7	44	20	29	0
Homer silt loam, 0 to 3 percent slopes	150	.1	36	22	1	41	0
Honeoye fine sandy loam, 0 to 3 percent slopes	110	(1)	99	0	0	0	1
Honeoye fine sandy loam, 3 to 10 percent slopes	6,000	2.6	82	6	1	3	8
Honeoye fine sandy loam, 10 to 20 percent slopes	200	.1	74	14	1	3	8
Honeoye fine sandy loam, eroded, 10 to 20 percent slopes	550	.2	87	7	4	0	2
Honeoye silt loam, 0 to 3 percent slopes	200	.1	81	11	0	8	0
Honeoye silt loam, 3 to 10 percent slopes	9,200	4.0	86	5	2	4	3
Honeoye silt loam, 10 to 20 percent slopes	350	.2	35	12	0	49	4
Honeoye silt loam, eroded, 10 to 20 percent slopes	2,100	.9	83	10	3	1	3
Honeoye soils, eroded, 20 to 30 percent slopes	350	.2	52	0	8	35	5
Hornell silt loam, 36 inches or more deep, 3 to 8 percent slopes	1,900	.8	71	3	20	4	2
Hornell silt loam, 12 to 20 inches deep, 3 to 8 percent slopes	40	(1)	0	0	100	0	0
Hornell silt loam, 36 inches or more deep, 8 to 15 percent slopes	80	(1)	1	4	0	95	0
Hornell silt loam, 12 to 20 inches deep, eroded, 8 to 15 percent slopes	20	(1)	0	0	100	0	0
Hornell silt loam, 36 inches or more deep, eroded, 8 to 15 percent slopes	650	3	63	16	16	5	0
Howard gravelly loam, 0 to 5 percent slopes	2,700	1.2	69	6	9	5	11
Howard gravelly loam, 5 to 15 percent slopes	2,700	1.2	60	7	16	13	4
Howard soils, 15 to 25 percent slopes	1,400	.6	40	14	17	23	6
Junius fine sandy loam, 0 to 2 percent slopes	10	(1)	30	0	0	70	0
Kendaia loam, 0 to 3 percent slopes	9	(1)	67	33	0	0	0
Kendaia silt loam, 0 to 3 percent slopes	2,900	1.3	48	26	3	23	0
Kendaia silt loam, 3 to 8 percent slopes	3,000	1.3	55	24	5	15	1
Lakemont silty clay loam, 0 to 2 percent slopes	120	.1	60	24	13	3	0
Langford gravelly silt loam, 3 to 8 percent slopes	9,800	4.3	64	12	12	12	0
Langford gravelly silt loam, 8 to 15 percent slopes	2,200	1.0	53	20	7	10	10
Lansing and Danley silt loams, 12 to 20 inches deep, 3 to 8 percent slopes	850	.4	74	12	8	5	1

See footnote at end of table.

TABLE 5.—*Approximate acreage, proportionate extent, and use of soils mapped in Yates County*—Continued

Soil	Area	Percent of county	Distribution according to use for—				
			Crops	Pasture	Idle land	Woods	Residential
	Acres	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Lansing and Danley silt loams, 12 to 20 inches deep, eroded, 8 to 15 percent slopes	625	0.3	58	26	11	3	2
Lansing and Danley silt loams, 12 to 20 inches deep, eroded, 15 to 25 percent slopes	850	.4	44	8	31	16	1
Lansing silt loam, 3 to 10 percent slopes	9,000	4.0	76	10	2	10	2
Lansing silt loam, 10 to 20 percent slopes	775	.3	42	12	0	46	0
Lansing silt loam, eroded, 10 to 20 percent slopes	3,100	1.4	76	14	5	3	2
Lansing silt loam, 20 to 30 percent slopes	120	.1	3	0	0	97	0
Lansing silt loam, eroded, 20 to 30 percent slopes	1,000	.4	50	28	13	9	0
Lima fine sandy loam, 0 to 3 percent slopes	350	.2	90	3	1	4	2
Lima fine sandy loam, 3 to 10 percent slopes	6,100	2.7	82	8	2	4	4
Lima silt loam, 0 to 3 percent slopes	1,150	.5	78	8	4	10	0
Lima silt loam, 3 to 10 percent slopes	7,900	3.5	83	8	2	4	3
Lima silt loam, 10 to 20 percent slopes	90	(1)	65	21	0	6	8
Lobdell silt loam, 0 to 2 percent slopes	2	(1)	100	0	0	0	0
Lordstown and Manlius soils, 25 to 45 percent slopes	4,500	2.0	5	15	12	68	0
Lordstown channery silt loam, 5 to 15 percent slopes	1,200	.5	39	22	11	28	0
Lordstown channery silt loam, 15 to 25 percent slopes	800	.4	4	9	4	83	0
Lordstown channery silt loam, eroded, 15 to 25 percent slopes	1,200	.5	22	47	27	4	0
Lordstown soils, 45 to 70 percent slopes	1,550	.7	1	2	4	93	0
Lyons silt loam, 0 to 1 percent slopes	2,600	1.1	12	36	10	42	0
Manlius shaly silt loam, 36 inches or more deep, 5 to 15 percent slopes	450	.2	49	1	7	38	5
Manlius shaly silt loam, 36 inches or more deep, eroded, 5 to 15 percent slopes	575	.3	63	23	8	5	1
Manlius shaly silt loam, 12 to 20 inches deep, eroded, 15 to 25 percent slopes	190	.1	53	13	2	32	0
Manlius shaly silt loam, 36 inches or more deep, eroded, 15 to 25 percent slopes	775	.3	55	24	10	10	1
Mardin channery silt loam, 3 to 8 percent slopes	11,900	5.2	57	15	16	11	1
Mardin channery silt loam, 8 to 15 percent slopes	2,600	1.1	23	24	13	38	2
Mardin channery silt loam, eroded, 8 to 15 percent slopes	3,500	1.5	49	23	25	3	0
Mardin channery silt loam, eroded, 15 to 25 percent slopes	1,450	.6	25	13	19	39	4
Mardin and Langford soils, 25 to 45 percent slopes	50	(1)	29	0	8	63	0
Middlebury silt loam, 0 to 2 percent slopes	700	.3	52	14	27	7	0
Muck, acid (unclassified), 0 to 1 percent slopes	9	(1)	0	100	0	0	0
Odessa silt loam, 0 to 6 percent slopes	1,000	.4	77	7	4	5	7
Odessa silty clay loam, eroded, 6 to 12 percent slopes	475	.2	70	4	20	6	0
Ontario gravelly loam, 3 to 10 percent slopes	700	.3	82	3	0	4	11
Ontario gravelly loam, eroded, 10 to 20 percent slopes	575	.3	83	11	0	0	6
Ontario, Lansing and Honeoye soils, 30 to 60 percent slopes	250	.1	18	45	9	28	0
Ontario loam, 3 to 10 percent slopes	1,650	.7	83	5	1	6	5
Ontario loam, 10 to 20 percent slopes	200	.1	32	12	6	48	2
Ontario loam, eroded, 10 to 20 percent slopes	550	.2	81	10	8	0	1
Ontario soils, eroded, 20 to 30 percent slopes	150	.1	34	30	9	27	0
Ovid silt loam, 0 to 3 percent slopes	200	.1	78	12	6	2	2
Ovid silt loam, 3 to 8 percent slopes	2,500	1.1	75	11	3	7	4
Ovid silty clay loam, eroded, 3 to 8 percent slopes	800	.4	63	20	16	0	1
Ovid silty clay loam, eroded, 8 to 15 percent slopes	400	.2	54	7	23	10	6
Palmyra and Howard soils, 25 to 35 percent slopes	625	.3	26	15	27	30	2
Palmyra gravelly loam, 0 to 5 percent slopes	325	.1	72	16	1	8	3
Palmyra gravelly loam, 5 to 15 percent slopes	1,150	.5	43	22	9	25	1
Palmyra gravelly loam, 15 to 25 percent slopes	425	.2	35	40	3	21	1
Phelps gravelly silt loam, 0 to 5 percent slopes	750	.3	63	7	10	11	9
Poygan silty clay loam, 0 to 1 percent slopes	80	(1)	52	43	1	0	4
Red Hook gravelly silt loam, 0 to 3 percent slopes	12	(1)	100	0	0	0	0
Schoharie silt loam, 0 to 6 percent slopes	5	(1)	80	20	0	0	0
Schoharie silt loam, 6 to 12 percent slopes	6	(1)	0	100	0	0	0
Schoharie silty clay loam, 0 to 6 percent slopes	30	(1)	100	0	0	0	0
Schoharie silty clay loam, 6 to 12 percent slopes	60	(1)	77	0	0	0	23
Schoharie silty clay loam, eroded, 6 to 12 percent slopes	90	(1)	84	4	10	2	0
Schoharie silty clay loam, 12 to 20 percent slopes	28	(1)	0	0	0	100	0
Schoharie silty clay loam, eroded, 12 to 20 percent slopes	14	(1)	100	0	0	0	0

See footnote at end of table.

TABLE 5.—*Approximate acreage, proportionate extent, and use of soils mapped in Yates County*—Continued

Soil	Area	Percent of county	Distribution according to use for—				
			Crops	Pasture	Idle land	Woods	Residential
	Acres	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Schoharie silty clay loam, eroded, 20 to 45 percent slopes	8	(1)	0	100	0	0	0
Sloan silt loam, 0 to 1 percent slopes	200	0.1	9	51	11	29	0
Steep broken land, 35 to 60 percent slopes	6,500	2.9	0	0	1	99	0
Toledo silty clay loam, 0 to 1 percent slopes	325	.1	25	38	16	15	6
Valois gravelly silt loam, 5 to 15 percent slopes	3,700	1.6	69	14	4	12	1
Valois gravelly silt loam, eroded, 5 to 15 percent slopes	1,250	.5	79	10	4	2	5
Valois gravelly silt loam, 15 to 25 percent slopes	225	.1	8	23	8	61	0
Valois gravelly silt loam, eroded, 15 to 25 percent slopes	1,000	.4	58	26	13	2	1
Volusia channery silt loam, 0 to 3 percent slopes	1,575	.7	45	21	17	17	0
Volusia channery silt loam, 3 to 8 percent slopes	10,600	4.7	42	16	23	18	1
Volusia channery silt loam, 8 to 15 percent slopes	775	.3	8	25	32	35	0
Volusia channery silt loam, eroded, 8 to 15 percent slopes	500	.2	19	24	45	11	1
Volusia channery silt loam, eroded, 15 to 25 percent slopes	180	.1	12	38	21	29	0
Wayland silt loam, 0 to 1 percent slopes	1,800	.8	6	49	23	20	2
Westland silt loam, 0 to 1 percent slopes	475	.2	24	24	14	37	1
Woostern, Bath and Valois soils, 25 to 45 percent slopes	3,600	1.6	14	24	24	36	2
Woostern gravelly loam, 5 to 15 percent slopes	3,800	1.7	60	10	11	18	1
Woostern gravelly loam, eroded, 5 to 15 percent slopes	1,600	.7	61	15	21	2	1
Woostern gravelly loam, 15 to 25 percent slopes	1,350	.6	6	18	7	69	0
Woostern gravelly loam, eroded, 15 to 25 percent slopes	3,300	1.4	50	23	21	5	1
Cemeteries	80	(1)					
Gravel pits	160	.1					
Land area	220,056	96.2					
Water	7,680	3.4					
Total	227,736	99.6					

[1] Less than 0.1 of 1 percent.

Alden Series

The soil representing this series (Alden silty clay loam) is very poorly drained. It was derived from neutral or weakly calcareous glacial till composed mostly of shale and sandstone. This soil belongs to the Valois-Langford-Erie-Alden soil catena. Its lime content is less than that of the high-lime soils in the northern part of these counties but more than that of the strongly acid soils in the southern part of the surveyed area. Unless the soil is artificially drained, it is wet much of the time. The runoff or seepage water from nearby areas accumulates above the very compact slowly permeable substratum of glacial till.

Typical profile of Alden silty clay loam under forest:

A_0 Thin deciduous forest litter underlain by 2 to 3 inches of peat or muck; neutral.

A_1 0 to 6 inches, very dark gray (10YR 3/1)[3] silty clay loam; moderately coarse granular structure; friable when moist, slightly plastic when wet; high in organic matter; contains many fine roots; neutral; 4 to 8 inches thick.

BG 6 to 18 inches, gray (10YR 6/1) silty clay loam strongly mottled with yellowish brown (10YR 5/4); moderate coarse blocky structure; firm when moist, plastic when wet; very few roots except near top of layer; neutral; 8 to 16 inches thick.

CG 18 to 30 inches +, gray (10YR 5/1) heavy silt loam or silty clay loam glacial till; compact in place; weak coarse blocky structure; very firm when moist, plastic when wet; mildly alkaline to weakly calcareous.

Alden silty clay loam, 0 to 1 percent slopes (Aa).—This low-lying, very poorly drained soil is too wet for crops or for good pasture unless it is artificially drained. Many areas receive seepage water from nearby soils. Some areas are in low wet spots and hinder the use of surrounding soils. These spots may be drained by open ditches or by tile.

When this soil is drained, it can be used and managed like the soils of rotation group 1, table 10. It needs little lime or potassium but a medium amount of phosphorus. There is adequate nitrogen in the soil, but, early in the spring when the soil is cold, most crops will benefit from added nitrogen.

Allendale Series

This series is represented by Allendale fine sandy loam, a very poorly drained soil. It has developed in fine sands

[3] Soil colors according to terminology in the Soil Survey Manual (*12*); symbols following names are Munsell color notations.

24 to 40 inches thick above silt or clay. It occupies low-lying areas in the sandy region north of Geneva and is associated with the well-drained Ottawa soils, the moderately well drained Berrien soil, and the poorly drained Morocco soil. It resembles the poorly drained Morocco soil but is not so deep above the clay.

Typical profile of Allendale fine sandy loam under forest:

- A_0 Organic mat of black decomposed leaves and twigs bound together by fine roots; 1 to 3 inches thick.
- A_1 0 to 4 inches, black (10YR 2/1) fine sandy loam; strong medium crumb structure; friable when moist, nonplastic when wet; high in organic matter and matted with fine roots; medium acid; 3 to 6 inches thick.
- G_1 4 to 12 inches, light brownish-gray (10YR 6/2) fine sand with low-contrast mottlings of yellowish brown (10YR 5/4); structureless; moderately dense in place; breaks into large angular blocks when moist, very friable when dry; contains small- and medium-sized roots; medium acid, 6 to 12 inches thick.
- G_2 12 to 30 inches, yellowish-brown (10YR 5/6) fine sand with low-contrast mottlings of brown (7.5YR 5/4); structureless; firm when moist, nonplastic when wet; contains a few medium-sized roots; low water-holding capacity but wet until late in the season; medium acid; 14 to 28 inches thick.
- CG 30 to 36 inches, pinkish-gray fine and medium sand with brown and yellowish-brown stains; medium acid to neutral; 0 to 16 inches thick.
- D 36 inches +, pinkish-gray (7.5YR 6/2) silt or clay with moderate-contrast mottlings of yellowish brown (10YR 5/4); dense in place and breaks out in large irregular blocks; firm when moist, slightly plastic when wet; contains very few roots; lies below the permanent water table; neutral to slightly calcareous.

The profile of this soil is not so acid as those of soils on deeper sands in the same area. Normally it is only medium acid. In some places the entire soil from the surface downward may be nearly neutral.

Allendale fine sandy loam, 0 to 2 percent slopes (Ab).—This sandy soil is too wet for most crops unless it has been drained artificially. Drainage can be improved by open ditches, or by tile if the clay is not too near the surface.

Most of the undrained areas are in second-growth forest or brush. Where drainage has been improved enough, the soil can be used for pasture, hay, corn, and some vegetable crops or small fruits. If the soil has been adequately drained by tiling, the rotations and supporting practices of rotation group 1, table 10, are suited to it. The soil requires medium amounts of lime and phosphorus and high amounts of potassium to maintain these rotations.

Allis Series

These soils are the poorly drained members of the catena that includes the well-drained Manlius soils, the imperfectly drained Hornell soils, and the very poorly drained Chippewa soils. The parent material is clayey glacial till, mostly from clay shales of the underlying bedrock.

The soils are fine textured and strongly acid. They vary from shallow to moderately deep. The growth of roots is restricted by the shallow depth of the soils and by their wetness in spring. During the summer, these soils become very dry.

Typical profile of Allis silt loam under forest:

- A_1 0 to 4 inches, dark-gray (10YR 4/1) silt loam; strong coarse granular structure; sticky when moist, plastic when wet; high in organic matter and matted with fine roots; medium acid; 3 to 5 inches thick.
- BG_1 4 to 12 inches, highly mottled 60 percent yellowish-brown (10YR 5/6) and 40 percent gray (10YR 6/1) silty clay loam; coarse blocky structure; aggregates coated with gray; firm when moist, plastic when wet; contains roots; strongly acid; 6 to 12 inches thick.
- BG_2 12 to 26 inches, silty clay with high-contrast mottling of 50 percent olive gray (5Y 5/2) and 50 percent brown (10YR 5/3); coarse blocky structure; very firm when moist, sticky and plastic when wet; contains only a few large roots; strongly acid; layer may be absent in shallow phases of this soil but normally is 10 to 20 inches thick.
- CG 26 to 36 inches, very dark grayish-brown (2.5Y 3/2) clay-shale till mottled with olive brown (2.5Y 4/4); thick platy structure; aggregates very firm when moist, "soapy" when wet; strongly acid; 0 to 10 inches thick.
- D 36 to 42 inches, olive-brown (2.5Y 4/4) thin-bedded soft acid clay shale at depths ranging from 1 to 10 feet.

Allis channery silt loam, 12 to 20 inches deep, eroded, 15 to 25 percent slopes (Ac).—This shallow poorly drained soil on moderately steep slopes is very poor for crops. It has lost most of its original surface layer. The highly mottled fine-textured subsoil is now exposed at the surface. Shallow gullies that have cut to bedrock are common. The soil is extremely wet in the spring, but it becomes very dry in midsummer.

This soil responds so poorly to fertilizers and other management practices that the increased yields usually do not pay for the time and materials used. Legumes are not well suited to this soil. Birdsfoot trefoil is probably the best, but even this will fail in many places. Without a legume, nitrogen fertilizer is essential to get even moderate yields from the grass meadows. The soil requires high amounts of lime and medium amounts of phosphorus and potassium.

If possible, this soil should be reforested or allowed to reforest naturally. If the soil must be used for crops, the management practices suggested in rotation group 11, table 10, are suitable.

Allis silt loam, 36 inches or more deep, 3 to 8 percent slopes (Ad).—This is a deep but poorly drained soil on moderate slopes. Seepage water contributes to the poor drainage. The subsoil is clayey.

The soil is low in fertility and responds poorly to management when used for most crops. It is difficult to keep the plow layer in good tilth. Control of erosion is a moderate problem, even though the slopes are gentle.

This soil is best suited to hay or pasture. It is not well suited to legumes, but Ladino clover and birdsfoot trefoil sown in mixtures with grasses may persist if limed and fertilized. If legumes fail, nitrogen must be added to get good yields of hay or pasture. The rotations and supporting practices under rotation group 5 of table 10 are suitable. The soil will need high amounts of lime and medium amounts of phosphorus and potassium.

Allis silt loam, 12 to 20 inches deep, 3 to 8 percent slopes (Ae).—This poorly drained shallow soil on gentle slopes is one of the poorest soils in this area for cropping. Its shallow depth and poor drainage greatly restrict its use. The soil is too wet in the spring and too dry in midsummer. The clayey texture and poor tilth are difficult to manage.

Diversion terraces are not practical on this soil, so rotations which control runoff should be used. If intertilled crops must be grown, three or more years of sod

crops should be used for each year of intertilled crops. The soil is poorly suited to legumes. Ladino clover and birdsfoot trefoil may succeed if sown in mixtures with grasses. If legumes fail, nitrogen must be added to the remaining grasses.

The management practices and rotations of rotation group 10, table 10, are suited to this soil. High amounts of lime and medium amounts of phosphorus and potassium are needed to maintain fertility.

Allis silt loam, 12 to 20 inches deep, eroded, 8 to 15 percent slopes (Af).—This shallow poorly drained clayey soil is strongly acid and moderate to low in fertility. It can be used for crops, but yields are low and response to management is poor.

This eroded shallow soil should be reforested or used for pasture. Birdsfoot trefoil is probably the best suited legume, but it may not persist. When no legume i grown, nitrogen fertilizer is necessary to get even fair yields of hay. The soil can be used for early spring grazing, but it becomes very dry and produces little forage in the middle of summer.

The rotations and management suggested in rotation group 10, table 10, are best for this soil. High amounts of lime and medium amounts of phosphorus and potassium are needed to maintain fertility.

Alluvial Soils, Undifferentiated, 0 to 2 Percent Slopes (Ag)

This map unit consists of several different kinds of soils on recently deposited alluvium along small streams. In the northern part of the county where lime is abundant, it may include soils of the Genesee, Eel, Wayland, or Sloan series. In the southern part of the county, where the alluvial materials are acid, this unit may include Tioga, Middlebury, Holly, and Sloan soils. Most areas are chiefly poorly drained soils surrounding very small areas of moderately well drained or well drained soils. Commonly the area next to the stream is made up of gravel and stream wash.

Most of these areas are cut up by the stream channel, or consist of wet and dry soils in such intricate patterns that they are not suitable for cropping. They may be fair or even good for permanent pasture. They commonly produce especially well in the drier parts of the summer when other pastures are making little growth. Phosphorus should be supplied to obtain good pastures. Areas of acid soils will benefit from lime.

Angola Series

This is a poorly drained moderately deep soil series. In these counties it is represented by Angola silt loam, 0 to 3 percent slopes. The parent material is a fine-textured glacial till that contains small amounts of lime. The glacial till was derived almost entirely from weakly calcareous clayey gray shales like those of the underlying bedrock.

The Angola soil is the poorly drained member of the catena that includes the imperfectly drained Aurora soils and the very poorly drained Fonda soils. Fonda soils, however, were included in the Alden soils as mapped in these two counties. The poor natural drainage of the Angola soil causes the surface layer to be gray in color and the subsoil to be highly mottled. The subsoil is saturated until late in spring. The soil becomes very dry in midsummer.

Typical profile of Angola silt loam under forest:

- A_1 0 to 4 inches, very dark gray (10YR 3/1) heavy silt loam; moderate coarse granular structure; friable when dry, moderately sticky and plastic when wet; high in organic matter and matted with fine roots; medium acid; 3 to 6 inches thick.
- BG_1 4 to 13 inches, olive-brown (2.5Y 4/4) silty clay loam strongly mottled with yellowish brown (10YR 5/8); strong medium blocky structure; aggregates firm when moist, sticky and plastic when wet; contains many fine roots; medium acid; 6 to 12 inches thick.
- BG_2 13 to 24 inches, olive (5Y 4/4) silty clay loam; moderate coarse blocky structure; aggregates firm when dry, sticky and plastic when wet; contains fewer roots than layer above; neutral to slightly acid; 8 to 16 inches thick.
- C 24 to 31 inches, olive-brown (2.5Y 4/4) silty clay loam; weak coarse blocky structure; hard when dry, plastic when moist, sticky and plastic when wet; contains very few roots; slightly alkaline to slightly calcareous (pH 7.5 to 8); 8 to 22 inches thick.
- D 31 inches +, gray or olive clay shales, alkaline to calcareous.

Angola silt loam, 0 to 3 percent slopes (Ah).—This moderately deep poorly drained soil commonly occurs in small level or depressed areas or on gentle slopes that receive seepage from higher ground. It is suited to only a few crops and responds poorly to management.

This soil is difficult to drain. Drainage-type diversion terraces may improve the drainage of deeper areas on seepage slopes. Open ditches or tile are needed to drain the depressed or level areas. In some places the shallow depth prevents the use of open ditches or tile. Even if drains are established, the water moves very slowly through the soil because it is fine textured.

In most places this soil is best used for continuous sod or for sod crops that are plowed only occasionally to renew the stands. The rotations in rotation group 3, table 10, are suitable. The soil needs medium amounts of lime, phosphorus, and potassium.

Arkport Series

These are well-drained sandy soils derived from lake-laid fine and very fine sands. They are the well-drained members of a catena that includes the moderately well drained Galen soil, the imperfectly to poorly drained Junius soil, and the very poorly drained Granby soil. The surface soil and subsoil are medium acid, but the substratum is calcareous.

The fine sandy loam soils of this series have fair to good water-holding capacity and are highly responsive to management. The loamy fine sand of this series is droughty.

The profiles of these soils are well aerated. Roots penetrate deeply and are able to draw on a large volume of soil for plant nutrients and water. The organic-matter content is moderate in uncultivated soils, but it is lost rapidly under cultivation. The maintenance of organic matter in these soils is one of the major management problems.

Typical profile of Arkport fine sandy loam under forest:

- A_1 0 to 4 inches, very dark grayish-brown (10YR 3/2) very fine sandy loam; moderately fine crumb structure; friable when moist, nonplastic when wet; high in organic matter and full of small roots; medium acid; 3 to 5 inches thick.
- A_{21} 4 to 8 inches, yellowish-brown (10YR 5/4) very fine sandy loam; moderate fine crumb structure; friable when moist, nonplastic when wet; small and medium-sized roots well distributed through layer; fair water-holding capacity; medium acid; 3 to 6 inches thick.
- A_{22} 8 to 18 inches, light yellowish-brown (10YR 6/4) very fine sandy loam; moderate medium crumb structure; easily penetrated by roots; will hold only a moderate amount of water, but nearly all of it is available to plants; medium acid; 8 to 14 inches thick.
- B_{21} 18 to 27 inches, brown (7.5YR 5/2 to 5/4) very fine sandy loam; contains slightly more clay than layers above; weak fine blocky structure; friable when moist, nonplastic when wet; easily penetrated by roots; moderate water-holding capacity; slightly acid; 8 to 16 inches thick.
- B_{22} 27 to 38 inches thick, brown (7.5YR 5/4) very fine sandy loam; medium blocky structure; friable when moist, nonplastic when wet; moderate water-holding capacity; neutral; 8 to 16 inches thick.
- C 38 inches +, gray (10YR 6/1 to 5/1) fine to very fine sand; firm in place but structureless when broken out; easily penetrated by roots; low water-holding capacity; moderately calcareous.

Arkport fine sandy loam, 0 to 5 percent slopes (Am).—This is a sandy soil with fair water-holding capacity and excellent tilth. It can be worked early in the spring. It is suited to a wide range of crops and is excellent for early vegetables. The soil is not naturally highly fertile, but it responds well to good management.

Although the slopes are gentle and the soil absorbs water rapidly, erosion is a moderate problem because the surface soil consists of uniformly sized particles readily moved by water. Erosion is especially serious in the spring when the soil is frozen below depths of 2 or 3 inches.

The rotations and supporting practices of rotation group 4, table 10, are suitable. Medium amounts of lime and phosphorus and high amounts of potassium fertilizers are needed to maintain fertility. Vegetable crops usually respond to even higher rates of fertilization. Special practices to maintain and increase the organic-matter content should be followed.

Arkport fine sandy loam, 6 to 12 percent slopes (An).—This is a good soil for crops and pasture. Plant roots can penetrate deeply. The soil responds well to good management.

The nearly uniform particle sizes in the surface soil cause it to erode very easily when crops are grown. Small eroded areas are marked on the soil map by erosion symbols. This is a productive soil for corn, small grains, alfalfa, and vegetables, but the high erosion hazard does not allow more than 1 year of intertilled crops in a rotation.

The rotations and supporting practices suggested in rotation group 7, table 10, are needed. Medium amounts of lime and phosphorus and high amounts of potassium will be required. The most intensive rotations of rotation group 7 also require stripcropping. If the topography is too complex for stripcropping, three or more years of sod crops should be used for each year of intertilled crops. Special practices should be used to maintain or increase organic-matter content.

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Arkport fine sandy loam, eroded, 12 to 20 percent slopes (Ao).—This highly erodible sandy soil is on moderately steep slopes that are generally complex. About three-fourths of its area is seriously eroded. These eroded areas have lost most of or all of the original plow layer. The fertility and water-holding capacity have been seriously reduced. Little nitrogen remains.

Eroded areas should be kept in sod crops for long periods. Alfalfa and birdsfoot trefoil are the best legumes for this soil. The rotations and management described in rotation group 9, table 10, can be used, but medium amounts of lime and phosphorus and high amounts of potassium will be needed to maintain fertility.

In most areas the stripcropping and diversion terraces needed to grow row crops are not practical. The topography is too irregular. No intertilled crops should be grown in these areas. Permanent pasture can be improved by addition of lime and fertilizer. Occasional plowing and reseeding to mixtures of suited legumes and grasses will result in better pasture production and better conservation of the soil.

Arkport loamy fine sand, 0 to 5 percent slopes (Ap).—This soil is well drained. It is suited to intensive cultivation and can be used for many kinds of crops. The water-holding capacity is moderately low, but roots penetrate easily and draw on a large volume of soil for water and plant nutrients. Shallow-rooted plants may be damaged by lack of moisture in dry periods.

Although water penetrates rapidly, the soil is subject to moderate erosion, even on these gentle slopes, because it is so uniform in texture. Danger of erosion is especially great early in spring when the surface soil thaws and the subsoil remains frozen.

This soil can be used for the rotations and supporting practices suggested in rotation group 1, table 10. Although continuous intertilled crops can be grown under intensive management, a better practice is to grow row crops no more than two years in succession. It is especially important to grow winter cover crops to prevent erosion after harvest of intertilled crops, and to maintain organic matter by using manure or sod-forming crops. Medium amounts of lime and phosphorus and high amounts of potassium are needed to maintain soil fertility.

Arkport soils, 20 to 45 percent slopes (Ar).—These soils are on slopes so steep that modern farm equipment cannot be used. It is difficult to maintain good pastures because these sandy well-drained soils are droughty.

Most areas of these soils that are not forested have been seriously eroded. Forestry is the best use for these areas, but they can be used for pasture if medium amounts of lime and phosphorus and high amounts of potassium are supplied. Pastures that receive these amendments produce fairly well in spring and early summer. Pastures that do not receive lime and fertilizer produce very little. These soils are in rotation group 12, table 10.

Arkport-Dunkirk fine sandy loams, 6 to 12 percent slopes (Ak).—This mapping unit consists of small areas of Arkport fine sandy loam and Dunkirk fine sandy loam mingled in such intricate patterns that they cannot be shown separately on the soil map. The topography consists of a series of knolls which slope in many directions. Typically, the tops of the knolls are Arkport fine sandy loam and the slopes are Dunkirk fine sandy loam.

The Arkport soil is sandy throughout. The Dunkirk soil is mostly silty in the subsoil, and it has a fine sandy loam surface soil.

The complex topography, moderately strong slopes, and the highly erodible soil material restrict the uses to which this mapping unit is suited. Intertilled crops produce well, but sod crops should be grown much of the time to prevent serious erosion. The rotations and practices suggested in rotation group 7, table 10, are suitable for the smoother areas of these soils. Where the slopes are too complex for the use of stripcropping or diversion terraces, the rotations of rotation group 10 ought to be used. Medium amounts of lime and phosphorus and high amounts of potassium are needed to maintain soil fertility.

Arkport-Dunkirk fine sandy loams, eroded, 12 to 20 percent slopes (Al).—This complex consists of moderately steep areas in which the sandy Arkport and the silty Dunkirk soils occur in such intricate patterns that they could not be mapped separately. The Arkport soils usually occur on the crests of knolls and ridges, and the Dunkirk soils occur on the slopes.

Nearly all of the original plowed layer has been eroded from most areas. A few small uneroded areas occur. The soils are very likely to erode further.

These are poor soils for intensive cultivation because of the erosion hazard, although crops may produce well if heavily fertilized. The rotations and management practices described in rotation group 9, table 10, are the most intensive that should be used. Rotations should include a minimum of 3 years of sod crops. Alfalfa and birdsfoot trefoil are the best suited legumes. Medium amounts of lime and phosphorus and high amounts of potassium will maintain fertility. These soils are low in organic matter.

Cultivation should be across the slope to control erosion when the sod is broken, but contour cultivation and terracing are usually not practical because of the uneven topography.

Atherton Series

This series is represented by a very poorly drained soil, Atherton silt loam, 0 to 1 percent slopes. It was derived from acid glacial outwash and occupies nearly level terraces and alluvial fans. It occurs along the streams of the southern part of the survey area. It is associated with the well-drained Chenango soils, the moderately well drained Braceville soil, and the poorly drained Red Hook soil.

Slowly permeable layers occur at varying depths under the Atherton soil. These layers and the nearly level or slightly depressed relief result in poor drainage. The water table of the general area is usually high. Some areas of the Atherton soil may receive seepage from other areas.

Typical profile of Atherton silt loam under forest:

- A_1 0 to 7 inches, very dark gray (10YR 3/1) to very dark grayish-brown (10YR 3/2) silt loam; coarse granular structure; friable when moist, slightly sticky and plastic when wet; high in organic matter; medium acid; 6 to 9 inches thick.
- G_1 7 to 13 inches, light brownish-gray (10YR 6/2) silt loam, faintly mottled with yellowish brown; structureless and firm in place; medium acid; 4 to 12 inches thick. This is a layer of intense reduction brought about by decay of organic matter under poor aeration.
- G_2 13 to 20 inches, grayish-brown (10YR 5/2) silt loam strongly mottled with light yellowish brown (10YR 6/4); no apparent structure; firm when moist, slightly plastic and sticky when wet; may be sandy or gravelly at 20 inches; medium acid; 6 to 20 inches thick.
- CG 20 inches +, light brownish-gray (10YR 6/2) mixed gravel and sands with some silty layers; medium acid (pH 5.5 to 6.0); usually underlain by impervious material at depths ranging from 5 to 10 feet.

Atherton silt loam, 0 to 1 percent slopes (As).—This low-lying very poorly drained soil is too wet for crops or for good pasture unless it is drained. It can be drained artificially if suitable outlets for water can be found. This soil when drained is suited to the rotations and supporting practices suggested in rotation group 1. Medium amounts of lime, phosphorus, and potassium must be added to support these rotations.

If these areas are only partially drained, only the last two rotations listed for rotation group 1, table 10, can be used. A few open ditches to remove extra surface water will allow the establishment of fair pasture. Permanent native pasture is moderately productive if limed, fertilized, and partly drained. Where the soil is drained enough to be plowed, better pastures can be produced by seeding Ladino clover-grass mixtures. Such pastures are especially valuable during the drier parts of the summer.

Aurora Series

The Aurora series, as mapped in Ontario and Yates Counties, consists of moderately well to imperfectly drained soils from shaly, neutral, or weakly calcareous glacial till. Shale bedrock lies at depths ranging from 20 to 36 inches. The underlying rock is commonly alkaline or weakly calcareous, but in places acid, thin-bedded, dense, gray sandstone may be interbedded with the shale. Other members of the catena are the poorly drained Angola soil and the very poorly drained Fonda soils. The Fonda soils, however, were included in the Alden series as mapped in these two counties.

Profile of Aurora silt loam under forest:

- A_1 0 to 5 inches, dark grayish-brown (10YR 4/2) silt loam; weak fine to medium granular structure; friable when moist, plastic when wet; medium acid; 3 to 5 inches thick.
- A_2 5 to 12 inches, pale-brown (10YR 6/3) silt loam; moderate fine blocky structure; firm when moist, plastic when wet; good water-holding capacity; contains many roots and some shale fragments; medium acid; 5 to 10 inches thick.
- B 12 to 23 inches, dark yellowish-brown (10YR 4/4) heavy silt loam, mottled with yellowish brown (10YR 5/4) and light brownish gray (10YR 6/2); moderate medium blocky structure; firm when moist, plastic when wet; good water-holding capacity; easily penetrated by roots; some shale and a few sandstone fragments mixed through layer; neutral to medium acid; 8 to 16 inches thick.
- C 23 to 32 inches, grayish-brown (10YR 5/2) shaly silt loam, faintly mottled with light brownish gray (10YR 6/2); weak thick platy structure; aggregates firm when moist, sticky and plastic when wet; layer marks the lower limit of root penetration; neutral to slightly alkaline (pH 7.0 to 7.5); 0 to 16 inches thick.
- D 32 inches +, olive-gray (5Y 5/2) soft thin-bedded flaky shale; neutral to alkaline (pH 7.0 to 8.0); calcareous in places.

Aurora silt loam, 3 to 8 percent slopes (At).—This is a moderately well drained to imperfectly drained soil. It

has formed in moderately fine textured materials on gentle slopes. The soil absorbs water slowly, but its water-holding capacity is fair. This soil is more likely to erode than deeper and more absorptive soils would be.

This is a fair soil for corn, small grains, Ladino clover, and red clover. It is poor for alfalfa and intensively grown vegetable crops. On slopes next to Seneca and Canandaigua Lakes, it is used for grapes and is moderately productive of this crop.

Crops should be carefully selected and managed because the soil has only moderate depth over bedrock, has moderate drainage, and is erodible. The crops and management practices named in rotation group 4, table 10, are suitable. Where the depth to bedrock is not enough to allow building of diversion terraces, the first two rotations listed cannot be used. For any of these rotations, medium amounts of lime and phosphorus and some potassium must be added to maintain fertility.

Aurora silt loam, eroded, 3 to 8 percent slopes (Au).—This soil has lost so much of the original surface layer through erosion that the moderately fine textured subsoil has been mixed with the plowed layer. Erosion of this soil is especially serious because its depth to bedrock is commonly less than 3 feet. Although this soil is gently sloping, it is likely to erode because it is low in organic matter and it absorbs water slowly. The resulting increase in runoff creates a management problem.

This is only fair cropland at best, but corn, small grains, and hay will produce moderately well under good management. Some vineyards are seriously eroded. It is important to build up the organic-matter content and to increase the fertility. Medium amounts of lime and phosphorus and some potassium should be added. The rotations and other practices suggested for rotation group 7, table 10, are suitable.

Aurora silt loam, 8 to 15 percent slopes (Av).—This imperfectly drained, moderately deep soil is very likely to erode seriously unless it is managed very carefully. It is a fair soil for some shallow-rooted crops, but its moderate depth and slow subsoil drainage make it a poor soil for deep-rooted plants such as alfalfa. The rotations and management practices of rotation group 7, table 10, would be suitable. Medium amounts of lime and phosphorus and some potassium should be added.

In many places the bedrock is so near the surface that diversion terraces cannot be built. In these places 3 years of sod crops to 1 year of intertilled crops is needed in the rotation to control runoff.

Aurora silt loam, eroded, 8 to 15 percent slopes (Aw).—This eroded, moderately fine textured, imperfectly drained soil is seriously restricted in its use. It is a poor soil for intertilled crops and for deep-rooted legumes such as alfalfa, but it is a fair soil for most sod crops. It needs management practices that will restore organic matter, control runoff, and supply fertility.

Where the soil is deep enough for diversion terraces, the rotations and other practices suggested in rotation group 9, table 10, can be used. In most places the bedrock is so near the surface that diversion terraces cannot be built. In these places the rotations and practices of rotation group 11 are better suited. Medium amounts of lime and phosphorus and some potassium should be added. Native pastures respond to lime and phosphorus, but better yields can be obtained by plowing, seeding to mixtures containing Ladino clover or birdsfoot trefoil, and providing enough lime and fertilizer.

Aurora silt loam, eroded, 15 to 30 percent slopes (Ax).—This moderately shallow imperfectly drained soil is poor cropland and responds poorly to management. The slopes make it difficult to work and very likely to erode under use. On most farms it should be used for permanent pasture or forestry. If the soil is needed as cropland, fair yields of hay can be grown on the less steep parts. Rotations suggested in rotation group 12, table 10, with addition of medium amounts of lime and phosphorus and some potassium, are best suited.

Bath Series

These are well-drained very strongly acid soils developed in glacial till derived from predominantly acid sandstones and shales. They are the well drained members of the catena that includes the moderately well drained Mardin soils, the imperfectly drained Fremont soils, the poorly drained Volusia soils, and the very poorly drained Chippewa soils. They are associated also with the shallow Lordstown soils.

In these soils, the bright yellowish or slightly reddish brown colors free of mottling indicate good drainage and good aeration in a weakly developed Podzol. The thin pinkish-gray horizon at the surface in forested areas is typical of the Podzol great soil group.

The soils of this series are low in fertility and are strongly acid, but they respond well to the addition of fertilizer and lime.

Typical profile of Bath channery silt loam under forest:

- A_0 Black humus, held in a mat of fine roots; no mineral material; extremely or very strongly acid.
- A_2 0 to 1 inch, pinkish-gray (7.5YR 6/2) silt loam or silt; very weak thin platy structure; very friable; intensively leached; leaching is in some places masked by organic matter from layer above; very strongly or extremely acid; ½ to 2 inches thick.
- B_{21} 1 to 9 inches, strong-brown (7.5YR 5/6) channery silt loam, in some places slightly darkened in the upper inch by humus; weak fine crumb structure; very friable; contains medium and fine roots; high in iron oxide; strongly or very strongly acid; 6 to 11 inches thick.
- B_{22} 9 to 17 inches, yellowish-brown (10YR 5/6) channery silt loam; similar to layer above but less reddish in color; weak fine crumb structure; friable; contains medium and large roots; strongly to very strongly acid; 10 to 13 inches thick.
- B_3 or A'_2 17 to 23 inches,[4] light yellowish-brown (10YR 6/4 to 5/4) channery silt loam; weak fine crumb structure; friable to firm; contains large roots; strongly acid; 4 to 10 inches thick.
- $A'_2B'_2$ 23 to 30 inches, light yellowish-brown (2.5Y 6/4 to 5/4) silt loam similar to material of the layer above extends into this layer in wedge-shaped bodies 1 to 4 inches wide surrounding olive-brown (2.5Y 4/3) very channery heavy silt loam; coarse to very coarse prisms; centers of prisms have weak to very weak medium and coarse blocky structure; firm when moist; contains roots; strongly acid; 4 to 10 inches thick.
- B'_{2m} 30 to 60 inches, panlike horizon of olive-brown (2.5Y 4/3) very channery silt loam; weak to very weak medium and coarse blocky structure; firm; vertical extensions

[4] Several of the soils have more than one sequence of horizons in which A and B horizons of a Podzol are underlain by horizons that resemble A and B horizons of another great soil group (*6*). The deeper horizons are designated in this report as A′ and B′.

of light yellowish-brown silt loam from the horizon above divide the upper part into prisms ranging from 12 to more than 30 inches across; prisms decrease with depth and usually disappear below depths of 4 feet; strongly to medium acid; 20 to 50 inches thick.

C 60 inches +, light olive-brown (2.5Y 5/3) to olive-brown (2.5Y 4/3) very channery silt loam glacial till from fine-grained sandstone or siltstone and shale; weak to moderate thick platy structure; firm; medium to slightly acid in upper part, and acidity decreases with depth; material usually calcareous below 8 feet but, in some places, below 6 feet.

Bath channery silt loam, 5 to 15 percent slopes (Ba).—This deep, well-drained soil is low in fertility but highly responsive to good management. The slopes are such that moderate restrictions on use are necessary for control of runoff and erosion. Some small areas that are already eroded are shown on the soil map by erosion symbols.

It is advisable to grow a row crop for only 1 year in the rotation, but row crops can be grown for 2 successive years if practices that will maintain organic matter and control runoff are used. Special practices to build up organic matter should be used on the eroded spots.

This is a good soil for potatoes, but they require large amounts of complete fertilizer for good yields. The soil is good for small grains. It is fair to good for silage corn if suitable hybrid varieties are used and the proper amounts and kinds of fertilizer are added. The short growing season makes this soil poor for grain corn. The soil is fair to good for alfalfa if liming and fertilization are heavy. The practices and crops suggested in rotation group 4, table 10, would be suited to the soil. The soil has high requirements for lime and medium requirements for phosphorus and potassium.

Bath channery silt loam, 15 to 25 percent slopes (Bb).—This well-drained soil is low in fertility. Response to good management is limited mainly by slope, which makes most kinds of farm machinery difficult to use. Erosion control is a moderate problem because of the rapid runoff and the consequent reduction in water available for crops. About one-fifth of the area is now moderately eroded.

Suitable rotations and supporting practices to maintain organic matter and control erosion are given under rotation group 8, table 10. These rotations should be supported by high rates of liming and medium rates of fertilization with phosphorus and potassium. Intertilled crops should be grown as seldom as possible.

This soil is suited to potatoes, corn for silage, small grains, and grass-legume mixtures for hay or pasture. Ladino clover or red clover are the best legumes for short periods; birdsfoot trefoil is the most promising legume if the stand is to remain for long periods of time.

Berrien Series

The Berrien series is represented in this county by Berrien fine sandy loam, 0 to 6 percent slopes. It is a strongly acid sandy soil and one of the better drained among the moderately well drained soils. It developed in lake-laid sand. Silt or clay lies at depths ranging from 3½ to more than 5 feet.

The bright colors of the upper part of the soil indicate good aeration; the mottling below 30 inches indicates occasional saturation with water. Roots penetrate easily and have a fairly large volume of soil from which to draw water and plant nutrients. The water-holding capacity of the upper part of the soil is medium to low. Plants compensate for this by moderately deep rooting. The native fertility of the soil is low, but it responds well to good management.

Typical profile of Berrien fine sandy loam under forest:

A_0 Black (10YR 2/1) mat of finely divided organic matter; strongly acid.

A_1 0 to 2 inches, very dark gray (5YR 3/1) fine to very fine sandy loam; strong fine crumb structure; very friable when moist, nonplastic when wet; high in organic matter; matted with fine roots; strongly acid; 1 to 3 inches thick.

B_{21} 2 to 12 inches, brownish-yellow (10YR 6/6) fine sandy loam; weak fine crumb structure; loose to very friable when moist, nonplastic when wet; contains many small and medium-sized roots; low water-holding capacity; strongly acid; 8 to 14 inches thick.

B_{22} 12 to 21 inches, yellowish-brown (10YR 5/6) fine sandy loam; very weak fine crumb structure; very friable when moist, nonplastic when wet; easily penetrated by roots but contains fewer roots than layer above; strongly acid; 8 to 20 inches thick.

B_{23} 21 to 30 inches, yellowish-brown (10YR 5/4) fine sand with mottlings of strong brown (7.5YR 5/8; firm in place but breaks into single-grain structure; friable when moist, nonplastic when wet; easily penetrated by roots; may contain a few iron concretions; strongly acid; 8 to 16 inches thick.

C 30 to 48 inches, light yellowish-brown (10YR 6/4) fine sand; single-grain structure; loose when moist, nonplastic when wet; contains a few large roots; low water-holding capacity; strongly acid; underlain by clays at depths ranging from 40 to more than 60 inches.

Berrien fine sandy loam, 0 to 6 percent slopes (Bc).—This soil is well suited to most field crops, vegetables, and tree fruits, but large amounts of fertilizer are needed for good yields. Requirements are medium for lime and phosphorus, and high for potassium.

The soil is sandy and almost free of gravel and is easy to work. It is moderately likely to erode even on the gentle slopes, especially early in spring when the upper few inches of thawed soil is underlain by frozen subsoil. Suitable rotations and supporting practices to control runoff and maintain organic matter are given in rotation group 3, table 10.

Bono Series

The Bono series, represented by Bono silty clay, 0 to 1 percent slopes, consists of permanently wet, depressional soils that have a shallow mucky surface layer underlain by calcareous clays and silts. In most places the Bono soil is covered with water during winter and early spring. The permanent water table stands near the surface during the rest of the year, unless the soil is artificially drained. The soil occurs in northern Ontario County, where it is associated with Carlisle and Edwards mucks in the old glacial drainage channel between Phelps and Victor.

Typical profile of Bono silty clay under forest:

A_1 0 to 7 inches, very dark gray (10YR 3/1) to black (10YR 2/1) mucky silty clay, high in mineralized organic matter; strong coarse granular structure; friable when moist; neutral to strongly alkaline; 6 to 10 inches thick.

G_1 7 to 14 inches, light-gray (10YR 7/1) to light brownish-gray (10YR 6/2) silty clay; dense in place but breaks out as irregular blocks; firm when moist, very plastic when wet; slightly alkaline; 4 to 10 inches thick.

G_2 14 to 32 inches, light-brown (7.5YR 6/4) silty clay mottled with yellowish brown (10YR 5/8) and gray (10YR

6/1); dense and tight in place; massive to coarse blocky structure; firm when moist, very plastic when wet; slightly alkaline to weakly calcareous; 12 to 24 inches thick.

CG 32 inches +, light-brown (7.5YR 6/4) to pinkish-gray (7.5YR 6/2) laminated very fine sand, silt, and clay, mottled with gray and rust brown; dense and tight in place; calcareous.

Bono silty clay, 0 to 1 percent slopes (Bd).—Undrained areas of this soil cannot be farmed to crops. None of it was drained well enough to use at the time of this survey. Sedges, cattails, rushes, and trees such as elm, soft maple, and willow are the native vegetation.

If drainage is improved by open ditches, the soil can be used for permanent pasture. Such pasture will furnish some grazing when well-drained upland pastures are too dry. If the soil could be drained well enough, it would be suited to the management and crops described under rotation group 1, table 10. To drain these areas properly, tile would have to be closely spaced. No lime would be necessary for crops, but medium amounts of phosphorus and some potassium would have to be added to maintain the fertility. If other land can be used for crops instead, the Bono soil probably should be left in woods.

Braceville Series

This is a moderately well drained soil in crudely stratified glacial outwash material derived from acid sandstone and shale. It is associated with the Chenango soils, but its parent materials contain more silt. This silt partly clogs the spaces in the sand and gravel layers and restricts the internal drainage of the soil.

Typical profile of Braceville gravelly silt loam under cultivation:

A_p 0 to 7 inches, dark-brown (10YR 4/3) to dark grayish-brown (10YR 4/2) gravelly silt loam; strong coarse crumb structure; friable when moist, slightly sticky and plastic when wet; strongly acid; 5 to 9 inches thick.

B_2 7 to 18 inches, yellowish-brown (10YR 5/4) gravelly silt loam; weak medium crumb structure; firm when dry, friable when moist, slightly sticky and slightly plastic when wet; contains many roots; good water-holding capacity; strongly acid; 10 to 20 inches thick.

B_{2g} 18 to 32 inches, olive (5Y 5/3 to 4/3) gravelly silt loam with low-contrast mottling of yellowish brown (10YR 5/4); weak coarse blocky structure; firm in place; aggregates firm when dry, friable when moist, slightly sticky and plastic when wet; contains few roots; strongly to medium acid; 12 to 30 inches thick.

C 32 inches +, grayish-brown (2.5Y 5/2) mixed gravel and sand with lenses of silt; silt layers very dense; permeability of layer very low; medium acid.

Braceville gravelly silt loam, 0 to 5 percent slopes (Be).—Although internal drainage is somewhat restricted, this soil is fair as cropland. It is used along with the better drained Chenango soils. Most of the Braceville soil is nearly level, but a few acres occur on slopes of 5 percent. Seepage water contributes to the wetness of these sloping areas.

The top 18 inches of the soil is not mottled. This indicates that water does not remain in these layers for very long. Roots grow in these top layers much as they do in better drained soils. Below 18 inches, this soil is periodically waterlogged and roots grow poorly. The soil is medium to low in fertility, but it responds moderately well to fertilizers.

Some areas associated with the Howard soils have plenty of lime below a depth of 30 inches. This lime is usually not available to plants, because of waterlogged soil layers above it. The upper layers of the soil are generally not so strongly acid where the limy substrata are present.

The restricted internal drainage is not good for alfalfa or other deep-rooted crops, but the soil is suited to other hay and pasture crops. If used for intensive cash cropping, it does not respond to good management so well as the better drained soils. Shallow-rooted legumes should be used in short rotations. If sod is to remain for several years, birdsfoot trefoil seems to be the best legume. The rotations and supporting practices of rotation group 1, table 10, are suitable for this soil. Its requirements are high for lime and medium for phosphorus and potassium.

Burdett Series

This imperfectly drained soil has developed in material derived from glacial lake sediments and outwash sands and gravels. These materials were reworked and mixed by repeated advances of glacial ice. The parent material is moderately fine textured and slowly permeable to water. The underlying material is somewhat clayey and commonly contains thin layers of silt, fine sand, or gravel. The soil is medium acid, but the material beneath is calcareous. The well-drained Nunda soils, which were derived from similar materials, are associated with the Burdett soils.

Typical profile of Burdett silt loam under cultivation:

A_p 0 to 7 inches, grayish-brown (10YR 5/2) silt loam; moderate medium crumb structure; friable when moist; contains a few stone fragments; strongly acid where unlimed; 6 to 9 inches thick.

A_{21} 7 to 9 inches, pale-brown (10YR 6/3) silt loam; may be weakly mottled with yellowish brown; weak medium crumb structure; friable when moist; contains a few stone fragments; medium acid; 0 to 4 inches thick.

A_{22g} 9 to 13 inches, mottled brown, yellowish-brown, and grayish-brown heavy silt loam; moderate medium platy structure; firm in place; slightly plastic when wet; contains a few stone fragments; medium acid; 3 to 5 inches thick.

B_{2g} 13 to 25 inches, strongly mottled brown, yellowish-brown, and light-gray gravelly silty clay loam or heavy silt loam; strong medium to coarse blocky structure; firm when moist, moderately sticky and plastic when wet; medium to slightly acid; 12 to 20 inches thick.

B_3 or C_1 25 to 33 inches, grayish-brown to light brownish-gray silty clay loam or heavy silt loam, faintly mottled with yellowish brown; weak coarse blocky structure; firm when moist, hard when dry; moderately compact in place; neutral reaction; 4 to 12 inches thick.

C_2 33 inches +, light brownish-gray gravelly silt loam or gravelly silty clay loam glacial till; weak coarse blocky structure; compact; firm when moist, hard when dry; commonly contains thin layers of sandy or gravelly material; calcareous.

Burdett silt loam, 0 to 6 percent slopes (Bf).—This is a moderately productive soil, but its use is restricted by slow internal drainage. It is generally used and managed according to the requirements of the better drained soils associated with it. It is not well suited to intensive cash cropping because it shows little response to good management. Hay and pasture crops are more suitable. This is a good soil for permanent pasture. Shallow-rooted legumes are better suited to the soil than alfalfa, but

alfalfa may be used in mixtures with grasses and other legumes.

The complex topography of the other soils associated with this soil makes contour tillage impractical. Rotations with a high proportion of sod crops to intertilled crops should be used to control runoff. Suitable rotations and practices that will maintain organic matter and control runoff are given in rotation group 4, table 10. The soil has medium requirements for lime and phosphorus but low requirements for potassium.

Camillus Series

These well-drained silty soils have developed from soft gray calcareous shale, which was moved only short distances by glaciers. The yellowish-brown color and freedom from mottling indicate good drainage. Roots penetrate to bedrock and are able to draw moisture and plant nutrients from a large volume of soil. The high silt content of the soil material and its good structure result in a high water-holding capacity and a moderate native fertility. The soils are more easily eroded because of their silt content.

In Ontario County, a small area of imperfectly drained soil has been named as a variant of the Camillus series. The characteristics of this soil are outside the normal range of the Camillus series, but it is associated with members of that series, and its acreage is too small to justify establishing a new series name.

Typical profile of Camillus silt loam under cultivation:

- A_p 0 to 7 inches, dark grayish-brown (2.5Y 4/2) silt loam; moderate fine to medium crumb structure; friable when moist, sticky when wet; high in organic matter and full of fine roots; good water-holding capacity; medium acid; 6 to 9 inches thick.
- B_{21} 7 to 16 inches, yellowish-brown (10YR 5/4) silt loam; weak medium blocky structure; friable; easily penetrated by roots; good water-holding capacity; medium acid; 8 to 12 inches thick.
- B_{22} 16 to 24 inches, yellowish-brown (10YR 5/4) heavy silt loam; moderate coarse blocky structure; friable when moist, slightly sticky and plastic when wet; easily penetrated by roots; good moisture-holding capacity; neutral; 6 to 12 inches thick.
- C 24 to 32 inches, dark grayish-brown (10YR 4/2) silt loam; weak thin platy structure retained from original shale; friable when moist, sticky and plastic when wet; this layer is the limit of root penetration; neutral to alkaline but does not effervesce with acid; 6 to 10 inches thick.
- D 32 inches +, grayish-brown (10YR 5/2) soft, partially disintegrated, calcareous, silty shales of the Camillus geologic formation.

Camillus silt loam, 0 to 8 percent slopes (Ca).—This well-drained moderately deep soil has good water-holding capacity. Roots can penetrate to bedrock. The soil is moderately likely to erode, even on these gentle slopes, because it has a uniform silty texture. Where the soil is well supplied with organic matter, it makes a good seedbed, but where organic matter is low, the surface soil becomes hard when dry.

This soil is well suited to horticultural specialties, vegetables for canning, corn, small grains, and sod crops for hay or pasture. Suitable legumes are alfalfa, Ladino clover, red clover, and birdsfoot trefoil. The soil, as mapped, includes small areas that are moderately well drained. These are less suited to deep-rooted crops than the normal Camillus silt loam, 0 to 8 percent slopes.

Rotations and supporting practices that will maintain organic matter and control runoff on this soil are given in rotation group 4, table 10. The requirement for phosphorus is medium, but the requirements for lime and potassium are low. Intensively grown vegetable crops will respond to high rates of fertilization.

Camillus silt loam, imperfectly drained variant, 0 to 5 percent slopes (Cb).—This soil would normally be named as a different series, but so few acres are known to exist that they do not justify recognition of a separate series. This soil occupies a somewhat lower and somewhat poorer drained position than the well-drained Camillus soil. The soil profile differs from that described for the Camillus series because it has yellowish-brown or rust-brown mottlings below depths of 10 to 15 inches. These mottlings indicate that the soil is sometimes saturated with water.

This variant occurs mainly in small areas used along with the well-drained Camillus silt loam, 0 to 8 percent slopes. The imperfectly drained soil gives slightly lower yields in most years, and intensively grown cash crops show less response when large amounts of fertilizer are applied. It is a fair soil for most crops, but alfalfa is not well suited, because of the imperfect drainage. The rotations and supporting practices described under rotation group 4, table 10, will maintain organic matter and control runoff. The soil has low lime and potassium requirements, but its phosphorus requirement is medium.

Canandaigua Series

This poorly drained soil was derived from lake-laid silts and very fine sands. It occurs on nearly level topography where the water table stands near the surface for long periods of time. It is associated with the well-drained Dunkirk soils, the imperfectly drained Collamer soils, and the very poorly drained Colwood soil.

Typical profile of Canandaigua silt loam under forest:

- A_1 0 to 4 inches, dark-gray (10YR 4/1) to dark grayish-brown (10YR 4/2) silt loam; moderate medium crumb structure; friable when moist; neutral to slightly acid; 4 to 6 inches thick.
- A_{2g} 4 to 11 inches, light brownish-gray (10YR 6/2) silt loam with low-contrast mottling of pale brown and gray; weak fine crumb structure; friable when moist; appears to be a zone of intense reduction just below the zone of maximum organic-matter accumulation; medium acid to neutral; 3 to 7 inches thick.
- BG_1 11 to 18 inches, very strongly mottled pale-brown (10YR 6/3), yellowish-brown (10YR 5/8), and gray (10YR 5/1) heavy silt loam; moderate medium blocky structure; friable when moist; slightly acid to neutral; 8 to 12 inches thick.
- BG_2 18 to 30 inches, strongly mottled gray (10YR 5/1) and yellowish-brown (10YR 5/8) heavy silt loam; weak coarse blocky structure; firm in place and may be compact; neutral; 10 to 24 inches thick.
- CG 30 inches +, gray (10YR 5/1 to 6/1) stratified silts and very fine sands; thin lenses of clay; generally distinctly laminated; yellowish-brown horizontal streaks may occur in upper part; firm in place but friable when crushed; calcareous.

Canandaigua silt loam, 0 to 3 percent slopes (CD).—The greatest management need of this soil is adequate drainage. The undrained soil is too wet for good yields of intertilled crops but will produce fair hay and pasture. Undrained pastures support bentgrass, redtop, and sedges.

Undrained forest areas have elm, soft maple, ash, sycamore, and willow trees.

Where artificially drained, the soil is suited to most of the crops grown in the county. It is not suited to alfalfa or tree fruits. Suitable rotations and supporting practices to maintain organic matter and control runoff are given under rotation group 2, table 10. Under these rotations the soil has low lime requirements and medium requirements for phosphorus and potassium.

Caneadea Series

These are imperfectly drained fine-textured acid soils developed in lake-laid silts and clays. The closely packed silts and clays of the subsoil and substratum restrict the movement of water. The mottling that is just below the plow layer shows that water stands at this level for long periods of the year. The underlying clay is calcareous, but the soil is strongly acid.

These soils are suited to only a few crops. Their response to good management is small because of their fine texture and imperfect drainage. They are very sticky and plastic. They puddle easily if plowed when too wet, and they bake and form crusts when they are very dry. Roots grow mostly in the upper 12 inches of soil because the subsoil is wet so much of the time. The soils erode easily.

Typical profile of Caneadea silty clay loam under forest:

- A_0 Black (2.5Y 2/0) humus layer; finely granular; matted with fine roots; very strongly acid (pH 4.5 to 5.0).
- A_1 0 to 3 inches, dark grayish brown (2.5Y 4/2) heavy silt loam to silty clay loam; strong medium granular structure; granules firm when moist, sticky and plastic when wet; high in organic matter; matted with fine roots; strongly acid; 2 to 5 inches thick.
- A_{2g} 3 to 12 inches, light yellowish-brown (2.5Y 6/4) heavy silt loam with gray and yellow mottles; moderate medium blocky structure; firm when moist, sticky and plastic when wet; contains fewer roots than layer above; strongly acid; 6 to 12 inches thick.
- B_{2g} 12 to 26 inches, pale-olive (5Y 6/3) silty clay with high-contrast mottling of brownish yellow (10YR 6/6); strong medium blocky structure; very firm when dry, plastic and sticky when wet; contains moderate number of small and medium roots; high water-holding capacity; medium acid; 12 to 18 inches thick.
- B_{3g} or C_{1g} 26 to 42 inches, grayish-brown (2.5Y 5/2) silty clay strongly mottled with yellowish brown (10YR 5/4); moderate medium to coarse blocky structure; aggregates very firm when dry, firm when moist, plastic and sticky when wet; contains only a few roots, which penetrate along cleavage planes; high water-holding capacity but less water available to plants than in coarse-textured soils; slightly acid; 10 to 20 inches thick.
- C_2 42 inches +, pale-olive (5Y 6/3 to 6/4) silty clay; strong coarse blocky structure verging on prismatic; aggregates firm when moist, sticky and plastic when wet; high water-holding capacity; very slow permeability; mildly alkaline to calcareous; varved in the deep substratum.

Caneadea silty clay loam, 0 to 6 percent slopes (Cc).—This imperfectly drained fine-textured soil is hard to work and is easily puddled. It dries slowly in the spring but usually can be worked earlier than the poorly drained soils of the uplands. Both the clayey texture and the imperfect drainage restrict crop suitability and response to management.

This is a poor soil for intensively grown cash crops. It is only fair for corn and is poor for potatoes and alfalfa. Ladino clover and red clover are the legumes best suited if the stand is to remain two or more years on this soil.

Suitable rotations and supporting practices for this soil are given in rotation group 4, table 10. The best management on this soil requires sod crops to maintain organic matter and to improve the soil structure. Long rotations of legume-grass mixtures for hay or pasture are good.

Fair permanent pasture can be established by using lime and superphosphate as a topdressing to encourage wild whiteclover and bluegrass. Better pasture can be provided by periodic plowing and reseeding to higher-yielding mixtures of grass and legumes. Requirements for lime are high, for phosphorus are medium, and for potassium are low. Larger amounts of fertilizer generally bring little response.

Caneadea silty clay loam, eroded, 6 to 15 percent slopes (Cd).—The crop suitability of this sloping, fine-textured, imperfectly drained soil is limited, and the response to management is low. Surface drainage is rapid, but internal drainage is very slow. The soil stays wet for moderate periods even though it is sloping. It can be worked earlier in the spring than the more gently sloping Caneadea soils, but it is considerably more likely to erode. The maintenance of good soil structure is a problem.

Rotations and management practices suitable for maintaining organic matter and controlling runoff are given in rotation group 7, table 10. Although intertilled crops can be used if adequate supporting practices are followed, the soil is better suited to sod crops. Drainage-type diversion terraces may help to control water.

Alfalfa is poorly suited to this soil. Ladino clover and birdsfoot trefoil are the legumes most likely to persist and do well. Red clover will do if used in short rotations. The soil has high requirements for lime, medium requirements for phosphorus, and low requirements for potassium.

Carlisle Series

This is a nearly neutral organic soil derived from woody peat. The upper 20 inches is so thoroughly decomposed that few of the original plant parts can be identified. The drainage waters that flow into the areas carry calcium, and this makes the soil neutral. The soil is permanently wet except where it has been artificially drained.

A typical profile of Carlisle muck follows:

1. 0 to 10 inches, black (10YR 2/1) thoroughly humified organic matter; strong fine to medium crumb structure; neutral to slightly acid; 8 to 10 inches thick.
2. 10 to 24 inches, black (10YR 2/1 to 2/2) finely divided organic matter; greasy consistence; neutral to slightly acid; 12 to 22 inches thick.
3. 24 to 34 inches, dark-brown to very dark brown (7.5YR 3/2 to 2/2) somewhat fibrous peat; occurs in thin layers or sheets in places, but may be absent; slightly acid or neutral; 10 to 20 inches thick.
4. 34 inches +, black (7.5Y 2/0) or very dark brown (7.5YR 2/2) woody peat; mildly alkaline.

Carlisle muck, 0 to 1 percent slopes (Ce).—This soil can be used for agriculture only if it is drained. The uncleared areas support a forest of elm, red maple, sycamore, alder, and other water-tolerant trees.

If good outlets can be found, the soil can be fully drained artificially by open ditches. When this is done, the soil is extremely productive of vegetables and potatoes. Potatoes, celery, carrots, onions, beans, and cabbage are the most important crops grown. The soil is usually used for continuous intertilled crops, but any of the rotations of rotation group 1, table 10, are suitable.

Control of the water table and fertilization are the most important management requirements. Large fields need windbreaks or other practices to control wind erosion of the surface soil. For hay and pasture crops, this soil has low lime requirements, medium phosphorus requirements, and high potassium requirements. Where the soil is drained, intensively grown cash crops respond well to very heavy fertilization.

Carlisle muck, shallow, 0 to 1 percent slopes (Cf).—This is a minor soil. Well-decomposed muck rests on sand or clay at depths ranging from 12 to 36 inches. This shallow muck is less productive than the deep Carlisle muck, but it is used in much the same way. Potatoes, celery, carrots, and beets are the most important crops. Intertilled crops can be grown continuously.

These shallow mucks are much more likely to lack plant nutrients or to accumulate poisons that will injure plants than are the deeper mucks. The shallow muck is sometimes harder to drain properly than the deeper muck. It is difficult to predict yields from this soil, because depth, drainage, fertility, and presence of toxic substances vary considerably from one locality to another. The yields given in table 12 represent an average; specific yields would have to be diagnosed separately for each area.

Cayuga Series

This series of well-drained moderately fine textured soils has developed in a thin layer of lacustrine clays over glacial till. In most places uprooting of trees, burrowing of animals, freezing and thawing, and soil creep have mixed the loam glacial till with the silty clay lacustrine deposit, so that stones and gritty material occur throughout the soil layers.

The soil profile has developed mainly in the moderately fine textured material. It rests on the calcareous loam glacial till at depths ranging from 24 to 40 inches. The soil has good moisture-holding capacity and is at least moderately well aerated. It is not strongly leached. It is more fertile than many other soils of the county. It does not respond so well to good management, especially fertilization, as the coarser textured soils of the county do.

Typical profile of Cayuga silt loam under forest:

A_0 Thin layer of deciduous forest litter of leaves and twigs.

A_1 0 to 4 inches, very dark grayish brown (10YR 3/2) silt loam; moderate medium granular structure; friable when moist, slightly sticky and plastic when wet; contains many fine and medium-sized roots; slightly acid to neutral; 3 to 5 inches thick.

A_2 4 to 12 inches, yellowish-brown (10YR 5/4) heavy silt loam; weak fine to medium blocky structure; aggregates firm when moist; contains many small and medium-sized roots; high water-holding capacity; medium to slightly acid; 6 to 10 inches thick.

B_{21} 12 to 24 inches, brown to dark-brown (7.5YR 4/4) silty clay loam; strong fine blocky structure; firm when moist, very sticky and very plastic when wet; easily penetrated by roots; high water-holding capacity; slightly acid to neutral; 8 to 15 inches thick.

B_{22} 24 to 34 inches, brown (7.5YR 5/2) silty clay loam; moderate medium blocky structure; firm when moist, plastic and sticky when wet; easily penetrated by roots; good water-holding capacity; contains streaks and nodules of free lime; 6 to 12 inches thick.

D 34 inches +, dark-brown (7.5YR 4/2) gritty loam or silt loam; moderate coarse platy structure; aggregates break into strong medium blocks; extremely firm when moist; penetrated by roots, mainly along the structural planes of the aggregates; has good capacity to hold and store water for plants; highly calcareous; this material is glacial till like that under the Honeoye or Lansing series, and the soil itself has developed from heavier material over it.

Cayuga silt loam, 3 to 8 percent slopes (Cg).—This deep, well-drained, moderately fine textured soil is slightly susceptible to erosion. It needs special practices to maintain the organic matter needed to preserve good soil structure. A few small areas with slopes less than 3 percent are included in the mapping unit, and these need only cultivation across the slope to control runoff.

Rotations and management suitable to maintain organic matter and to control runoff are given in rotation group 4, table 10. Corn for grain or silage, small grains, hay or pasture, vegetables, and fruits are all suited to the soil. Alfalfa is one of the best legumes for this soil. If cropped to the rotations given in group 4, the soil has low requirements for lime, medium requirements for phosphorus, and low requirements for potassium.

Cayuga silt loam, eroded, 3 to 8 percent slopes (Ch).—This soil has lost most of the original plowed layer, and the silty clay loam subsoil has been mixed with the surface soil by plowing. The present plow layer is low in organic matter. It puddles if cultivated when too wet. The greatest management problem is to build up the organic matter and to restore good structure to the plow layer.

The soil is now suited to the rotations described in rotation group 5, table 10. When organic matter and good soil structure have been restored to the plow layer, the soil can be used for rotations in group 4. The soil has a low lime requirement, a medium phosphorus requirement, and a low potassium requirement. This soil is very low in nitrogen; nitrogen fertilizers generally bring a striking response.

Cayuga silt loam, 8 to 15 percent slopes (Ck).—The use of this well-drained, moderately fine textured, deep soil should be planned to control runoff. The soil is good for crops but is susceptible to erosion.

Rotations and supporting practices suitable to maintain organic matter and control runoff are listed in rotation group 7, table 10. The soil is well suited to corn for grain or silage, small grains, field beans, alfalfa, and sod crops. It is less suited to intensive cash crops. If used for the suggested rotations, the soil has a low lime requirement, a medium phosphorus requirement, and a low potassium requirement.

Cayuga silt loam, eroded, 8 to 15 percent slopes (Cl).—This is a severely eroded sloping soil. Its silty clay loam subsoil has been mixed with the surface soil by plowing. The present plow layer is low in organic matter and puddles and bakes easily. The soil is well drained and has good water-holding capacity.

About 55 percent of this Cayuga soil has been eroded. It must be managed carefully to control runoff and to prevent further erosion. Only 1 year of intertilled crop should be used in each rotation. Long periods of sod

crops, with use of nitrogen fertilizer, are advisable to restore the organic matter. Rotation group 9, table 10, gives some rotations and supporting practices that will help maintain organic matter and control runoff. The soil has low lime requirements, medium phosphorus requirements, and low potassium requirements in support of these rotations, but it needs large amounts of nitrogen fertilizer for good yields.

Cayuga silt loam, eroded, 15 to 25 percent slopes (Cm).—Both eroded and uneroded areas are included in this unit, but more than 80 percent is eroded enough that the silty clay subsoil material is mixed into the plow layer. The rapid runoff from these moderately steep slopes results in erosion unless special erosion control practices are used. It is difficult to work these slopes.

The soil is better suited to hay or pasture than to intertilled crops. Alfalfa is the best suited legume. Birdsfoot trefoil can be used if the sod is to be left for very long periods. Rotations and management suitable for maintaining organic matter and controlling runoff are suggested in rotation group 11, table 10.

Cazenovia Series

This series consists of well-drained, moderately fine textured soils that have developed from glacial till high in silts and clays. Typically the till is from reddish clayey shale, but in this area most of the material is a mixture of clayey lacustrine sediments and loamy glacial till that was formed when the ice overrode clay deposits. Much of the sediment of the original lacustrine deposits came from the reddish colored shales.

Typical profile of Cazenovia silt loam under forest:

- A_1 0 to 3 inches, dark grayish-brown (10YR 4/2) silt loam; strong coarse granular structure; friable, slightly plastic; high in organic matter; filled with roots; neutral or slightly acid; 3 to 5 inches thick.
- A_2 3 to 9 inches, light brownish-gray (10YR 6/2) to pale-brown (10YR 6/3) silt loam; moderate medium crumb structure; friable, slightly plastic; well supplied with roots; good water-holding capacity; neutral to medium acid; 4 to 8 inches thick.
- B_{21} 9 to 16 inches, dark-brown (7.5YR 4/2) heavy silt loam; strong medium blocky structure; firm and plastic; easily penetrated by roots; good capacity to hold and supply water to plants; neutral; 6 to 10 inches thick.
- B_{22} 16 to 28 inches, dark reddish-brown (5YR 3/3) silty clay loam; strong fine to medium blocky structure; firm, plastic; easily penetrated by roots; excellent water-holding capacity; neutral; 10 to 16 inches thick.
- C 28 inches +, brown (7.5YR 5/4) silty clay loam; strong medium blocky structure; aggregates very firm and plastic; has good root penetration; good capacity to store water and supply it to plants; highly calcareous; lime has segregated in nodules and concretions.

Cazenovia silt loam, 3 to 10 percent slopes (Cn).—This well-drained soil has high water-holding capacity and good native fertility. It is more erodible than coarser textured soils on similar slopes and needs more intensive management to control runoff. When the organic-matter content is low, the soil puddles and bakes easily.

This soil is well suited to most crops grown in the area. If used intensively for vegetable crops, it responds less to high rates of fertilization than the coarser textured soils of the Honeoye series. Cazenovia silt loam, 3 to 10 percent slopes, is a very good soil for alfalfa and most of the other hay and pasture crops. Rotation group 4, table 10, lists some suitable rotations and the management needed with them to maintain organic matter and control runoff. The soil has low lime requirements, medium phosphorus requirements, and low potassium requirements.

Cazenovia silt loam, 10 to 20 percent slopes (Co).—Control of runoff and erosion is more difficult on this moderately steep soil than it is on the more gently sloping Cazenovia soil. Some small areas are eroded enough that the silty clay subsoil is mixed into the plow layer. These areas are shown by erosion symbols on the soil map. In such areas intertilled crops should be omitted from rotations. Sod crops should be used to restore organic matter and good structure.

This soil is suited to hay and pasture crops. It responds less to intensive management for vegetables than do the more easily conserved soils on gentler slopes. Rotation group 9, table 10, gives some suitable rotations for this soil. When the soil is used for these rotations, its requirements are low for lime, medium for phosphorus, and low for potassium.

Chagrin Series

These are some of the best soils in the area. They are well drained and medium textured. Those that consist of recent alluvium along streams are subject to overflow. Those on young alluvial fans are normally above flood stages. Both are young soils in which the principal change from the original alluvium is the accumulation of organic matter in the upper 5 to 8 inches. The upper 2½ feet of these soils is acid, but the material below is neutral.

Typical profile of Chagrin silt loam under forest:

- A_1 0 to 6 inches, dark-brown (10YR 4/3) to very dark grayish-brown (10YR 3/2) silt loam; moderate medium crumb structure; friable when moist, slightly plastic when wet; high in organic matter; medium acid; 5 to 10 inches thick.
- C_1 6 to 30 inches, light yellowish-brown (10YR 6/4) silt loam; weak medium blocky structure; friable when moist, nonsticky and nonplastic when wet; easily penetrated by roots; excellent ability to hold water and supply it to plants; lower part of layer varies somewhat in texture; medium acid; 18 to 30 inches thick.
- C_2 30 inches +, pale-brown (10YR 6/3) to light yellowish-brown (10YR 6/4) alluvium ranging in texture from gravelly loam to silt loam; firm in place, but friable when moist and broken out; nonsticky and nonplastic when wet; easily penetrated by roots, which may reach to the permanent water table at 5 to 10 feet; neutral.

Chagrin silt loam, 0 to 2 percent slopes (Cp).—This nearly level soil has excellent physical condition. With only moderate fertilization it is highly productive of most crops grown in the area. It is well suited to alfalfa. Small grains are probably the least well suited crops on this soil. Suitable rotations are given in rotation group 1, table 10. The soil has medium lime requirements, medium phosphorus requirements, and low potassium requirements. More fertilizer is required for high yields of intensive cash crops.

Special practices to control runoff are not necessary. The soil is flooded nearly every year, but it usually dries early enough for spring planting. In some places streambank erosion must be controlled. A plant cover is needed on the ground to guard against scouring by spring floods.

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Chagrin silt loam, alluvial fan, 2 to 8 percent slopes (Cr).—This soil is on small alluvial fans where small tributary streams enter the larger valleys. These alluvial fan areas have distinct slopes, in contrast to the nearly level slopes of the Chagrin soils on the first bottoms. The soil lies above the level of most floods that go through the main valleys, but sheet flooding from nearby uplands accompanies heavy rains. The soil profile is darker gray than the profile of Chagrin silt loam on first bottoms. It contains small fragments of shale. The shale and stones are not on the surface, but the deep substratum may consist almost entirely of shale fragments.

In some places it will be necessary to deepen or straighten stream channels that cut through these alluvial fans. Straightening the channel will prevent erosion of the banks. This soil is suited to the rotations of rotation group 1, table 10, but where slopes are more than 600 feet in length, some method of diverting water is needed for rotations that grow row crops for 2 or more years in succession. Intertilled crops can be grown on this soil in very intensive rotations if they are heavily manured. The soil has medium lime and phosphorus requirements and low potassium requirements.

Chagrin shaly silt loam, alluvial fan, 2 to 8 percent slopes (Cs).—This soil has a large quantity of shale fragments on the surface and throughout the profile. It has fair to good water-holding capacity but is generally more droughty than the silt loam.

This is a good soil, suited to most crops grown in the county. On many farms it is the best cropland available, and intertilled crops should be concentrated on it. Rotation group 1, table 10, suggests rotations and other practices for this soil. Management requirements for maintenance are similar to those described for Chagrin silt loam, alluvial fan, 2 to 8 percent slopes.

Chenango Series

These are strongly acid well-drained soils on glacial outwash terraces in southern Ontario and Yates Counties. They occur well above the overflow level of streams. A few areas of these soils are on kames in the same general locality. The parent material comes almost entirely from acid sandstone and shale. The Chenango series is the well-drained member of the catena that includes the moderately well drained Braceville soil, the poorly drained Red Hook soil, and the very poorly drained Atherton soil.

The Chenango soils are strongly acid. They are low in natural fertility, but they have good physical properties, and they respond very well to good management. Plant roots are able to penetrate deeply and to obtain water and plant nutrients from a large volume of soil. The substratum has low water-holding capacity.

Typical profile of Chenango gravelly loam under forest:

- A_0 Thin layer of litter overlying a 1-inch to 2-inch mat of finely divided black (10YR 2/1) organic matter; contains many fine roots; strongly acid.
- A_1 0 to 2 inches, very dark grayish-brown (10YR 3/2) loam; moderate fine crumb structure; very friable, nonsticky and nonplastic; contains many small and medium-sized roots; high in organic matter; specks of white sand suggest that organic matter masks a thin A_2 horizon; layer is 1 to 3 inches thick.
- B_{21} 2 to 11 inches, yellowish-brown (10YR 5/6) gravelly loam; weak fine crumb structure; very friable, nonplastic; full of small and medium-sized roots; good water-holding capacity; strongly acid (pH 5.0 to 5.5); 6 to 12 inches thick.
- B_{22} 11 to 21 inches, brown (10YR 5/3) to yellowish-brown (10YR 5/4) gravelly loam; weak medium crumb structure; easily penetrated by roots; has fair water-holding capacity and will release most of the water to plant roots; strongly acid; 8 to 16 inches thick.
- B_3 21 to 32 inches, light yellowish-brown (10YR 6/4) gravelly sandy loam; very weak fine crumb structure; very friable; contains roots; low water-holding capacity; medium acid; 10 to 20 inches thick.
- C 32 inches +, grayish-brown (10YR 5/2) stratified beds of sand and gravel derived principally from shale and sandstone; low water-holding capacity; medium acid.

Chenango gravelly loam, 0 to 5 percent slopes (Cu).—This deep well-drained soil is well suited to intensive cultivation for most crops grown in the county. On many farms it is the best cropland available, and intertilled crops may be concentrated on it. The principal management problem is maintaining fertility.

Suitable rotations are suggested in rotation group 1, table 10. For these rotations, the soil has high lime and potassium requirements and medium phosphorus requirements. More intensive fertilization brings a good response from many of the high-value crops.

Chenango gravelly loam, 5 to 15 percent slopes (Cv).—This well-drained strongly acid soil is somewhat droughty. It usually occurs on small knolls that have irregular moderate slopes, but sometimes it is on the single short slopes of the terrace faces. The greater slope increases runoff, so that the soil is more droughty than Chenango gravelly loam on the nearly level terraces. In most places the topography is too complex for the use of contour tillage, but cultivation should be across the slope if possible.

This soil can be used for most crops grown in the county. Rotations and supporting practices suitable for maintaining organic matter and controlling runoff are given in rotation group 3, table 10. For the rotations listed, the soil has high lime and potassium requirements and medium phosphorus requirements. This soil responds less to management than the nearly level Chenango soils.

Chenango soils, 15 to 25 percent slopes (Cw).—These are well to excessively drained, droughty, gravelly soils on rounded hills. Much water runs off these slopes. The upper 24 to 30 inches has fair water-holding capacity, but the underlying strata hold little water. Fertility is low. The moderately steep and complex slopes make use of machinery difficult, and contour tillage is almost impossible.

Rotations used on this soil must control runoff and maintain organic matter. Suitable rotations are listed in rotation group 6, table 10. Not more than 1 year of intertilled crop should be used in each rotation. The soil has high lime and potassium requirements and medium requirements for phosphorus.

On most farms the soil is best suited to long stands of sod crops for hay or pasture. Birdsfoot trefoil and alfalfa are the best suited legumes.

Chenango soils, 25 to 45 percent slopes (Cx).—Steep, complex slopes and droughtiness make this mapping unit poor for any use except pasture or forestry. Much of it has been severely eroded. In uneroded areas the soil material is thinner over the gravel than is normal for the

Chenango soils on gentle slopes, but the kind, the order, and the distinctness of the separate layers are similar.

Most of this unit is now used for pastures that contain poor stands of unpalatable grasses. The management described in rotation group 12, table 10, is appropriate. If continuous sod is used, high rates of liming, medium rates of phosphorus fertilization, and high rates of potassium fertilization are needed. These materials are very difficult to apply on such steep slopes. Because of droughtiness, yields of pasture are low even when fertility is improved. The unit is probably better used for forestry.

Chenango and Tioga gravelly silt loams, alluvial fan, 2 to 5 percent slopes (Ct).—This complex of soils occurs on gently sloping alluvial fans where small tributary streams enter the larger valleys in the southern part of the area. On the older, higher lying fans the soil profile is like that of the Chenango series. On the younger, lower lying fans, which are flooded occasionally, the soils consist of alluvial sediments and there has been little soil development other than accumulation of organic matter in the surface layers. The gravel in both of these kinds of soil is mainly flat, angular sandstone fragments from the adjoining uplands.

This complex is good cropland, sometimes the best on the farm. It can be used intensively for intertilled crops if heavily manured. Suitable rotations are given in rotation group 1, table 10. For these rotations the soils have high lime requirements and medium requirements for phosphorus and potassium. Response of intensively grown cash crops to additional fertilizer is normally high. Runoff must be controlled, and organic matter must be maintained. Streambank erosion needs to be controlled along the small streams that flow across these areas from the uplands.

Chippewa Series

These are very poorly drained strongly acid soils. They have developed on firm glacial till derived from acid sandstone and shale. They are the very poorly drained soils of the catena that includes the well-drained Bath soils, the moderately well drained Mardin soils, the imperfectly drained Fremont soils, and the poorly drained Volusia soils.

The Chippewa soils are permanently wet in their natural state. The dull gray color and strong mottling of the subsoil indicate prolonged waterlogging. Some of the areas are wet, because they receive seepage from higher lying land. Others occupy definite depressions.

A typical profile of Chippewa silt loam under forest follows:

- A_0 2 or 3 inches of black (10YR 2/1) well-decomposed organic matter; granular structure; very strongly acid.
- A_{1g} 0 to 5 inches, very dark gray (10YR 3/1) silt loam; weak medium granular structure; firm, plastic; strongly acid; 4 to 8 inches thick.
- G 5 to 20 inches, gray (2.5Y 6/0) heavy silt loam strongly mottled with yellowish brown (10YR 5/4); breaks out into coarse blocky aggregates; firm, plastic; contains only a few roots in upper part of layer; medium acid; 12 to 36 inches thick.
- CG 20 inches +, light olive-gray (5Y 6/2) heavy silt loam to silty clay loam mottled with brown; weak coarse blocky structure; very firm when moist, plastic when wet; contains very few roots; medium to slightly acid; permanent water table usually lies above this layer.

Chippewa silt loam, 0 to 1 percent slopes (Cy).—This very poorly drained soil is unsuited to crops unless it is drained. Pastures furnish very little grazing. The use made of the small areas of this soil is usually determined by the use of the surrounding better drained soils.

If the soil can be at least partly drained, it will support fair pastures if limed and fertilized with phosphorus and potassium. It is difficult and expensive to drain the soil properly, because both seepage and surface drainage contribute to the wetness. The soil is sometimes drained to allow efficient use of the rest of the field.

This soil could be used for any of the rotations described in rotation group 1, table 10, but only the last two are convenient or economical. The soil has high lime requirements and medium requirements for phosphorus and potassium.

Chippewa silt loam, 3 to 8 percent slopes (Cz).—This soil is on slopes that receive seepage water. This water commonly comes from deep-seated permeable strata in the till that cannot be tapped easily by surface ditches. Locating the water-bearing layer and tapping it with tile before it reaches the seepage spot has been successful in some places.

Most areas of this soil are small. In pastures these spots are ignored. In cultivated areas of better soils, they interfere with tillage unless drained. Where the drainage can be improved to the equivalent of that of a poorly drained soil, the soil can be used in all but the first two rotations of rotation group 4, table 10. The requirements of this soil for lime are high and for phosphorus and potassium fertilizers are medium. The soil responds little to management.

Collamer Series

These imperfectly drained soils have developed in silts, very fine sands, and clays laid down in glacial lakes. They are free of gravel and stones. They are associated with the well-drained Dunkirk soils, the poorly drained Canandaigua soil, and the very poorly drained Colwood soil.

The mottling and rust-brown staining in the subsoil indicate that it is saturated for moderate periods during the year. The soil has not been strongly leached. It is moderately high in organic matter. Roots penetrate the upper part of the profile easily. In the lower subsoil and substratum they appear to grow mainly along the cracks between the structural aggregates.

Profile of Collamer silt loam under forest:

- A_1 0 to 4 inches, dark grayish-brown (10YR 4/2) silt loam; fine crumb structure; friable; high in organic matter and full of fine roots; medium acid; 3 to 5 inches thick.
- A_{21} 4 to 8 inches, light olive-brown (2.5Y 5/4) silt loam; fine crumb structure; friable; slightly plastic; contains considerable organic matter and many small and medium-sized roots; medium acid; 2 to 6 inches thick.
- A_{22} 8 to 11 inches, light-gray (2.5Y 7/2) silt loam mottled with strong brown (7.5YR 5/8); weak thin platy structure; friable when moist, slightly plastic when wet; allows fair root penetration; medium acid; 3 to 5 inches thick.
- B_{21} 11 to 16 inches thick, brown to dark-brown (7.5YR 4/4) heavy silt loam with medium-contrast mottling of strong brown (7.5YR 5/6); moderate fine blocky structure; firm, moderately plastic; has good capacity to hold moisture and supply it to plants; restricts roots slightly; slightly acid; 4 to 8 inches thick.

B_{22} 16 to 32 inches, brown to dark-brown (7.5YR 4/4) heavy silt loam with low-contrast mottling of light brown (7.5YR 6/4); moderate medium blocky structure; firm, sticky, and plastic; dense in place but breaks out easily; penetrated by roots mainly along cracks between structural aggregates; high water-holding capacity; slightly acid or neutral; 12 to 36 inches thick.

C 32 inches +, grayish-brown (10YR 5/2) laminated silt and very fine sand with an occasional layer of clay; firm when moist, plastic when wet; penetrated by roots along cracks between structural aggregates; excellent water-holding capacity; calcareous, contains lime in streaks and nodules.

Collamer silt loam, 0 to 6 percent slopes (CA).—Use of this moderately fertile soil is somewhat restricted by periodic waterlogging of the subsoil. The soil erodes very easily, even on gentle slopes, because the soil material is silty and it contains no stones or gravel.

This is a productive soil for many crops, including corn for grain or silage, wheat, oats, hay, field beans, sweet corn, and vegetables. The rotations of group 4, table 10, are suited to this soil. Crops that can stand occasional saturation of the soil below depths of 12 inches should be chosen. Ladino clover is especially well suited as the legume in pasture mixtures, but alfalfa is not well suited. The organic-matter content must be maintained, because the soil crusts and bakes badly where the organic matter level is low. For the recommended rotations, the soil has a low lime requirement, but medium requirements for phosphorus and potassium.

Collamer silt loam, 6 to 12 percent slopes (CB).—This sloping soil erodes very easily. It cannot be used so intensively as the more gently sloping soil, but it is fair for crops. It is a very good soil for pastures. It is suited to the rotations of rotation group 7, table 10. In support of these rotations, the lime requirement is low, and the requirements for phosphorus and potassium are medium.

Some eroded areas of this soil are shown on the soil map by symbols. These areas need long periods under sod crops, which will restore organic matter and improve the structure of the soil.

Colwood Series

The soil representing this very poorly drained series has developed in lacustrine silts and very fine sands. It belongs to the catena that includes the well-drained Dunkirk soils, the imperfectly drained Collamer soils, and the poorly drained Canandaigua soil. It is permanently wet but can be drained by tile.

Typical profile of Colwood silt loam under forest:

A_1 0 to 7 inches, very dark brown (10YR 2/2) smooth silt loam; layer is a mixture of silt and organic matter and approaches a muck in places; coarse granular structure; friable, slightly plastic; high in organic matter; thoroughly matted with fine roots; neutral; 6 to 9 inches thick.

G_1 7 to 14 inches, light brownish-gray (2.5Y 6/2) silt loam, mottled weakly with yellowish brown (10YR 5/6); weak coarse blocky structure; firm when moist, nonplastic when wet; contains only a few roots; neutral; 5 to 10 inches thick.

G_2 14 to 30 inches, mottled pale-olive (5Y 6/3) and yellowish-brown (10YR 5/4) light silt loam; weak coarse blocky structure; friable, nonplastic; contains few roots; layer is usually below the permanent water table; neutral to weakly calcareous; 12 to 24 inches thick.

CG 30 inches +, pale-olive (5Y 6/3) thinly layered silts and very fine sands, mottled with yellowish brown (10YR 5/6 to 5/4); strongly calcareous.

Colwood silt loam, 0 to 1 percent slopes (CC).—Undrained areas of this soil are too wet for agriculture. Partly drained areas furnish fair grazing. Where good drainage can be brought about by tiling or open ditches, the soil is suited to the rotations described in rotation group 1, table 10. Corn, hay, pasture, and many vegetable crops can be grown. For these rotations, the soil has a low lime requirement and medium requirements for phosphorus and potassium. Larger amounts of fertilizer are needed for good yields of vegetable crops. In many low-lying areas good drainage cannot be obtained because outlets for the water are lacking.

Darien Series

These are imperfectly drained medium-lime soils derived from firm glacial till high in shale. Dull colors and strong mottling of the subsoil reflect slow internal drainage and waterlogging part of the time. The profile of the soil is acid, but the underlying material is highly calcareous.

Both the parent material and the soil are moderately fine textured. The fine textured soil swells when wet and closes the passageways among the structural aggregates. This restricts the downward movement of water.

The upper part of the profile is well aerated, and roots grow freely in it. Roots penetrate the subsoil mainly along the cleavage planes between structural aggregates. The soil is poorly suited to deep-rooted crops such as alfalfa, but most shallow-rooted crops do moderately well. The response to fertilizer is less than on many medium-textured soils.

Typical profile of Darien silt loam under forest:

A_1 0 to 4 inches, dark-brown (7.5YR 4/2) to dark grayish-brown (10YR 4/2) silt loam; moderate medium crumb structure; friable, slightly plastic; high in organic matter; contains many fine roots; medium acid; 3 to 5 inches thick.

A_2 4 to 10 inches, pale-brown (10YR 6/3) silt loam; moderate medium crumb or weak blocky structure; friable, moderately plastic; contains many fine and medium-sized roots; good water-holding capacity; medium acid; 5 to 10 inches thick.

B_{21} 10 to 17 inches thick, brown (10YR 5/3) heavy silt loam, mottled with yellowish brown (10YR 5/8); moderate coarse blocky structure; firm, plastic; easily penetrated by roots; good water-holding capacity; slightly acid; 6 to 12 inches thick.

B_{22} 17 to 27 inches, grayish-brown (2.5Y 5/2) silty clay loam with high-contrast mottling of olive brown (2.5Y 4/4) and yellowish-brown (10YR 5/8); moderate medium blocky structure; firm, very plastic; root penetration is mainly along cracks of aggregates; has high water-holding capacity but holds the water tightly; neutral; 8 to 16 inches thick.

C 27 inches +, dark grayish-brown (2.5Y 4/2) to olive (5Y 4/3) silty clay loam; coarse irregular blocky structure; firm to very firm, very plastic; little penetration by roots; contains partly weathered shale fragments; calcareous; overlies soft gray calcareous shale at 4 to 10 feet.

Darien silt loam, 0 to 3 percent slopes (Da).—The restricted internal drainage of this soil is difficult to improve. It is very important to maintain organic matter and the structure of this silty soil. Rotations that use only 1 year of intertilled crop to at least 2 years

of sod crops are best. The soil does not erode easily, because it has gentle slopes.

In rotation group 2, table 10, are suitable rotations and other practices to maintain organic matter and control runoff. Under these rotations, the soil has medium lime and phosphorus requirements and a low potassium requirement. Good management for intertilled crops such as vegetables brings only a poor response from this soil.

Darien silt loam, 3 to 8 percent slopes (Db).—The silty texture of this soil makes it difficult to maintain soil structure when the organic-matter content is lowered. The soil responds poorly to good management because of its imperfect drainage. It is more erodible than coarser textured soils on similar slopes.

Suitable rotations and supporting practices to maintain organic matter and control runoff are given in rotation group 4, table 10. Corn for grain or silage, small grains, sod crops for hay or pasture, and some vegetables are suited to this soil. Its limited response to good management makes it a poor soil for intensive vegetable production. Under these rotations the soil has medium lime and phosphorus requirements and a low potassium requirement.

Darien silt loam, 8 to 15 percent slopes (Dc).—This silty imperfectly drained sloping soil has moderate fertility. Restricted drainage and silty texture limit the response to management. Slope and slow permeability allow rapid runoff and serious erosion. Maintaining good structure is important.

This soil is suited to the rotations and management practices described in rotation group 7, table 10. With these rotations, it has medium lime and phosphorus requirements and low potassium requirements. The soil is not suited to intensive cash cropping because it responds so poorly to management. It is suited to corn for grain or silage, small grains, and sod crops for hay and pasture. A high proportion of sod crops in the rotation and liberal use of manure are important in maintaining soil structure and organic matter. This is a poor soil for alfalfa, but Ladino clover, red clover, and birdsfoot trefoil are well suited.

Darien silt loam, eroded, 8 to 15 percent slopes (Dd).—Slow permeability and sloping surface combine to cause rapid runoff and serious erosion on this soil. It has lost most of its original surface layer, and the clayey subsoil is plowed up in many places. The organic-matter content is low, and good structure is difficult to maintain. Imperfect drainage limits the response to management.

This soil is suited to the rotations and supporting practices described in rotation group 9, table 10. Corn for grain or silage, small grains, sod crops for hay or pasture, and certain vegetables are suited to this soil. Ladino clover, red clover, and birdsfoot trefoil are well suited, but alfalfa is not. This soil has medium lime and phosphorus requirements and a low potassium requirement. In addition, because of the low organic-matter content, it has a special requirement for nitrogen.

Dunkirk Series

These are well-drained medium-lime soils derived from lake-laid silts and very fine sands. The entire soil is silt or very fine sand and almost free of stones. The soil is medium acid, but the substratum is weakly calcareous.

The Dunkirk series is the well-drained member of the catena that includes the imperfectly drained Collamer soils, the poorly drained Canandaigua soil, and the very poorly drained Colwood soil. It is the silty equivalent of the sandy Arkport soils.

Typical profile of Dunkirk silt loam under forest:

- A_1 0 to 4 inches, dark grayish-brown (10YR 4/2) silt loam; moderate medium crumb structure; friable, slightly plastic; contains many fine roots; slightly acid; 3 to 5 inches thick.
- A_2 4 to 9 inches, pale-brown (10YR 6/3) silt loam; moderate fine to medium crumb structure; friable, slightly plastic; excellent water-holding capacity; medium acid; 5 to 7 inches thick.
- B_{21} 9 to 15 inches, brown to dark-brown (10YR 4/3) heavy silt loam; moderate medium blocky structure; firm, slightly plastic; easily penetrated by roots; good capacity to hold water and supply it to roots; medium acid; 5 to 10 inches thick.
- B_{22} 15 to 24 inches, dark-brown (10YR 4/4) heavy silt loam or silty clay loam; moderate medium blocky structure; firm, plastic when wet; roots penetrate easily but mainly along the faces of structural aggregates; good water-holding capacity; medium to slightly acid; 8 to 14 inches thick.
- B_3 24 to 36 inches, brown to dark-brown (10YR 4/3 to 7.5YR 4/4) silt loam; moderate coarse blocky structure; firm, slightly plastic; roots penetrate easily between structural aggregates; excellent capacity for holding water and supplying it to plants; neutral (pH 6.5 to 7.0); 10 to 20 inches thick.
- C 36 inches +, pale-brown (10YR 6/3) to pinkish-gray (7.5YR 6/2) silt loam or very fine sand; material varies and in many places is laminated silt and very fine sand or fine sand; coarse platy to coarse blocky structure; easily penetrated by roots; good water-holding capacity; mildly calcareous.

Dunkirk fine sandy loam, 0 to 6 percent slopes (De).—This soil has a fine sandy loam surface layer, and it may have a loam subsoil. Layers of silt, fine sand, and very fine sand are common, and textures vary considerably with depth. In kind and arrangement of soil layers, the soil is similar to Dunkirk silt loam.

This soil is only moderately fertile but is highly responsive to fertilizer and other good management practices. It is easy to cultivate and can be worked at a fairly wide range of moisture content. It is permeable to water, but even the gentle slopes erode seriously during heavy rains.

This is an excellent soil for intertilled crops if practices to maintain organic matter and to control erosion are followed. It is well suited to corn for grain or silage, small grains, hay, pasture, and vegetables. Alfalfa is probably the best legume for stands left 2 years or more. The rotations and supporting practices of rotation group 4, table 10, are good on this soil. It has medium lime and phosphorus requirements and a high potassium requirement when used for these rotations. The soil is highly responsive to larger amounts of fertilizer applied for vegetables.

Dunkirk fine sandy loam, 6 to 12 percent slopes (Df).—The fine sandy loam surface layer of this soil overlies a loam or silt loam subsoil. It is well-drained, has excellent structure, and responds very well to good management, but it is highly erodible. The small areas shown on the soil map by erosion symbols have lost part or all of the original plow layer. These areas have a lower organic-matter content and poorer structure than the

uneroded soil. This soil is medium acid, but the parent material below 30 to 40 inches is calcareous.

In spite of the erosion problem, this is a good soil for crops. It needs more sod crops and less intertilled crops in the rotation than do the less strongly sloping Dunkirk soils. Rotation group 7, table 10, gives suitable rotations and supporting practices that will maintain organic matter and control runoff. Maintaining the supply of organic matter is especially important on this soil. The soil has medium lime and phosphorus requirements and a high potassium requirement. Alfalfa and other legumes, corn for grain or silage, small grains, small fruits, and vegetables are all good crops for this soil.

Dunkirk silt loam, 0 to 6 percent slopes (Dg).—This is one of the best soils in the area for crops such as corn for grain or silage, small grains, hay, pasture, and vegetables. It is well drained, has good water-holding capacity, and responds well to good management. It is moderately erodible even on gentle slopes.

Suitable rotations and supporting practices to maintain organic matter and control runoff are given in rotation group 4, table 10. It is important to maintain the organic-matter content, because when it is low, the surface soil develops poor physical condition. Medium amounts of lime, phosphorus, and potassium will maintain fertility under the rotations suggested.

Dunkirk silt loam, 6 to 12 percent slopes (Dh).—This deep well-drained soil supplies abundant moisture for crops and permits deep rooting. Fertility is moderate. The soil responds very well to fertilizer and other good management practices. However, the soil erodes very easily. Parts of it have already lost 4 to 8 inches of soil material. These places are low in organic matter and have poor tilth. They need special management to build up the organic matter and to restore good structure to the surface soil.

The rotations and management practices suggested in rotation group 7, table 10, are suited to this soil. It is used for the same crops as the more gently sloping Dunkirk silt loam just described, but it must be managed even more carefully to control erosion. Medium applications of lime, phosphorus, and potassium fertilizer are required for the rotations suggested. This soil responds well if large amounts of fertilizer are applied on intensively grown cash crops.

Dunkirk silt loam, eroded, 12 to 20 percent slopes (Dk).—This moderately steep soil is highly erodible. The slopes allow rapid runoff, and the material is of uniform silty texture and washes away rapidly. Most of the soil has already lost between 6 and 10 inches of soil material, and the plow layer is now in the original subsoil. Organic matter is low and soil structure is poor.

Although the soil is well drained and responds at least moderately well to good management, its erodibility drastically restricts the uses to which it is suited. Where the slopes are too uneven for contour stripcropping and diversion terraces, intertilled crops should not be planted. The rotations given in rotation group 9, table 10, are suitable for this soil where the other management practices can be applied. The soil has medium requirements for lime, phosphorus, and potassium. It also has a critical need for nitrogen fertilizer.

Dunkirk silt loam, eroded, 20 to 45 percent slopes (Dl).—Slopes of this well-drained silty soil are so steep that the use of most kinds of farm machinery is difficult or impossible. All except a few small areas in woods have lost the topmost 6 to 12 inches of the original Dunkirk profile. The present surface layer is in the original subsoil. Organic matter is low and soil structure is poor.

The uses listed in rotation group 11, table 10, are those best suited to this soil. Maintaining organic matter and fertility and preventing further erosion are the main problems. Permanent pastures provide fair grazing in spring but produce little in the midsummer, even where they have been limed and fertilized. Where the use of machinery is possible, plowing at long intervals and reseeding to desirable grasses and legumes will result in better yields and better conservation of soil. Birdsfoot trefoil may be a suitable plant for long-term pasture on this soil.

Edwards Series

Edwards muck is a well-humified organic soil. It is shallow over marl. The marl ranges from a few inches to several feet in thickness. Beneath the marl may be calcareous sands or lacustrine silty clay. Most of the organic material came from deciduous trees.

Typical profile of Edwards muck under forest:

1. 0 to 12 inches, black (10YR 2/1) well-humified organic matter; coarse crumb structure; greasy consistence; neutral; 9 to 15 inches thick.
2. 12 to 22 inches, very dark brown (10YR 2/2) humified organic matter; greasy; neutral to alkaline; 0 to 28 inches thick.
3. 22 inches +, white (10YR 8/1) chalky marl containing very many small shells; may extend for several feet or be underlain at 30 inches or below by light-gray (10YR 7/2) compact sand or silt.

Edwards muck, 0 to 1 percent slopes (Ea).—Some drainage is necessary before this soil can be used for agriculture. Pasture is a suitable use where the soil is partly drained, but trampling cattle may punch holes in the sod.

In many areas the muck is so shallow over the marl that the cost of drainage cannot be justified. Crops on these areas of shallow muck are subject to various nutritional disorders, especially where the marl is turned up in plowing. These disorders vary according to the impurities in the drainage water that flows into these areas, and the problems of each area must be considered individually.

Where the muck is fairly deep and can be fully drained, it is suitable for intensive production of potatoes, celery, onions, cabbage, and other vegetables. The crops and management suggested in rotation group 1, table 10, are suited to this soil when it has been drained. Normally it is used continuously for intertilled crops. The soil has a low lime requirement, a medium phosphorus requirement, and a high potassium requirement. High rates of fertilization, especially for potassium, are needed for good yields.

Eel Series

These moderately well drained soils were derived from neutral or weakly calcareous recent alluvium on the first bottom lands along streams. The sediments are from high-lime soils of the nearby uplands. The soils receive thin

deposits of fresh alluvium each year when they are flooded by the streams.

This series is the moderately well drained member of the catena that includes the well-drained Genesee soils, the poorly drained Wayland soils, and the very poorly drained Sloan soil. There has been little soil development other than accumulation of organic matter in the topmost 6 to 8 inches. Little weathering of the parent material has occurred. The material under the surface soil may be slightly browner than that in the substratum.

Typical profile of Eel silt loam under forest:

A_1 0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; moderate medium crumb structure; friable; high in organic matter and filled with fine roots; neutral to slightly acid; 6 to 10 inches thick.

C_1 8 to 18 inches, grayish-brown (10 YR 5/2) silt loam; weak medium crumb structure; friable; easily penetrated by roots; neutral to slightly acid; 10 to 18 inches thick.

C_{g1} 18 to 30 inches, mottled grayish-brown and pale-brown (10YR 5/2 and 6/3) silt loam; weak medium blocky structure; slightly firm when moist; contains less roots than layer above; neutral; 12 to 24 inches thick.

C_{g2} 30 inches +, strongly mottled light brownish-gray (10YR 6/2) and brown (10YR 5/3) heavy silt loam to silt loam; weak coarse blocky structure; firm to moderately dense in place; structural aggregates are firm when moist and plastic when wet; substratum varies from silty clay to fine sand; layers of gravel in places.

Eel silt loam, 0 to 2 percent slopes (Eb).—This moderately well drained, stone-free soil is good cropland. It is one of the most fertile soils in the county. It is normally flooded each spring, but the water recedes early enough to allow planting most crops on time. Open drainage ditches promote early drying of the soil in some areas.

This soil is well suited to corn for grain or silage, sod crops for hay or pasture, and most of the intensively grown cash crops of the area. Spring grains may be affected by late planting. The soil is excellent for Ladino clover. It is less well suited to alfalfa than the associated Genesee soils, but alfalfa can be grown in mixtures with other legumes and grasses. All of the rotations of group 1, table 10, are suited to the soil. The requirement for lime is low, for phosphorus medium to low, and for potassium low. Intensively grown vegetable crops usually respond to high rates of fertilization.

Eel silty clay loam, 0 to 2 percent slopes (Ec).—This soil is finer in texture than the Eel silt loam just described. The topmost layer is heavy silt loam or light silty clay loam, and the substratum is silty clay or silty clay loam. Mottling occurs below depths of 16 to 24 inches. The soil is flooded in spring.

This soil is used for the same crops as the silt loam, but yields are generally lower. The soil dries more slowly in the spring and puddles more easily than the silt loam. It responds less to good management than the silt loam. Requirements for lime, phosphorus, and potassium are low. The rotations of group 1, table 10, are suitable.

Erie Series

These poorly drained soils developed in very firm neutral or weakly calcareous glacial till. The till came from shale, sandstone, and small amounts of limestone. The upper part of the soil resembles similar horizons in the Volusia soils. A light-colored strongly mottled friable horizon lies below the plow layer, and a very dense horizon is at depths of 15 to 28 inches. This dense horizon is very slowly permeable to water. The Erie series is the poorly drained member of the catena that includes the well-drained Valois soils, the moderately well drained Langford soils, and the very poorly drained Alden soil.

Typical profile of Erie gravelly silt loam under cultivation:

A_{1p} 0 to 8 inches, dark grayish-brown (10YR 4/2) gravelly silt loam; moderate medium crumb structure; friable; strongly acid where unlimed; 6 to 9 inches thick.

A_{21g} 8 to 10 inches, yellowish-brown (10YR 5/4 to 5/3) silt loam with few to many pale-brown mottles; weak medium and fine crumb structure; friable; horizon is commonly absent in plowed fields; strongly acid; 0 to 4 inches thick.

A_{22g} 10 to 15 inches, pale-brown (10YR 6/3) to very pale brown (10YR 7/3) coarse silt loam with many medium and coarse yellowish-brown mottles; very weak thin platy to weak fine and medium crumb structure; friable; strongly to medium acid; 3 to 7 inches thick.

B_{2gm} 15 to 28 inches, dark yellowish-brown (10YR 4/4) to olive-brown (2.5Y 4/4) silty clay loam to heavy silt loam, with more gravel or channers than layers above; vertical streaks ½ to 1 inch wide at the top divide horizon into very coarse prisms 8 to 24 inches across; streaks are light brownish-gray (10YR 6/2) coarse silt or very fine sandy loam similar to the horizon above; streaks have a natural breakage plane down the middle and have thin yellowish-brown borders; prisms break into weak medium subangular blocks that have light brownish-gray coatings; very firm, very hard, or extremely hard; strongly acid in the upper part, medium to slightly acid in the lower part; in places the entire layer only slightly acid; 10 to 24 inches thick.

B_{3gm} 28 to 45 inches, olive-brown (2.5Y 4/4) very gravelly or channery silt loam; very thin extensions of streaks from the horizon above divide this horizon into gray-coated prisms 18 to 36 inches across; prisms divide into weak to very weak medium blocks; thin light brownish-gray coats on blocks appear as a network of gray against the darker background; very firm, very hard; medium acid in the upper part decreasing to neutral with depth, or entire layer may be nearly neutral; 10 to 30 inches thick.

C 45 inches +, olive-brown (2.5Y 4/4) to light olive-brown (2.5Y 5/3) very gravelly or channery silt loam or loam; medium low-contrast mottles common in the upper part; weak to very weak medium blocky or very thick platy structure; firm, hard; neutral in reaction, and may be calcareous at top and generally is calcareous at less than 60 inches.

Erie gravelly silt loam, 0 to 3 percent slopes (Ed).—Poor drainage and low fertility restrict the suitability of this soil for crops and its response to management. Improvement of drainage is difficult because of the shallow depth to the very dense hardpan. Deep structures for drainage cannot be installed. Drainage-type diversion terraces may improve the soil for short distances down the slope from the terrace. Tile must be very narrowly spaced to be effective.

Suitable rotations and supporting practices to maintain organic matter and control runoff are given in rotation group 3, table 10. It is important to keep the soil in good tilth. Although the soil can be used for two consecutive years of intertilled crops if proper supporting practices are used, yields rarely justify such intensive use. Winter wheat usually yields better than spring grains, and sod crops are fairly well suited. The soil is unsuited to alfalfa but is a fair soil for Ladino clover or red clover. It needs medium lime, phosphorus, and potassium applications in support of these rotations. It rarely shows much response to larger amounts of fertilizers.

Erie gravelly silt loam, 3 to 8 percent slopes (Ee).—As on the other Erie soils, poor drainage is the greatest hindrance to production. The soil remains wet until late in spring, and rooting is seriously restricted. The soil may be very dry in midsummer. The dense subsoil makes artificial drainage difficult. Drainage-type diversion terraces are probably the most effective means of drainage.

The soil is suited to the rotations and supporting practices of rotation group 4, table 10, except that two successive intertilled crops are rarely justified. Corn for grain or silage, small grains, and sod crops are suited to the soil. Planting of spring grains is commonly delayed enough to reduce yields. In very wet years corn planting is also delayed.

Low response to good management limits use of this soil for intensively grown cash crops. Alfalfa is poorly suited to this wet soil, but Ladino clover, red clover, and birdsfoot trefoil can be used. To maintain fertility under the rotations suggested, the soil requires medium amounts of lime, phosphorus, and potassium. Response to additional fertilizer and lime is generally small.

The small areas of this soil that are eroded need additions of organic matter. Long rotations consisting mostly of sod crops or heavy applications of manure will restore organic matter.

Erie gravelly silt loam, 8 to 15 percent slopes (Ef).—This poorly drained sloping soil is kept wet for long periods by water from adjoining higher land. Runoff is rapid, and erosion is moderately serious.

The hardpan prevents downward movement of water and restricts root growth. Drainage-type diversion terraces are probably the most effective means of draining these soils. Other drainage practices are restricted in effective depth by the depth to the hardpan.

The soil can be used for the rotations and supporting practices listed in rotation group 7, table 10. Corn for grain or silage, small grains, and sod crops are best suited to this soil. The soil is not suited to alfalfa, but Ladino clover and birdsfoot trefoil can be used. Response to management is generally too small to justify use of intensively grown cash crops. The soil needs medium additions of lime, phosphorus, and potassium in support of these rotations. Most crops respond little to larger amounts of lime or fertilizer.

Small eroded areas included in this mapping unit are shown on the soil map by erosion symbols. These areas should be used mainly for sod crops and should be heavily manured until the organic matter has been restored. Even then, yields will not equal those of the uneroded soil, because less depth for rooting remains above the hardpan.

Farmington Series

These well-drained slightly acid medium-textured soils range from 12 to 36 inches deep over limestone bedrock. The soil material is a thin mantle of glacial till derived principally from limestone. Shallow depth to bedrock is the main factor limiting agricultural use.

Typical profile of Farmington loam under forest:

A_1 0 to 4 inches, dark-brown (10YR 4/3) mellow gritty loam; fine crumb structure; very friable, nonplastic; contains many fine roots; slightly acid; 3 to 5 inches thick.

A_2 4 to 8 inches, brown (10YR 5/3) loam; weak fine crumb structure; very friable; contains many fine roots; slightly acid; 3 to 6 inches thick.

B_{21} 8 to 11 inches, dark yellowish-brown (10YR 4/4) gritty silt loam; moderate fine blocky structure; friable; good moisture-holding capacity; well-supplied with roots; many chert fragments and pieces of limestone mixed through layer; slightly acid; 2 to 5 inches thick; this layer may lie directly on the limestone bedrock.

B_{22} 11 to 24 inches, dark-brown (7.5YR 4/4) heavy gravelly silt loam; well-defined medium to coarse blocky structure; firm when moist, slightly plastic when wet; easily penetrated by roots; good water-holding capacity; contains many chert and limestone fragments; this layer is lacking in some places; 0 to 24 inches thick.

D 24 inches +, limestone bedrock.

Farmington loam, 12 to 30 inches deep, 2 to 8 percent slopes (Fa).—Use of this shallow to moderately deep soil is limited principally by depth to bedrock, which varies greatly within short distances.

The soil is suited to the rotations of group 3, table 10. It has low requirements for lime and potassium and a medium requirement for phosphorus. Yields vary according to the supply of moisture above the bedrock. The deeper areas are suited to most crops grown in the county, and yields are moderate to high under good management. In the shallow areas, yields are apt to be very low, and response to management is too small to justify use of the soil for intensive cash crops.

The soil is useful for grazing mainly in spring and early summer. The yields given in table 12 are for a soil with 20 to 24 inches of soil above bedrock. Midsummer pastures produce little where the soil is more shallow than this.

Farmington loam, 0 to 12 inches deep, 2 to 15 percent slopes (Fb).—Some of this soil has a profile about 12 inches deep over bedrock, but much of it is shallower. In many places the bedrock is exposed as a flat-lying rock surface or as ledges.

The few areas that can be cultivated are very droughty. The soil is suited mainly to pasture or forestry. It provides some grazing in spring and early in summer, but produces little pasture in midsummer because moisture is lacking.

Fremont Series

These imperfectly drained soils have developed on broad high hilltops where water does not accumulate from higher land. The parent material of medium-textured glacial till was derived almost entirely from sandstone and shale. Most of the material is acid, but in some places the substratum is neutral.

The Fremont series is the imperfectly drained member of the catena that includes the well-drained Bath soils, the moderately well drained Mardin soils, the poorly drained Volusia soils, and the very poorly drained Chippewa soils. Internal drainage is very slow, but the upper 7 to 10 inches have at least some aeration, as is indicated by the yellowish-brown colors of the soil.

Typical profile of Fremont channery silt loam under forest:

A_0 Deciduous forest litter and about 3 inches of a black finely granular humus; matted with fine roots; very strongly acid.

A_1 0 to 2 inches, very dark gray (10YR 3/1) silt loam; moderate coarse crumb structure; friable, nonplastic; contains very many medium and fine roots; very strongly acid; 1 to 3 inches thick.

B_{21g} 2 to 9 inches, dark yellowish-brown (10YR 4/4) silt loam, generally with low-contrast mottles of yellowish-brown; weak medium crumb structure; friable; good moisture-storage capacity; most roots concentrated in this layer and layer above; very strongly acid (pH 5.0 to 5.5); 6 to 10 inches thick.

B_{22g} 9 to 14 inches, yellowish-brown (10YR 5/4) silt loam, strongly mottled with olive (5Y 5/6); weak coarse blocky structure; friable; contains a few roots in the upper part of the layer; strongly acid; 5 to 8 inches thick.

A'_{2g}[5] 14 to 19 inches, pale-olive (5Y 6/3) silt loam, strongly mottled with yellowish brown (10YR 5/8); moderate medium to coarse blocky structure; firm; roots penetrate only along cracks of structural aggregates; strongly to medium acid (pH 5.0 to 6.0); 4 to 6 inches thick.

B'_{2g} and B'_3 19 to 48 inches, light olive-brown (2.5Y 5/6) to olive (5Y 5/6) silt loam; moderate coarse blocky structure; hard, compact and dense in place; less firm below 32 inches; contains many sandstone channers and flags; penetrated very little by roots; medium acid (pH 5.5 to 6.0), and may be nearly neutral in some places; 18 to 36 inches thick.

C 48 inches +, olive-brown (2.5Y 4/4 to 5/4) unmottled channery loam containing from 30 to 60 percent coarse angular gray sandstone pieces; weak to moderate coarse platy structure; firm, but less hard than layer above; strongly to slightly acid in upper part, pH increases with depth, and may be calcareous below 6 feet.

Fremont channery silt loam, 0 to 3 percent slopes (Fc).—On this nearly level soil, restricted drainage and low fertility are the principal factors limiting agricultural use. The soil is suited to corn or silage, small grains, and sod crops. Potatoes are moderately successful in normal or dry years. The soil is fair for Ladino clover, red clover, or birdsfoot trefoil but is poorly suited to alfalfa.

Rotations and supporting practices that will maintain organic matter and control runoff on this soil are given in rotation group 2, table 10. Maintenance of fertility under these rotations requires high rates for liming and medium rates for applying phosphorus and potassium. If no legumes are grown, and if manure has not been applied, nitrogen fertilizer is also required. This soil usually responds poorly to higher rates of liming or fertilizing, but in a good year potatoes may respond to large amounts of complete fertilizer.

Fremont channery silt loam, 3 to 8 percent slopes (Fd).—The use of this gently sloping soil is limited by the restricted drainage, by low fertility, and by moderate erosion hazard when intertilled crops are grown frequently. Suitable crops are corn for silage, small grains, and sod crops. Ladino clover, birdsfoot trefoil, and red clover are the best suited legumes. Potatoes grow successfully in the drier years.

Rotation group 4, table 10, lists some rotations and other management practices that would maintain the organic matter and control runoff on this soil. These rotations will need high rates of liming and medium rates of phosphorus and potassium fertilization. Hay and pasture crops seldom respond to heavier fertilization, but potatoes may respond to increased fertilization in dry years. Diversion terraces will help improve the drainage below each terrace and permit earlier planting of small grains.

[5] See footnote 4, page 31.

Fremont channery silt loam, 8 to 15 percent slopes (Fe).—This sloping imperfectly drained soil has major problems of restricted drainage, low fertility, and erosion danger. Not more than 1 year of intertilled crop should be used in a rotation, and 2 or more years of sod crops are advisable. Rotation group 7, table 10, gives crops and supporting practices that are suited to the soil. This management should include high rates of liming and medium rates of phosphorus and potassium fertilization. Nitrogen must be added to meadows where legumes have failed.

Fresh Water Marsh, 0 to 1 Percent Slopes (Ff)

This land type consists of areas along the margins of lakes. The areas are permanently saturated to the surface. These areas cannot be drained because their water level is determined by the level of the lakes. Cattails, rushes, and coarse grass grow on this land type. Some elm, soft maple, and willow trees grow near the landward edges. There is no agricultural use for these areas.

Fulton Series

This imperfectly to poorly drained series has developed in calcareous, gray, lake-laid silts and clays. It occurs in local depressions where temporary glacial lakes existed during the recession of the ice.

The Fulton series is the imperfectly to poorly drained member of the catena that includes the well-drained Lucas soils and the very poorly drained Toledo soil. The Lucas series is not mapped in Ontario and Yates Counties. The imperfect to poor drainage of the Fulton series is reflected in the mottling, which occurs from the plow layer downward.

The amount of clay in the soil increases with depth. The surface layers are slightly acid or neutral, the subsoil is neutral, and the substratum is calcareous. Few plant roots penetrate below a depth of 18 inches.

Typical profile of Fulton silt loam under forest:

A_1 0 to 4 inches, very dark grayish brown (10YR 3/2) silt loam; weak medium crumb structure; friable when moist, slightly plastic when wet; matted with fine roots; neutral (pH 6.8 to 7.3); 3 to 5 inches thick.

A_{2g} 4 to 8 inches, light brownish-gray (10YR 6/2) silt loam mottled with light yellowish brown (10YR 6/4); moderate medium nuciform structure; friable when moist, sticky and plastic when wet; good root distribution and good moisture-holding capacity; slightly acid (pH 6.0 to 6.5); 4 to 8 inches thick.

B_{g1} 8 to 14 inches, grayish-brown (10YR 5/2) silty clay loam mottled with yellowish brown (10YR 5/6); moderate medium blocky structure; firm, moderately sticky and plastic; some roots penetrate but not as many as in layer above; neutral to slightly acid; 4 to 8 inches thick.

B_{g2} 14 to 28 inches, grayish-brown (10YR 5/2) or gray (10YR 5/1) silty clay with high-contrast mottlings of yellowish brown (10YR 5/8); coarse blocky structure; firm, very plastic and sticky; contains few roots; neutral; 12 to 24 inches thick.

C_g 28 inches +, gray (10YR 5/1) silty clay with high-contrast mottling of yellowish brown (10YR 5/6); very firm, very plastic; massive; dense in place, but breaks out into large sharply angled lumps; contains few or no roots; mildly alkaline to weakly calcareous in upper part but becomes strongly calcareous with depth.

Fulton silt loam, 0 to 3 percent slopes (Fg).—This is poor soil for intertilled crops because of its poor drainage and fine-textured subsoil. It is best suited to hay or pasture. Ladino clover and birdsfoot trefoil are the best suited legumes if the stand is to last several years; red clover may be used for short periods if drainage is slightly improved. When the soil is partly drained by open ditches, it can be used for corn, spring grains, and shallow-rooted legumes.

Drainage and keeping good soil structure are the main problems in using this soil. The fine textures of the subsoil make artificial drainage difficult. Tile must be closely spaced. When organic matter is depleted, the soil is easily puddled.

This soil can be used for the rotations and other practices listed in rotation group 2, table 10. Under this management the soil has a low lime requirement, a medium phosphorus requirement, and a low potassium requirement. Larger amounts of phosphorus and potassium seldom bring much response in yields. Nitrogen makes a considerable difference, especially if it is applied early in the spring. Intensive cash crops commonly yield poorly, even under good management.

Galen Series

This series consists of moderately well drained soils that developed in calcareous fine and very fine sands of glacial lake deposits. The surface soil and upper subsoil have been leached of lime and are medium or slightly acid. The lower subsoil is neutral and the substratum is calcareous.

The Galen series is the moderately well drained member of the catena that includes the well drained Arkport soils, the poorly drained Junius soil, and the very poorly drained Granby soil. Thin layers of compact very fine sands or silts in the substratum of the Galen soil restrict downward movement of water. In Ontario and Yates Counties the soil ranges from moderately to imperfectly drained.

Typical profile of Galen fine sandy loam under cultivation:

- A_p 0 to 7 inches, dark-brown (7.5YR 3/2) fine sandy loam plow layer; moderate medium crumb structure; very friable; medium acid; 6 to 9 inches thick.
- A_2 7 to 14 inches, yellowish-brown (10YR 5/4) fine sandy loam; weak fine crumb structure; friable; medium to slightly acid; upper part of layer has been mixed with the plow layer; 6 to 10 inches thick.
- B_{21} 14 to 18 inches, yellowish-brown (10YR 5/4) fine sandy loam with slightly more clay than the layer above; weak coarse crumb structure; friable to slightly firm when moist; medium to slightly acid; 4 to 8 inches thick.
- B_{22g} 18 to 30 inches, brown (10YR 5/3) fine sandy loam with low-contrast mottling of dark brown and yellowish brown; weak medium blocky structure; slightly firm; neutral to slightly acid; 12 to 20 inches thick.
- C 30 inches +, light yellowish-brown (10YR 6/4) fine sand and very fine sand with horizontal streaks of pinkish-gray mottling; weakly stratified; slightly firm in place but very friable or loose if crushed when moist; moderately calcareous; contains thin strata of silt or compact very fine sand that slightly restrict penetration of water.

Galen fine sandy loam, 0 to 6 percent slopes (Ga).—This sandy soil has excellent physical condition and can be worked at a wide range of moisture content. It dries moderately quickly in the spring. The moderate drainage retains a better moisture supply during late summer than is available on the well-drained sandy soils.

The soil is suited to most crops grown in this region and is especially well suited to those requiring intensive cultivation. It is not so good for alfalfa as the associated well-drained Arkport soils, but Ladino clover and red clover are well suited. The rotations of group 2, table 10, which have low requirements for lime, medium requirements for phosphorus, and high requirements for potassium, are suited to this soil. Intensively grown vegetable crops respond well to heavier fertilization, including liberal use of nitrogen.

Genesee Series

These are well-drained neutral soils on the first bottoms. The parent material is young stream alluvium derived mainly from upland areas high in lime. There has been little soil development other than accumulation of organic matter in the topmost layer.

These soils are subject to flooding annually, but floodwater recedes early enough to allow planting most crops on time. New soil material is deposited on the surface during each flood. The Genesee series is the well drained member of the catena that includes the moderately well drained Eel soils, the poorly drained Wayland soils, and the very poorly drained Sloan soil.

Typical profile of Genesee silt loam under forest:

- A_1 0 to 5 inches, dark grayish-brown (10YR 4/2) silt loam; strong medium granular structure; very friable, nonplastic; high in organic matter; neutral to slightly acid; 5 to 8 inches thick.
- C_1 5 to 12 inches, grayish-brown (10YR 5/2) silt loam; moderate medium crumb structure; friable, nonplastic; neutral; 5 to 10 inches thick.
- C_2 12 inches +, pale-brown (10YR 6/3) silt loam, generally finer textured than layer above but more variable in texture; weak medium crumb structure; friable, nonplastic; excellent capacity to hold water and supply it to plants; neutral; below 30 inches, texture ranges from sandy loam to silt loam and the material is mildly alkaline or weakly calcareous.

Genesee fine sandy loam, 0 to 2 percent slopes (Gb).—This soil differs from the Genesee silt loam just described in having a fine sandy loam or very fine sandy loam texture in the upper 2 feet. The substratum may be similar to that of the silt loam, or it may be more sandy. The soil can be worked slightly earlier in the spring than the silt loam, but it gives about the same yields.

This soil is suited to all of the rotations listed in rotation group 1, table 10. It can be used continuously for intertilled crops. It is an excellent soil for most of the important crops grown in the area. It is well suited to alfalfa, Ladino clover, red clover, and birdsfoot trefoil. The principal management practices needed are protection against streambank erosion and growing of cover crops to prevent scouring during floods.

The soil has low requirements for lime, medium requirements for phosphorus, and high requirements for potassium. Intensively grown cash crops commonly respond well to larger amounts of fertilizer, including nitrogen.

Genesee silt loam, 0 to 2 percent slopes (Gc).—This is a silty well-drained fertile soil. It is flooded annually but dries early enough for most crops to be planted on time. It needs protection against stream-bank erosion and it needs cover crops to prevent scouring during spring floods. It has good water-holding capacity and responds well to good management.

All of the rotations of group 1, table 10, would be good on this soil. It is suited to most of the crops grown in the county and is especially suitable for intensively grown vegetables. It is probably least suited to small grains, which tend to make a heavy growth and to lodge. Under the rotations listed, the soil has a low lime requirement, a medium phosphorus requirement, and a low potassium requirement. Intensively grown cash crops generally respond to larger amounts of fertilizer, including nitrogen.

Genesee silt loam, high bottom, 0 to 2 percent slopes (Gd).—This soil probably has the highest natural productivity in Ontario or Yates Counties. It lies on high bottom lands or low terraces that are rarely flooded. It has the good properties of the Genesee silt loam on the first bottom lands, but it has none of its limitations. It has good water-holding capacity. It responds well to fertilizer and other management practices.

Under any of the rotations listed in group 1, table 10, this soil is suited to all of the crops grown in the region. For good yields under these rotations, it has low lime requirements, medium phosphorus requirements, and low potassium requirements.

Granby Series

This very poorly drained sandy soil developed in calcareous lake-laid sands. The water table stands at or near the surface almost continuously. The soil occupies flat or depressed areas. It is the very poorly drained member of the catena that includes the well-drained Arkport soils, the moderately well-drained Galen soil, and the poorly drained Junius soil. It is associated with these soils and with Carlisle or Edwards muck.

Typical profile of Granby fine sandy loam under forest:

- A_1 0 to 8 inches, black (10YR 2/1) fine sandy loam; moderate fine to medium granular structure; friable, nonplastic, somewhat greasy feeling; high in organic matter; contains many fine and medium-sized roots; neutral; 6 to 10 inches thick.
- G_1 8 to 13 inches, white (10YR 8/2) or light-gray (10YR 7/2) fine sand, almost free of mottling; firm in place, nonplastic; contains few roots; an intensely reduced horizon; slightly acid to neutral; 4 to 8 inches thick.
- G_2 13 to 29 inches, strongly mottled dark-brown (7.5YR 4/4) and light brownish-gray (10YR 6/2) very fine sandy loam; firm in place, friable when moist, nonplastic when wet; contains very few roots; neutral to slightly acid; 12 to 24 inches thick.
- CG 29 inches +, light brownish-gray (2.5Y 6/2) medium to fine sand; upper part may be mottled with yellowish brown; single-grain structure; dense to compact in place, nonplastic when wet; contains no roots; layer is permanently wet except when drained; calcareous.

Granby fine sandy loam, 0 to 1 percent slopes (Ge).—Where undrained this soil is unsuited to agricultural use. Areas partly drained by open ditches can be used for pasture. These pastures are especially productive during the drier parts of the year. They consist of good stands of desirable grasses.

When this soil is completely drained by tile, it is suited to most of the crops grown in the county. All of the rotations of group 1, table 10, can be used. The soil is not well suited to alfalfa, but it is excellent for Ladino clover and red clover. The rotations suggested require low rates for lime application, medium rates for phosphorus and high rates for potassium. Intensively grown vegetables respond to higher rates of fertilization than the general rates suggested.

Holly Series

This is a poorly drained medium acid series on the first bottoms. The moderately well drained Middlebury soil is in the same catena. The very poorly drained soils from the same materials would be in the Sloan series, but their area in Ontario and Yates Counties was so small that they were included with the Holly silt loam mapping unit.

Typical profile of Holly silt loam in forest:

- A_1 0 to 5 inches, very dark grayish-brown (2.5Y 3/2) silt loam; moderate medium crumb structure; friable, slightly plastic; high in organic matter; many roots; medium acid; 4 to 6 inches thick.
- CG_1 5 to 11 inches, dark grayish-brown (2.5Y 4/2) silt loam mottled with rust brown; moderate coarse crumb structure; slightly firm when moist, slightly plastic when wet; moderate in organic matter; many roots concentrated in this layer; medium acid; 4 to 8 inches thick.
- CG_2 11 to 24 inches, dark-gray (5Y 4/1) silty clay loam strongly mottled with brown (10YR 3/3); massive to coarse blocky structure; firm when moist, plastic when wet; contains only a few small roots; water table is within this layer for long periods; medium acid; 10 to 20 inches thick.
- CG_3 24 inches+, gray (5Y 5/1) silty clay loam mottled with yellowish brown; mottling decreases with depth; massive, firm when moist, plastic when wet; this horizon is below the water table most of the year; medium to slightly acid.

Holly silt loam, 0 to 1 percent slopes (Ha).—The gray surface soil and the high degree of mottling below 8 to 10 inches indicates the poor drainage. The soil is saturated for long periods. In most places it is too wet to be used for anything but grass hay or pasture. Native pastures are mostly coarse unpalatable grasses. Fair to good pastures or meadows can be obtained by seeding to reed canarygrass or redtop.

In most areas drainage cannot be improved without deepening existing stream channels. Usually this is not practical. Where the soil can be drained, it is suited to the rotations of group 1, table 10. Where it can be even slightly drained, good pastures of Ladino clover and grass can be established. This soil has a high lime requirement, a medium phosphorus requirement, and a medium potassium requirement.

Homer Series

This series includes poorly drained high-lime soils from glacial outwash. The parent material was mostly layered sand and gravel, high in limestone, and a few layers of silt or silty clay. The Homer series is the poorly drained member of the catena that includes the well drained Palmyra and Howard soils, the moderately well drained Phelps soil, and the very poorly drained Westland soil.

In many places the poor drainage of these soils is caused by clogging of the small soil pores with silt. Compact layers of sandy clay or silty clay cause poor internal drainage in other places. In some areas all layers of this soil can be penetrated by water, but it is poorly drained because it occupies depressions that have a high water table.

Typical profile of Homer silt loam under forest:

- A_1 0 to 5 inches, dark-gray (10YR 4/1) silt loam; moderate fine to medium crumb structure; friable, nonplastic; high in organic matter; slightly acid; 4 to 6 inches thick.
- A_{2g} 5 to 10 inches, dark yellowish brown (10YR 4/4) silt loam with moderate-contrast mottling of grayish brown (10YR 5/2); medium crumb structure; firm, slightly plastic; good root distribution; good water-holding capacity; medium acid to neutral; 4 to 8 inches thick.
- BG_1 10 to 18 inches, mottled light-gray (10Y 7/2) and light yellowish-brown (10YR 6/4) silt loam; contains some gravel; moderate medium blocky structure; firm, slightly plastic; good distribution of roots; neutral; 6 to 12 inches thick.
- BG_2 18 to 30 inches, strongly mottled gray (10YR 6/1) and brown (7.5YR 5/4) sandy clay loam; contains some gravel and small stones; moderate coarse blocky structure; firm, slightly plastic; contains fewer roots than layer above; neutral; 10 to 18 inches thick.
- CG 30 inches +, gray (7.5YR 6/0) mixed sand and gravel, somewhat silty and mottled with yellowish brown at top of layer but grading into sand and gravel at 40 inches; may include strata of slowly permeable silty material; very few roots at this depth, which is below water table for long periods; mildly calcareous.

Homer sandy loam, 0 to 3 percent slopes (Hb).—This soil differs from the Homer silt loam profile just described because it has a sandy loam surface layer. The coarser material may continue to depths of 18 to 30 inches. In these places the subsoil is a heavy sandy loam or loam, but the underlying strata are like those of Homer silt loam.

This poorly drained soil usually occurs in small areas associated with highly productive better drained soils. If the soil is not drained artificially, it is suited mostly to hay or pasture. In some years fair corn can be produced. Wherever possible, this soil has been drained, and it is then used for the same crops as the associated better drained soils.

With adequate artificial drainage the soil is well suited to most of the crops grown in the county, except tree fruits and deep-rooted legumes. It can be used for the rotations of group 1, table 10. It has a low lime requirement, a medium phosphorus requirement, and a high potassium requirement to maintain fertility under these rotations. The soil responds well when additional fertilizer, especially nitrogen, is added to intensively grown cash crops.

Homer silt loam, 0 to 3 percent slopes (Hc).—This poorly drained soil in its natural condition is poor for most crops except hay and pasture. In Yates County it is slightly more acid than most areas of Homer silt loam.

When it is adequately drained artificially, this soil is suited to most crops of the county. Deep-rooted legumes and tree fruits do not do well. Alfalfa is poorly suited to this soil, but Ladino or red clover and birdsfoot trefoil are well suited. The rotations of group 1, table 10, are good.

For these rotations, the soil has a low to medium lime requirement and medium phosphorus and potassium requirements.

Honeoye Series

Soils of this series are among the most productive in New York State. They are well-drained medium-textured soils that developed in very high lime glacial till. They are coarser textured in the upper layers than the Cayuga soils and they are less acid than the Lansing soils. They differ from the Ontario soils in being derived from limestone and shale rather than from limestone and sandstone. The Honeoye series is the well-drained member of the catena that includes the moderately well drained Lima soils, the poorly drained Kendaia soils, and the very poorly drained Lyons soil.

Typical profile of Honeoye silt loam under forest:

- A_1 0 to 5 inches, very dark brown (10YR 2/2) silt loam; strong medium crumb structure; very friable; contains some gravel and many fine roots; high in organic matter; slightly acid to neutral; 3 to 6 inches thick.
- A_{21} 5 to 8 inches, very dark grayish brown (10YR 3/2) silt loam; colors masked by organic matter; moderate coarse crumb structure; friable; medium to slightly acid; 2 to 5 inches thick.
- A_{22} 8 to 12 inches, dark grayish-brown (10YR 4/2) silt loam; distinctly leached; very weak thin platy to medium crumb structure; friable; slightly to medium acid; 3 to 6 inches thick.
- B_{21} 12 to 16 inches, brown to dark-brown (10YR 4/3) silt loam; moderate medium blocky structure; grayish-brown coatings on nutlike fragments indicate that the leached horizon is moving downward into this weak zone of clay accumulation; friable; slightly to medium acid; 3 to 5 inches thick.
- B_{22} and B_{23} 16 to 24 inches, brown to dark-brown (10YR 4/3) clay loam; strong medium blocky structure; friable, moderately sticky and plastic when wet; a zone of clay accumulation; slightly acid to neutral; 6 to 12 inches thick.
- C 24 inches +, very dark grayish brown (10YR 3/2) gravelly loam glacial till consisting mainly of limestone and shale with some sandstone; weak very coarse platy structure; firm in place but friable when crushed; strongly calcareous.

Honeoye fine sandy loam, 0 to 3 percent slopes (Hd).—Good drainage, good water-holding capacity, and good native fertility make this one of the best soils of the area. It is well suited to nearly all of the crops of the region if they are grown in rotations such as those shown in group 1, table 10. Potatoes can be grown, but they are likely to develop scab disease. The soil is excellent for alfalfa and other legumes.

Good tilth is easily maintained on this medium-textured soil if it has a moderate content of organic matter. To maintain the fertility, the soil has a low lime requirement, a medium phosphorus requirement, and a medium to low potassium requirement. Intensively grown cash crops respond to higher rates of fertilization with amendments that include nitrogen.

Honeoye fine sandy loam, 3 to 10 percent slopes (He).—This is one of the best farming soils of the area. It is well drained, gently sloping, and fertile and has a good water-holding capacity. It is highly responsive to good management. The soil is deep, friable, and easy to work. Water runs off slowly, and the soil can absorb water and hold it for use by plants. Heavy farm machinery can be used on these gentle slopes.

Group 4, table 10, gives suitable rotations for use on this soil. Nearly all of the crops grown in the region are suited. Potatoes can be grown, but they are likely to have scab. For maintaining fertility under the rotations listed, the soil has a low lime requirement, a medium phosphorus requirement, and a medium to low potassium requirement. When intensively grown cash crops receive larger amounts of fertilizer, including nitrogen, the response is generally high.

Honeoye fine sandy loam, 10 to 20 percent slopes (Hf).—This soil is productive but moderately steep. The runoff is enough to create a moderately severe erosion problem and to reduce the water available for plants. The soil has most of the good characteristics of the other Honeoye soils, but its strong slopes limit its agricultural use. Some of this mapping unit has already been moderately to severely eroded.

This soil is suited to the rotations of group 5, table 10. When used for these rotations, it has a low lime requirement, a medium phosphorus requirement, and a medium to low potassium requirement. Intensively grown cash crops generally respond well to heavier rates of fertilization, including application of nitrogen. The eroded areas are low in organic matter. They should be kept in sod crops as much as possible or should receive heavy applications of manure.

Honeoye fine sandy loam, eroded, 10 to 20 percent slopes (Hg).—This sloping Honeoye fine sandy loam has lost 5 to 8 inches of the original surface soil. In many places the finer textured subsoil is turned up in plowing. The present surface layer is low in organic matter and absorbs water more slowly than uneroded soil of the same type. It is harder to keep this soil in good tilth, and it is more likely to erode. Special management should be practiced to control runoff, and sod crops should be grown as much of the time as possible.

The rotations of group 8, table 10, are suited to this soil. It needs large amounts of nitrogen fertilizer for all crops except legumes. Besides the need for nitrogen, this soil has a low lime requirement, a medium phosphorus requirement, and a medium to low potassium requirement.

Honeoye silt loam, 0 to 3 percent slopes (Hh).—This is one of the best soils of the area. It has all of the good characteristics of the Honeoye series. It is higher in available potassium than the Honeoye fine sandy loam soils, but it is not as easy to maintain in good tilth.

Nearly all of the crops grown in the area are suited to this soil, and they can be grown in the rotations suggested in group 1, table 10. Potatoes may develop scab because of the high lime content of the soil. The requirement of this soil for lime is low, for phosphorus is medium, and for potassium is low. Intensively grown cash crops generally respond well if heavier rates of fertilization are used and nitrogen is added.

Honeoye silt loam, 3 to 10 percent slopes (Hk).—This is the most extensive soil of the Honeoye series and is one of the most important soils of the two counties. It responds very well to good management. The gentle slopes allow the use of all kinds of farm machinery. The soil is well drained and has good water-holding capacity.

The rotations and the management practices of group 4, table 10, are good for this soil. Almost all the crops grown in the area can be used. Potatoes are subject to scab because the soil has so much lime. To maintain fertility under these rotations, requirements are low for lime, medium for phosphorus, and low for potassium. Heavier rates of fertilization bring a good response from intensively grown cash crops. Yields of such crops also improve when nitrogen is added. Table 6 shows how much increase in yields can be expected from some of the important crops.

Where this soil has been intensively cultivated for a long time without using enough manure or sod crops, the amount of organic matter in the plow layer has been reduced from about 4 or 5 percent to about 2 percent. In these areas the soil has only fair tilth, and its surface is likely to bake. Special practices should be followed to increase the supply of organic matter.

TABLE 6.—*Average acre yield of commercial canning crops on Honeoye and Ovid silt loams, 3 to 8 percent slopes, under different rates of fertilization*

[All rates of fertilization used on rotations that consisted entirely of row crops, but rye or ryegrass for winter cover was included wherever possible, and the same crop was not grown on the same plot 2 successive years. Tests made at Geneva, N. Y.[1]]

Amendments applied during rotation	Crop and years of record				
	Beets	Cabbage	Peas	Sweet corn	Tomatoes
	4	11	7	4	[2] 12
	Tons	*Tons*	*Lb.*	*Tons*	*Tons*
a. No fertilizer	8. 8	15. 0	1, 830	4. 3	7. 5
b. 12 to 15 lbs. nitrogen (N), 30 to 48 lbs. phosphate (P_2O_5), and 12 to 30 lbs. potash (K_2O) per acre	------	------	2, 200	------	------
c. 24 to 30 lbs. nitrogen (N), 60 to 96 lbs. phosphate (P_2O_5), and 24 to 60 lbs. potash (K_2O) per acre	10. 2	19. 6	2, 400	4. 8	11. 0
d. 48 to 60 lbs. nitrogen (N), 120 to 192 lbs. phosphate (P_2O_5), and 48 to 120 lbs. potash (K_2O) per acre	11. 7	[3] 22. 4	------	4. 7	12. 1
e. 90 lbs. nitrogen (N), 180 to 270 lbs. phosphate (P_2O_5), and 180 lbs. potash (K_2O) per acre	12. 6	[3] 23. 4	------	4. 7	------

[1] Data from New York State Agricultural Experiment Station bulletins (*10, 11*) and from personal correspondence with C. B. Sayre, Head, Division of Vegetable Crops, New York State Agricultural Experiment Station.

[2] Includes 1 year of exceptionally low yields caused by late plantings.

[3] Only 4 years of record at this fertilization rate.

Honeoye silt loam, 10 to 20 percent slopes(Hl).—This is a sloping well-drained fertile soil with good water-holding capacity. The most important management problems are conserving rainfall and controlling erosion. This soil is more droughty than the less sloping Honeoye soils.

The soil is suited to most crops grown in the area, and especially well suited to alfalfa. Potatoes are subject to scab because of the high lime content of the soil. The rotations of group 5, table 10, are suitable for this soil. Under the rotations suggested, requirements are low for lime, medium for phosphorus, and low for potassium. Intensively grown cash crops generally respond moderately well to larger amounts of phosphorus and potassium and to the addition of nitrogen. This soil should be kept in sod as much of the time as possible, but it is suited to intertilled crops also.

Honeoye silt loam, eroded, 10 to 20 percent slopes (Hm).—This soil has lost from 5 to 10 inches of its original surface layer. In most places the finer textured subsoil is turned up in plowing. This plow layer is low in organic matter and difficult to maintain in good tilth. Water

penetrates more slowly than on the uneroded soils. Erosion and loss of water are more serious than on uneroded soils of similar slope.

The rotations of group 8, table 10, are most suitable for this soil. The requirements for lime are low, for phosphorus are medium, and for potassium are low. Larger amounts of fertilizer do not bring much response from crops because the soil has strong slopes and poor tilth. The soil should be kept in sod as much of the time as possible. Manure should be used liberally to help restore the organic matter needed to maintain good soil structure.

Honeoye soils, eroded, 20 to 30 percent slopes (Hn).—About 85 percent of these moderately steep Honeoye soils has been moderately to severely eroded. Most of the uneroded areas are in woods. Both silt loam and fine sandy loam types are mapped in this unit. The strong slopes allow rapid runoff and loss of water needed by crops. Special practices are needed to control water and to prevent erosion.

The rotations and supporting practices listed in rotation group 11, table 10, are needed on this soil. For these rotations the requirement is low for lime, medium for phosphorus, and low for potassium. Response to extra amounts of fertilizer is generally small. Nitrogen may bring some response from hay or pasture that contains few legumes.

With proper supporting practices, the best uneroded parts of this soil can be used for a rotation that consists of 1 year of intertilled crops and at least 3 years of sod crops. It is better not to grow the intertilled crops, however.

Hornell Series

These strongly acid, medium-textured, imperfectly drained soils have developed on thin to moderately thick deposits of glacial till that contains much soft, gray, acid shale. They occur on smooth nearly level ridgetops and moderate slopes in association with the well-drained Manlius and the poorly drained Allis soils. Some deep phases have been mapped in this area, but the soil is usually shallow to moderately deep. In the shallow areas, the soil rests directly on the underlying rock, which may be broken and slightly displaced by glacial action. Restricted drainage, low fertility, silty texture, and shallow or moderate depth combine to make these poor soils.

Typical profile of Hornell silt loam under forest:

- A_0 Humus layer of black well-decomposed organic matter; fine crumb structure; matted with fine roots; very strongly acid; 2 to 3 inches thick.
- A_1 0 to 3 inches, dark grayish-brown (10YR 4/2) heavy silt loam; moderate medium granular structure; friable when moist, slightly plastic when wet; high in organic matter, contains many fine roots; strongly acid; 1 to 4 inches thick.
- B_2 3 to 13 inches, yellowish-brown (10YR 5/4) heavy silt loam; medium blocky structure; friable when moist, plastic when wet; good distribution of roots; good water-holding capacity; contains fragments of shale and sandstone; strongly acid; 8 to 14 inches thick.
- B_g 13 to 21 inches, dark yellowish-brown (10YR 4/4) silty clay loam mottled with yellowish red (5YR 5/8) and light brownish gray (10YR 6/2); moderate coarse blocky structure; firm when moist, plastic when wet; contains fewer roots than layer above; high water-holding capacity but does not release moisture readily to plant roots; strongly acid; 5 to 12 inches thick.
- C_g 21 to 33 inches, light yellowish-brown (2.5Y 6/4) silty clay loam with high-contrast mottling of grayish brown (2.5Y 5/2) and rust brown; moderate medium blocky structure; very firm, very plastic; contains few roots, which penetrate mostly along cracks; high water-holding capacity but moisture is tightly held; strongly acid; 8 to 60 inches.
- D 33 inches +, gray (2.5Y 6/0) or olive (5Y 5/4) soft thin-bedded clay shale, partially disintegrated at 30 to 40 inches; strongly acid.

Hornell silt loam, 36 inches or more deep, 3 to 8 percent slopes (Ho).—This is an imperfectly drained silty strongly acid soil on gentle slopes. It is moderately erodible even on these slopes, and special management is needed to control erosion. It is important to maintain the organic matter, because the soil loses its structure and good tilth if organic matter is low.

The soil is suited to the rotations and supporting practices of rotation group 4, table 10. It is moderately well suited to corn for grain or silage, small grains, and sod crops. The soil is poorly suited to intensive growing of cash crops, but it may be used successfully for some of the less intensively grown vegetable crops. The restricted internal drainage makes it poorly suited to alfalfa, but it is a fair to good soil for Ladino clover or birdsfoot trefoil.

The rotations suggested have high lime requirements, medium phosphorus requirements, and low potassium requirements. Larger amounts of fertilizer and lime bring little response.

Hornell silt loam, 12 to 20 inches deep, 3 to 8 percent slopes (Hp).—This soil is like the one just described, but it is more shallow over bedrock. The imperfect drainage makes the soil too wet in the spring, and the shallow depth makes it too dry in midsummer. Maintenance of good structure is difficult because of the silty texture of the surface layer. About 8 percent of the soil mapped here has been eroded enough that the present plow layer consists mainly of subsoil material.

This is a very poor soil for intertilled crops. It should be kept in sod crops for hay or pasture as long as the legume in the mixture persists. If legumes fail, nitrogen fertilizer or manure should be used on the grass that remains.

Rotation group 10, table 10, suggests crops and rotations that would be good on this soil. The shallow depth to bedrock prevents the use of diversion terraces, which would provide better drainage and make more intensive rotations practical. If necessary, the soil can be used with fair success for corn for silage, small grains, and sod crops. When used for these crops, the soil has high lime requirements, medium phosphorus requirements, and low potassium requirements. The response of crops to higher rates of fertilization is generally too small to justify the extra cost.

Hornell silt loam, 36 inches or more deep, 8 to 15 percent slopes (Hr).—This imperfectly drained moderately fine textured soil is strongly acid and low in fertility. Runoff is rapid, and the silty surface material is easy to erode. Maintenance of good structure by keeping organic matter high is a serious management problem. The response of crops to fertilization and other good management practices is moderately low.

Suitable rotations and supporting practices for maintaining organic matter and controlling runoff are given in rotation group 7, table 10. The soil can be used for corn for grain or silage and for small grains, but it is better

suited to sod crops. Cash crops, including some vegetables, can be grown where necessary, but they respond so little to good management that growing them may not pay. Fertility of the soil can be maintained by high rates of liming, medium rates of phosphorus fertilization, and low rates of potassium fertilization. If legumes fail in the sod crop, commercial nitrogen fertilizer will benefit the remaining grass in the stand.

Hornell silt loam, 12 to 20 inches deep, eroded, 8 to 15 percent slopes (Hs).—This imperfectly drained shallow silty soil is poor for crops. Early in spring it is wet, and in midsummer it is dry. It erodes easily and is low in organic matter. Serious management problems are conserving water for plants, maintaining fertility, controlling erosion, and restoring soil structure. This soil should be kept in sod crops as much of the time as possible.

The soil is suited to the rotations and supporting practices of group 11, table 10. The shallow depth prevents the use of diversion terraces that would permit more intensive rotations. For the rotations given, the soil has high lime requirements, medium phosphorus requirements, and low potassium requirements. It also needs nitrogen.

Alfalfa is poorly suited because this soil is too wet. Ladino clover gives only fair yields because the soil is too dry in midsummer. Birdsfoot trefoil is probably the best legume. Many meadows consist mostly of grass, which needs nitrogen fertilizer for even moderate yields.

A few small areas in this mapping unit have slopes greater than 15 percent. These are probably best used for forest.

Hornell silt loam, 36 inches or more deep, eroded, 8 to 15 percent slopes (Ht).—Erosion has removed 6 to 10 inches of material from most areas of this soil. The fine-textured mottled subsoil is turned up in plowing. The easily eroded material on moderate to strong slopes results in serious erosion. Soil structure is hard to maintain because the organic matter is low.

Although erosion has reduced the productivity of this soil, it is better than the eroded areas of Hornell silt loam 12 to 20 inches deep. It has higher water-holding capacity and is less droughty in midsummer. The imperfect drainage restricts the suitability for crops and their response to management.

This soil is poorly suited to intensively grown cash crops. It can be used for corn, small grains, and sod crops with fair success if management is good. The rotations and supporting practices of group 9, table 10, are suggested. For maintenance of fertility under these rotations, the soil has a high lime requirement, a medium phosphorus requirement, and a low potassium requirement. Nitrogen from manure or commercial fertilizer is badly needed unless good stands of legumes can be grown. Larger amounts of fertilizer do not bring much response from crops.

Some small areas with slopes between 15 and 25 percent are included in this mapping unit. These strongly sloping soils are very poor for crops. They should be in continuous sod or forest.

Howard Series

These are deep, well-drained, medium-lime soils with acid surface soil and subsoil but a calcareous substratum. Their parent material is glacial outwash sand and gravel derived from a mixture of limestone, sandstone, and shale materials. They occur on nearly level terraces and on hummocky hilly areas called kames.

In lime content Howard soils are intermediate between the nearly neutral Palmyra soils and the strongly acid Chenango soils. They are the best drained members of the catena that includes the moderately well drained Phelps soil, the poorly drained Homer soils, and the very poorly drained Westland soil.

The yellowish-brown colors and freedom from mottling throughout the profile show that this soil has good drainage and good aeration. The loamy texture of the surface soil and the medium texture of the subsoil give the soil fair water-holding capacity. Roots penetrate easily and deeply and are able to draw moisture and plant nutrients from a large volume of soil. The upper layers have been strongly leached and are low in plant nutrients, but good physical condition and good water-holding capacity permit good response to lime and fertilizer.

Typical profile of Howard gravelly loam under forest:

- A_0 Very dark brown humus held in a mat of fine roots; unmixed with mineral soil; very strongly acid; up to 2 inches thick, but lacking in some places.
- A_1 0 to 4 inches, gravelly loam; dark grayish brown (10YR 4/2) when the A_0 is absent, grayish brown (10YR 5/2) when the A_0 is present; a mixture of organic and mineral material thickest where no A_0 horizon occurs; moderate medium crumb structure; very friable; strongly or very strongly acid; 2 to 5 inches thick.
- A_{21} 4 to 9 inches, yellowish-brown (10YR 5/4) gravelly loam; weak fine crumb structure; friable; contains medium and fine roots; a zone of leaching and release of iron oxide; strongly to very strongly acid; 5 to 15 inches thick.
- A_{22} 9 to 13 inches, pale-brown (10YR 6/3) gravelly loam; very weak thin platy structure; very friable; contains roots; a zone of leaching; strongly acid; 3 to 6 inches thick.
- B_1 13 to 21 inches, brown (10YR 5/3) gravelly loam with distinctly more clay than the layer above; weak fine subangular blocky structure; aggregates are brown and clayey on inside and pale brown and silty on outside; friable; a layer of moderate clay concentration on which the zone of leaching is encroaching; strongly acid to medium acid; 6 to 9 inches thick.
- B_{21} 21 to 30 inches, brown to dark-brown (10YR 4/3) gravelly loam to gravelly clay loam; moderate medium to fine blocky structure; friable; slightly sticky and plastic; medium and large roots present; a layer of distinct clay accumulation; medium acid; 6 to 12 inches thick.
- B_{22} 30 to 39 inches, brown to dark-brown (10YR 4/3) gravelly clay loam; moderate to strong medium blocky structure; friable; moderately sticky, and plastic; a layer of strong clay accumulation; clays are concentrated as dark coatings on the aggregates and in pore spaces; slightly acid to neutral; 4 to 10 inches thick.
- C_1 39 to 50 inches, grayish-brown (10YR 5/2) stratified gravel and sand; loose and incoherent; leached of calcareous material but neutral or weakly alkaline in reaction; 11 to 20 inches thick.
- C_2 50 inches +, stratified gravel and sand similar to that of layer above; glacial outwash material consists mainly of sandstone and shale but contains small to moderate amounts of limestone; layer may be strongly cemented in places by secondary lime; moderately to strongly calcareous.

Howard gravelly loam, 0 to 5 percent slopes (Hu).—This is one of the better soils of the area. It is highly responsive to lime and fertilizer and to other good management practices. This nearly level acid soil has fair to good water-holding capacity, good drainage, and good aeration.

This soil is suited to most crops. Corn for grain or silage, small grains, field beans, small fruits, and intensively

grown vegetable crops are all good crops for this soil. Alfalfa is the best legume for hay. Ladino clover is suited, but it is more apt to be affected by drought than alfalfa. Red clover is better for short-lived stands.

The soil can be used in intensive rotations, including all of those in rotation group 1, table 10, with few or no runoff-control practices. Under most of these rotations, the soil has medium lime and phosphorus requirements and a high potassium requirement. Crops respond to heavier rates of fertilization. On some farms these soils can be used continuously for intertilled crops if they are limed, fertilized, and manured heavily and cover crops are grown to maintain organic matter.

Howard gravelly loam, 5 to 15 percent slopes (Hv).—This is a well-drained medium-lime soil on moderate but irregular or hummocky slopes. The subsoil has fair to good water-holding capacity. The rapid runoff makes this soil more droughty in midsummer than the more nearly level gravelly Howard soils. The rapid permeability and high content of gravel resist erosion, so that this soil can support more intensive cropping than most soils of similar slopes. Intensity of cropping is somewhat restricted by the irregular topography, which interferes with farming strictly on the contour.

This soil is suited to those rotations and supporting practices of rotation group 3, table 10, that do not involve contouring. It is at least moderately well suited to corn for grain or silage, small grains, sod crops, small fruits, grapes, and vegetables. It responds less to management than the more nearly level Howard soils and is less well suited to crops that require large inputs of labor and materials.

Alfalfa and birdsfoot trefoil are the best suited legumes for hay. Under the rotations suggested, this soil has medium lime and phosphorus requirements and a high potassium requirement. It also responds to nitrogen fertilizer, even when legumes have been a part of the sod crop.

Howard soils, 15 to 25 percent slopes (Hw).—These soils occur on groups of small round hills which have very irregular complex slopes. Both eroded and uneroded areas have been put into this mapping unit. The complex and steep slopes make the soils difficult to work. The rapid runoff and moderate water-holding capacity make the soils rather droughty.

These soils are naturally low in fertility. Their response to fertilization and other management practices is small because of the limited moisture supply. They are best suited to those crops that require little labor or management. Eroded areas should be kept in sod crops as much of the time as possible. The rotations of group 6, table 10, are suggested for these soils. They have medium lime and phosphorus requirements and high potassium requirements. The need for nitrogen depends upon the intensity of cropping and whether or not legumes were included in the sod crops. Alfalfa is one of the best suited legumes for 3 or 4 years of hay, but birdsfoot trefoil is better for longer stands. The soil is rather poor for Ladino clover because it is droughty.

Junius Series

This series has a dark surface and poor drainage. It developed in fine and very fine sands deposited as deltas in glacial lakes. The soil occupies flat or depressed areas. Water charged with lime saturates the whole soil during part of the year, and this helps keep the acidity low. The sands were originally calcareous, but free carbonates have been leached to depths of 30 or 40 inches, and the soil is neutral to medium acid.

The mottling of the subsoil is caused by poor natural drainage. This series is the poorly drained member of the catena that includes the well-drained Arkport soils, the moderately well drained Galen soil, and the very poorly drained Granby soil.

Typical profile of Junius fine sandy loam under forest:

- A_1 0 to 4 inches, black (10YR 2/1) fine sandy loam; moderate medium crumb structure; contains many fine roots; neutral to slightly acid; 4 to 6 inches thick.
- A_{2g} 4 to 11 inches, light yellowish-brown (10YR 6/4) fine sandy loam with low-contrast mottling of gray (10YR 6/1); weak medium crumb structure; slightly firm when moist, nonplastic when wet; well supplied with small and medium roots; slightly to medium acid; 6 to 8 inches thick.
- BG_1 11 to 19 inches, yellowish-brown (10YR 5/6) fine sandy loam mottled with pinkish gray (7.5YR 6/2), about equal parts of both colors; firm in place, breaks out in easily crushed irregular lumps, nonplastic when wet; contains a moderate number of medium-sized roots; neutral; 6 to 12 inches thick.
- BG_2 19 to 35 inches, yellowish-brown (10YR 5/8) very fine sand with low-contrast mottling of strong brown (7.5YR 5/8) and pinkish gray (7.5YR 7/2); very weak coarse blocky structure; firm to slightly compact in place; firm when moist, nonplastic when wet; contains only a few roots; saturated with water about half of the year; neutral; 12 to 22 inches thick.
- C_g 35 inches +, light-gray (7.5YR 7/0) to pinkish-gray (7.5YR 7/2) calcareous fine to very fine sand; structureless; commonly contains thin layers of tightly packed silt; slightly acid.

Junius fine sandy loam, 0 to 2 percent slopes (Ja).—The undrained areas of this soil are best suited to sod crops. They are wet too late in the spring for planting of most crops. Corn can be grown successfully in some years. Slight improvement of drainage by open ditches makes the soil suitable for sod crops and corn for silage or grain. Yields of small grains are likely to be low because of late planting in the spring.

When this soil is drained by tile or open ditches, it is an excellent soil for most crops grown in these counties, except alfalfa and tree fruits. Small grains generally make a heavy vegetative growth and are likely to lodge. The drained soil is highly responsive to fertilizer and other good management practices and is well suited to intensive growing of cash crops.

When it is well drained artificially, this soil is suited to all of the rotations of group 1, table 10. Under these rotations it has a low lime requirement, a medium phosphorus requirement, and a high potassium requirement. The soil generally responds to heavier applications of phosphorus and potassium and the use of nitrogen for intensively grown cash crops.

Kendaia Series

These poorly drained, medium-textured, high-lime soils developed on highly calcareous glacial till consisting mainly of material from limestone. This series is the poorly drained member of the catena that contains the well-drained Honeoye soils, the moderately well drained Lima soils, and the very poorly drained Lyons soil. It

is also mapped as the poorly drained associate of the Ontario, Lansing, and Cayuga series.

The profile described is for the soil associated with the Honeoye series. The soil associated with the Ontario series has a slightly pinkish color. That associated with the Lansing soils may be slightly acid or even medium acid in the upper part. The small areas associated with the Cayuga soils have slightly more clay in the subsoils. In all of these associations the Kendaia soils are in long strips next to drainageways and on flat areas or gentle slopes that receive seepage water from higher land.

Typical profile of Kendaia silt loam under forest:

- A_1 0 to 6 inches, dark grayish-brown (10YR 4/2) silt loam; moderate medium to fine crumb structure; very friable; high in organic matter; contains very many small and medium-sized roots; neutral; 5 to 8 inches thick.
- AG 6 to 9 inches, light brownish-gray (10YR 6/2) silt loam with low-contrast mottling of light yellowish brown; very weak fine crumb structure; friable; contains roots; neutral; 2 to 5 inches thick.
- BG 9 to 18 inches, strongly mottled yellowish-brown (10YR 5/6), grayish-brown (2.5Y 5/2), and gray (10YR 6/1) heavy silt loam; moderate fine to medium blocky structure; firm, slightly plastic; roots penetrate easily, but fewer present than in layer above; periodically saturated with water; neutral; 8 to 16 inches thick.
- CG 18 to 36 inches, light-gray (10YR 7/2) to pinkish-gray (5YR 6/2) calcareous loam glacial till, mottled with yellowish brown in the upper part; moderate thick platy structure; firm; 10 to 20 inches thick.
- C 36 inches +, light brownish-gray (10YR 6/2) to pinkish-gray (5YR 6/2) silt loam glacial till; moderate coarse platy structure; firm; highly calcareous.

Kendaia loam, 0 to 3 percent slopes (Ka).—This is a poorly drained but very fertile soil. Drainage is the chief problem in management. This soil is associated with Honeoye fine sandy loam.

When not drained, this soil responds poorly to management. It is best suited to sod crops that can stand a high water table; for example, Ladino clover with grasses, or grasses alone. Corn can be grown successfully in some years. Small grains usually yield poorly because of late planting.

When this soil is artificially drained, it is suited to most crops grown in the region, except alfalfa and tree fruits. It has plenty of moisture and is among the most fertile soils of the area. It is highly responsive to good management. It is suited to the rotations of group 1, table 10, with few or no special practices for control of erosion. It has a low lime requirement and medium phosphorus and potassium requirements. This soil is good for intensively grown vegetable crops, but they do best with heavy fertilization. The soil contains plenty of nitrogen, but sod crops and special crops respond to nitrogen fertilizer early in the spring when the soil is cold and wet.

Kendaia silt loam, 0 to 3 percent slopes (Kb).—This nearly level poorly drained soil is very fertile. It is suited to the same crops and management practices as the Kendaia loam but is slightly more difficult to drain and has poorer soil structure. If it is not drained, it is suited mainly to hay or pasture.

When this soil is artificially drained, it is very productive and highly responsive to good management. It has a low lime requirement and medium phosphorus and potassium requirements when used for the rotations of group 1, table 10. The silt loam soil has a slightly higher reserve of potassium than the Kendaia loam.

Kendaia silt loam, 3 to 8 percent slopes (Kc).—This soil has adequate surface drainage but is poorly drained because water seeps into the soil from surrounding higher land. Some areas are small shallow depressions within well drained or moderately well drained soils. Most of the soil lies on uniform gentle slopes to which water moves from nearby higher areas. Drainage of this soil is best done by intercepting the seepage water before it reaches the area.

When undrained, this soil is restricted in suitability for crops and in response to management. It is suitable to more crops than the nearly level phase of Kendaia silt loam.

If this soil is adequately drained, it is well suited to many crops. Because of its slight erosion hazard, it needs the rotations and supporting practices given in rotation group 2, table 10. It has a medium requirement for phosphorus and low requirements for lime and potassium when used for these rotations. Intensively grown vegetable crops generally respond well to heavier rates of fertilization, including the use of nitrogen.

Lakemont Series

This poorly drained, high-lime, fine-textured series developed in lake-laid silts and clays. It occupies level areas in association with the well-drained Schoharie soils, the imperfectly drained Odessa soils, and the very poorly drained Poygan soil. The dark surface soil and the strongly mottled subsoil are evidence of the poor drainage.

Typical profile of Lakemont silty clay loam under forest:

- A_1 0 to 6 inches, dark grayish-brown (10YR 4/2) silty clay loam; moderate coarse granular structure; firm when moist, plastic when wet; high in organic matter and matted with fine roots; slightly acid to neutral; 5 to 8 inches thick.
- A_2G 6 to 10 inches, grayish-brown (10YR 5/2) silty clay loam mottled with dark yellowish brown (10YR 4/4); strong coarse crumb structure; firm, sticky, plastic, moderately dense in place; roots grow along cracks; slightly acid to neutral; 3 to 6 inches thick.
- BG 10 to 28 inches, brown (7.5YR 5/4) silty clay with low-contrast mottling of strong brown (7.5YR 5/6) on insides of aggregates; surfaces of aggregates are gray (10YR 5/1); coarse blocky structure; firm when moist, very plastic when wet; poor root penetration; saturated with water for long periods in winter and spring; mildly alkaline (pH 7.5 to 8.0); 12 to 22 inches thick.
- C 28 inches +, brown (7.5YR 5/4) stratified clays and silts grading into pink to pinkish-gray clay; firm when moist, plastic when wet; dense and tight in place; contains very few roots; calcareous, the lime being segregated in streaks and nodules.

Lakemont silty clay loam, 0 to 2 percent slopes (La).—Fine texture and poor drainage determine the management of this soil. It is too wet for most crops except grass hay and pasture. It is saturated to the surface for long periods in the spring. The soil puddles if plowed too wet, and maintaining good structure is a very serious problem in cultivated areas.

Open ditches to remove excess surface water can improve the soil somewhat for sod crops. The fine-textured dense subsoil and substratum make drainage with tile very difficult. Very close spacing of tile is necessary, but it is not practical in most areas.

The soil can be conserved under the rotations in group 2, table 10, but its response to management is so low in

most areas that rotations dominated by sod crops are most practical. The soil has low requirements for lime and potassium and a medium requirement for phosphorus. Very little or no response results from heavier applications. If the soil is drained enough to permit the growth of winter wheat, oats, or other crops planted early in spring, nitrogen will usually benefit these crops. Corn can be grown in some areas, but it yields poorly.

Langford Series

This moderately well drained series was derived from neutral or weakly calcareous glacial till derived from sandstone and shale. The topmost 12 to 18 inches is well aerated and resembles the upper part of the profile of the Valois soils. Below that is a very dense horizon that restricts downward movement of water. This horizon, commonly called a "pan", is lighter colored and more silty in the upper than in the lower part. This lighter colored silty material extends downward into cracks that divide the horizon into prisms 8 to 24 inches across. The pan grades downward into neutral or weakly calcareous compact glacial till. Both the hardpan and the substratum restrict the downward movement of water.

The Langford series is the moderately well drained member of the catena that includes the well-drained Valois soils, the poorly drained Erie soils, and the very poorly drained Alden soil. The upper part of the soil is strongly acid. The soil material that has not been leached is mostly below or within the hardpan. Plant roots generally cannot reach it. The Langford soils are like the Mardin soils, but they are less acid and they have a neutral or calcareous substratum.

Typical profile of Langford gravelly silt loam under forest:

- A_0 Forest litter and raw humus mat; very strongly acid; 1 to 3 inches thick.
- A_1 0 to 2 inches, dark grayish-brown (10YR 4/2) silt loam; moderate fine to medium granular structure; friable when moist, slightly plastic when wet; high in organic matter and matted with fine roots; strongly acid; ½ to 3 inches thick.
- B_2 2 to 15 inches, yellowish-brown (10YR 5/4) silt loam; weak medium crumb structure; friable when moist, slightly plastic when wet; contains considerable organic matter; zone of maximum root growth; strongly acid; 8 to 18 inches thick.
- A'_{2g}[6] 15 to 18 inches, yellowish-brown (10YR 5/4) silt loam with high-contrast mottling of gray (10Y 5/1); moderate medium crumb structure; firm when wet; compact in place but fair root penetration; somewhat gravelly or stony; good water-holding capacity; medium acid; 3 to 7 inches thick.
- B_{2m} and B'_3 18 to 50 inches, olive-brown (2.5Y 4/4) heavy silt loam faintly mottled with yellowish brown (10YR 5/6); divided into large prisms 8 to 24 inches across by cracks filled with gray silty material; prism interiors have weak fine angular blocky structure; layer firm when moist, plastic when wet; compact and hard in place; very little root penetration; contains angular gravel and small stones; below 30 inches the prisms are larger and material is not so hard as in upper part; 24 to 48 inches thick.
- C 50 inches +, olive-brown (2.5Y 4/4) compact shaly or stony silt loam glacial till; moderate medium to coarse blocky structure; aggregates hard when dry, plastic when wet; may be only mildly alkaline (pH 7.5 to 8.0) in upper part but commonly contains free lime throughout.

[6] See footnote 4, page 31.

Langford gravelly silt loam, 3 to 8 percent slopes (Lb).—This gently sloping soil gives only fair response to management because it is only moderately well drained. Root growth is restricted mainly to the topmost 15 to 20 inches of soil.

This is a fair to good soil for crops that do not require much labor, but it is less well suited to intensive growing of cash crops. It is fair for corn for silage or grain, small grains, potatoes, and sod crops for hay or pasture. It is a poor soil for alfalfa or tree fruits. Alfalfa can be used in seeding mixtures, but it should not be the only legume in the mixture. The soil is better suited to Ladino clover or red clover.

The rotations of group 2, table 10, are most suitable for this soil. They have a high lime requirement and medium phosphorus and potassium requirements. Good stands of legumes are difficult to maintain. Grass meadows that contain no legumes respond well to nitrogen fertilizer. The response to higher rates of fertilization is commonly too small to make this a good soil for intensive growing of cash crops.

Langford gravelly silt loam, 8 to 15 percent slopes (Lc).—Control of erosion is a problem on the moderate slopes of this Langford soil. Runoff is rapid, and this loss of moisture for plants causes slightly lower yields. Modern agricultural machinery can be used on these slopes; heavier machines are difficult to use.

The rotations and supporting practices of rotation group 5, table 10, are suitable for this soil. Corn for silage or grain, small grains, and hay or pasture are fairly good crops for the soil. Alfalfa is poorly suited, but it can be used with other legumes in seeding mixtures. Better suited legumes are Ladino clover, red clover, and birdsfoot trefoil.

The response to heavy fertilization and other good management practices is generally too small to justify use of this soil for intensive cash crops. The soil has a high lime requirement and medium phosphorus and potassium requirements. Nitrogen may be needed on grass meadows, on small grains early in spring, and on silage corn at planting time.

Lansing Series

These well-drained, medium-textured, medium-lime Lansing soils developed in glacial till that was a mixture of sandstone, shale, and limestone. They lie in the transition zone between the high-lime soils in the north and the strongly acid soils in the south of Ontario and Yates Counties. They are the well-drained members of the catena that includes the poorly drained Kendaia soils and the very poorly drained Lyons soil.

Some areas of these soils are shallow over bedrock. Where the soil is medium textured, it is considered a shallow phase of the Lansing series. In some places the glacial till is mainly from the calcareous shales of the underlying bedrock. In these places the soil contains more clay and is classified as a shallow phase of the Danley series. The Danley series was not mapped separately in these two counties. Areas where Danley soils occur either separately or intermingled with shallow Lansing soils were mapped as undifferentiated Lansing and Danley silt loam.

The Danley silt loams are much like the Lansing. They differ mainly in being finer textured below depths of about 8 to 10 inches. The plow layer of a Danley silt loam is a dark grayish-brown silt loam with moderate medium crumb structure. It is slightly to medium acid. From 6 to 16 inches the soil is a light yellowish-brown heavy silt loam with weak medium crumb structure. This layer is also medium acid. This leached horizon is comparable to the A_{21} and A_{22} horizons of Lansing silt loam. From 16 to 24 inches is dark yellowish-brown silty clay loam with strong medium to coarse blocky structure. This layer is slightly acid or neutral. In the shallow phase, it rests on gray calcareous shale, usually at depths ranging from 18 to 24 inches. In some places this last layer occurs at shallower depths and the second layer is very thin. Shale bedrock may be within 12 inches of the surface.

Profile in a virgin area of Lansing silt loam:

- A_1 0 to 3 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate medium crumb structure; very friable; high in organic matter and filled with roots; slightly or medium acid; 3 to 5 inches thick.
- A_{21} 3 to 10 inches, yellowish-brown (10YR 5/4 to 5/6) silt loam; weak very fine crumb structure; very friable; organic matter occurs as fillings in worm holes and root channels; contains medium and fine roots; a leached horizon; strongly acid; 5 to 9 inches thick.
- A_{22} 10 to 16 inches, light yellowish-brown (10YR 6/4) silt loam; weak thin platy or fine crumb structure; friable; contains medium-sized roots; a leached horizon; strongly acid; 4 to 8 inches thick.
- B_1 16 to 22 inches, dark yellowish-brown (10YR 4/4) clay loam or heavy silt loam; streaks of light yellowish brown extend into this horizon from above; weak medium blocky structure; friable when moist, moderately plastic when wet; medium to strongly acid; 4 to 8 inches thick.
- B_{21} 22 to 30 inches, dark yellowish-brown (10YR 4/4) clay loam; moderate medium blocky structure; friable when moist, moderately plastic when wet; a layer of clay accumulation; medium acid; 7 to 10 inches thick.
- B_{22} 30 to 38 inches, brown (10YR 5/3) clay loam; moderate coarse blocky structure; firm when moist, moderately plastic when wet; the lowest part of the zone of clay accumulation; large roots extend through this layer; medium acid to neutral; 6 to 10 inches thick.
- C 38 inches +, grayish-brown (10YR 5/2) to light brownish-gray (10YR 6/2) loam or silt loam; firm moderately coarse platy glacial till consisting mainly of shale and sandstone, with some limestone material; moderately to strongly calcareous; topmost 12 inches may be only neutral or mildly alkaline and not calcareous.

Lansing silt loam, 3 to 10 percent slopes (Lg).—This deep, medium-textured, well-drained soil is moderate in native fertility. Its water-holding capacity is good. The soil responds well to management for practically all crops grown in the area. It is well suited to alfalfa, clover, or birdsfoot trefoil in grass-legume mixtures for hay or pasture.

The soil is well suited to the rotations and supporting practices of group 4, table 10. Under these rotations it has medium requirements for lime, phosphorus, and potassium. Intensively grown cash crops respond well to heavier rates of fertilization, including liberal use of nitrogen. Under poor management that adds little or no lime and little fertilizer, the soil will not produce as well as Honeoye soils on similar slopes, but with good management, crop yields are nearly as high.

Lansing silt loam, 10 to 20 percent slopes (Lh).—This deep, medium-textured, well-drained soil has medium fertility. The rapid runoff from its moderate slopes results in loss of water needed by crops and creates a moderately severe erosion problem. Response to intensive management is not so good as on the less sloping soils. It is a fair soil for hay and pasture crops, but intensively grown cash crops are less likely to be successful. Alfalfa is probably the best suited legume. Birdsfoot trefoil may be better suited for long stands of sod. Ladino clover may be damaged by drought in midsummer.

Intertilled crops are not so well suited to the soil as sod crops and small grains, but they can be grown if necessary. The rotations of group 7, table 10, can be used. These rotations require medium amounts of lime, phosphorus, and potassium. Response to larger amounts of fertilizer is generally small.

Lansing silt loam, eroded, 10 to 20 percent slopes (Lk).—This soil has lost most of its original surface layer. The present plow layer consists mainly of subsoil material. It is low in organic matter. The control of erosion and conservation of water are much more difficult on this soil than they are on the uneroded soil on similar slopes. Special attention should be paid to building up organic matter by using sod crops and manure.

This soil is not so well suited to crops as the uneroded soil. It can be used for the rotations of group 8, table 10, with the supporting practices listed. Medium amounts of lime, phosphorus, and potassium will be necessary. Response to larger amounts of lime and fertilizer is generally small.

Permanent pasture on this soil gives fair yields of forage in spring and early in summer when moisture is plentiful. Little is produced later in the season. A better stand can be produced by plowing and reseeding to suitable cultivated legumes and grasses.

Lansing silt loam, 20 to 30 percent slopes (Ll).—The slopes of this well-drained, medium-textured soil are too steep for the use of most modern agricultural machinery. Runoff is rapid, and the erosion problem is serious. The soil should be kept in permanent sod if possible.

If it is necessary to grow crops on this soil, the rotations of group 11, table 10, can be used, but with difficulty. Medium rates of liming and fertilization with phosphorus and potassium are required. If legumes are not grown, nitrogen is also needed. Native pastures can be improved in spring and early in summer by addition of lime and fertilizer, but water is usually the limiting factor in midsummer. The best pastures are obtained by seeding a legume such as birdsfoot trefoil in a small grain and allowing it to remain as long as the stand is good.

Lansing silt loam, eroded, 20 to 30 percent slopes (Lm).—This soil has lost most of its original plow layer. The present plow layer is made up of subsoil material in most places. This layer is low in organic matter. It absorbs water more slowly than the uneroded soil and erodes more easily. Use of machinery is difficult. Yields are low because of lack of water in midsummer.

This soil can be used for the rotations of group 11, table 10, if necessary. It has medium requirements for lime, phosphorus, and potassium. Little response is obtained from higher rates of liming or fertilization. Native pasture can be improved with lime and fertilizer, but more productive pasture is grown by planting a small grain in which a mixture containing birdsfoot trefoil is seeded. The stand achieved by this seeding should re-

main for a long time. Periodic topdressing is necessary to maintain these stands, but even under good management yields are low in midsummer. Where the slopes are favorable for good air drainage, vineyards are successful. Clean-cultivated vineyards that have rows up and down the slope erode very seriously; contour-planted vineyards erode much less.

Lansing and Danley silt loams, 12 to 20 inches deep, 3 to 8 percent slopes (Ld).—These are well-drained medium to moderately fine textured soils that are shallow over shale or sandstone bedrock. The soil profile over shale is like that described for the Danley soil. The profile over sandstone is like that of Lansing silt loam on comparable slopes, except that the horizons below the B_{21} are lacking. Shallow depth to bedrock limits the agricultural use of these soils by allowing them to dry out in midsummer. Diversion terraces cannot be used to control runoff because bedrock is so near the surface.

The rotations and supporting practices of rotation group 6, table 10, are best suited to these soils. They can be used for corn, small grains, dry beans, hay, or pasture with fair success, but crop yields average 25 to 50 percent less than on the deeper phases of Lansing silt loam. Because of droughtiness, the deeper rooted legumes usually do better than very shallow rooted ones such as Ladino clover. The response to management is so small because of lack of moisture that intensive growing of cash crops is not justified. These soils have medium requirements for lime, phosphorus, and potassium. The response to heavier applications is so small that their use does not pay.

Lansing and Danley silt loams, 12 to 20 inches deep, eroded, 8 to 15 percent slopes (Le).—These are shallow, well-drained, medium-textured soils that have low water-holding capacity. Most areas of these soils are seriously eroded, and this further reduces depth and water-holding capacity.

About one-third of this mapping unit is used for crops, but it is poor cropland. Shallow depth prevents the use of diversion terraces, and water control must be achieved mainly by choice of rotations. The rotations and supporting practices of group 10, table 10, are most suitable. Under these rotations, the soils have medium lime, potassium, and phosphorus requirements. Little response is obtained from heavier applications.

Lansing and Danley silt loams, 12 to 20 inches deep, eroded, 15 to 25 percent slopes (Lf).—Low water-holding capacity and rapid runoff make these soils droughty. Most of them are already seriously eroded and are likely to erode further.

These soils are poor for most crops or pasture. Where they lie on slopes with good air drainage, they are fair for vineyards. They should not be used for intertilled crops. The rotations and practices suggested in group 11, table 10, with medium applications of lime, phosphorus, and potassium, are suitable for these soils.

Permanent pastures may be improved enough by lime and fertilizer to provide spring grazing, but they produce little in midsummer. Forestry is the best use for many of these areas.

Lima Series

These are moderately well drained, medium-textured, high-lime soils. They have developed in firm glacial till that was derived mainly from limestone and shale. The Lima series is the moderately well drained member of the catena that includes the well-drained Honeoye soils, the poorly drained Kendaia soils, and the very poorly drained Lyons soil. The upper 14 to 18 inches of the profile resembles the profile of the Honeoye soils. Below that depth, the Lima soils are mottled because they are periodically saturated with water.

The Lima soils are among the most productive in the two counties. They are well suited to all the crops common to the area except the deep-rooted legumes and tree fruits. They are less well suited to alfalfa than the Honeoye soils, but alfalfa can be grown successfully. It is probably the most productive legume for stands intended to last 3 years or less. The Lima soils are better suited to Ladino clover than the Honeoye soils. Yields usually exceed those on Honeoye soils in dry years, but they vary more according to the wetness of the season.

Typical profile of Lima silt loam under forest:

- A_1 0 to 5 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate medium crumb structure; friable; contains many small and medium-sized roots; slightly acid to neutral; 4 to 6 inches thick.
- A_2 5 to 10 inches, light yellowish-brown (10YR 6/4) silt loam; weak medium crumb structure; friable; well supplied with fine and medium-sized roots; slightly acid to neutral; 0 to 6 inches thick.
- B_{21} 10 to 16 inches, dark yellowish-brown (10YR 4/4) heavy silt loam, in some profiles with low-contrast mottling of grayish brown (10YR 5/2); moderate medium blocky structure; firm; excellent water-holding capacity; good root penetration; neutral; 4 to 8 inches thick.
- B_{22g} 16 to 24 inches, yellowish-brown (10YR 5/4) heavy silt loam with low-contrast mottling of light brownish gray (10YR 6/2); moderate coarse blocky structure; firm when moist, slightly plastic when wet; readily penetrated by roots; good moisture-holding capacity; neutral to weakly calcareous; 5 to 10 inches thick.
- C_{1g} 24 to 36 inches, grayish-brown (10YR 5/2) loam or silt loam faintly mottled with light brownish gray (10YR 6/2); coarse platy structure; aggregates hard when dry, firm when moist; fair root penetration but mainly along cracks; free lime at usual depth of about 24 inches; 8 to 18 inches thick.
- C_2 36 inches +, compact light brownish-gray (10YR 6/2) loam; gritty, highly calcareous glacial till from limestone and shale.

Lima fine sandy loam, 0 to 3 percent slopes (Ln).—This is an excellent soil, easy to cultivate and well suited to intertilled crops. Runoff is slow, and erosion is not a hazard. Internal drainage is somewhat restricted but does not interfere seriously with use of the soil except in very wet years. The soil has good water-holding capacity and responds well to the intensive management needed for growing high-value cash crops.

To make the best use of the favorable properties of this soil, it should be heavily fertilized and used intensively. The rotations of group 1, table 10, are suitable. For maintenance of fertility it has a low lime requirement and medium phosphorus and potassium requirements, but it responds well to the larger amounts of fertilizer and nitrogen applied for cash crops. Alfalfa can be grown,

but it may winterkill if the soil freezes and thaws many times during the winter. This is a poor soil for tree fruits because the wet lower subsoil restricts rooting.

Lima fine sandy loam, 3 to 10 percent slopes (Lo).—On this gently sloping soil, runoff is more rapid, loss of water is greater, and erosion is more serious than on the nearly level phase of Lima fine sandy loam. It is a very productive soil, well suited to most crops and especially suited to vegetable crops grown under intensive management. Moderate restriction of internal drainage makes this soil poor for tree fruits. Alfalfa can be grown successfully and is probably the best legume for stands intended to last 3 years or less.

Much of this soil has been improved by tile drainage. It is suited to the rotations and supporting practices of group 4, table 10. It needs longer rotations and more practices to control runoff than does the same soil on milder slopes. For maintenance of fertility the soil has a low lime requirement and medium phosphorus and potassium requirements, but it responds well to the larger amounts of fertilizer and nitrogen applied for intensively grown cash crops. Practices to maintain the supply of organic matter are very important.

Lima silt loam, 12 to 20 inches deep, 0 to 3 percent slopes (Lp).—This moderately well drained to somewhat poorly drained soil is shallow over limestone bedrock. It is a minor soil, mapped only in Ontario County, and is associated with the well-drained Farmington soils. The upper part of the soil profile is like that described for Lima silt loam, but bedrock lies at depths of 12 to 20 inches. Part of the B horizon is present, but the C horizon is usually lacking.

This soil can be used for the same crops as the deeper Lima silt loam on the same slopes, but its shallow depth limits water-holding capacity and causes the soil to respond less to good management. The soil can be used for the rotations of group 1, table 10, but rotations that include row crops only once in 4 to 5 years, or not at all, are the most practical. Yields are low, and the soil is poorly suited to crops that require much labor or many management practices. It can be used for oats, corn, or winter wheat. It is a fair soil for hay and pasture. It is poorly suited to alfalfa, but red clover and Ladino clover can be grown. Pastures produce well in spring and early in summer but are generally too dry to do well in midsummer. The soil has low requirements for lime and potassium and a medium requirement for phosphorus. It rarely responds to higher rates of fertilization with any plant nutrient except nitrogen.

Lima silt loam, 0 to 3 percent slopes (Lr).—This soil has the profile described under the Lima series. It is associated with Honeoye silt loams. Its crop suitability and management requirements are similar to those of Lima fine sandy loam on similar slopes. This finer textured soil is harder to keep in tilth and it needs less potassium than the fine sandy loam. It is one of the most important soils of the area and is suited to almost all of the crops grown in this region. It is not suited to tree fruits because it restricts their root development. Potatoes are not a good crop for this soil because they are likely to develop scab. Alfalfa can be used as the principal legume in meadows that remain for only 2 or 3 years, but it can be killed by frost heaving in winter.

The average yields over a period of years probably equal or slightly exceed those on Honeoye silt loam, 0 to 3 percent slopes, but the yields are much lower in wet years and may be considerably higher in dry years. The soil is suited to all of the rotations of group 1, table 10, with few or no supporting practices to control runoff. Under these rotations it has low requirements for lime and potassium, and a medium requirement for phosphorus. It responds well to heavier rates of fertilization, including application of nitrogen. This is a good soil for pasture but is so well suited to intensive growing of cash crops that use for pasture cannot be justified.

Lima silt loam, 3 to 10 percent slopes (Ls).—This gently sloping soil is like the Lima silt loam on slopes less than 3 percent but it has more rapid runoff. Some water is lost from crop use, and erosion is a minor problem. This soil is not suited to the most intensive rotations that are used on the nearly level Lima soils. It needs simple practices for control of runoff. The rotations and practices suggested in rotation group 4, table 10, are good for this soil. When used for these rotations the soil has low requirements for lime and potassium and a medium requirement for phosphorus. Higher rates of fertilization, including use of nitrogen on intensively grown crops, bring a good response.

Lima silt loam, 10 to 20 percent slopes (Lt).—Almost half of this soil has been eroded enough that the present plow layer is made up of former subsoil material. In these places, free lime lies within 18 inches of the surface. Steeper slopes cause greater runoff, loss of water needed by crops, and more serious erosion than is evident on the other Lima soils. Response to good management is only moderate because moisture for crops is lacking in midsummer.

The soil can be used for most of the crops grown in this area. The root zone is too restricted for tree fruits. Alfalfa is the best legume for stands intended to last 3 years or less; birdsfoot trefoil is better for longer stands. The soil needs rotations and supporting practices like those of group 8, table 10. For these rotations, the soil has low lime and potassium requirements and a medium phosphorus requirement. Response to heavier applications of these amendments is low. Nitrogen gives a good response on most areas, especially those that are eroded and are low in organic matter.

Lobdell Series

This series is moderately well drained. The upper soil layers are acid and the lower layers are neutral. The series occurs in the first bottom where thin layers of sediments are deposited annually by streams in flood. The soil material comes from nearby uplands where most of the soils are medium in lime. The Lobdell series is the medium acid equivalent of the Eel series which occurs in high-lime areas. It occurs in a transition zone between soils of the neutral Genesee catena in the northern part of the area and soils of the acid Tioga catena in the southern part. The Lobdell soils are the moderately well drained associates of the well-drained Chagrin soils, the poorly drained Wayland soils, and the very poorly drained Sloan soil.

Typical profile of Lobdell silt loam under forest:

A_1 0 to 6 inches, grayish-brown (10YR 5/2) silt loam; moderate medium granular structure; friable when moist, slightly plastic when wet; contains many fine and medium-sized roots; slightly acid (pH 6.1 to 6.5); 5 to 8 inches thick.

C_1 6 to 18 inches, light yellowish-brown or pale-brown (10YR 6/4 to 6/3) silt loam; weak medium crumb structure; friable; slightly to medium acid; 10 to 20 inches thick.

C_g 18 inches +, pale-brown (10YR 6/3) silt loam or fine sandy loam mottled with gray (10YR 5/1) and yellowish brown (10YR 5/4); layers may range from sandy loam to silty clay loam and contain layers of gravel in some places; weak medium blocky to crumb structure; firm in place but friable if broken out when moist; neutral.

Lobdell silt loam, 0 to 2 percent slopes (Lu).—Most of this soil in Ontario and Yates Counties occurs as long narrow strips between streams and the nearby uplands. It is moderately well drained, but it is flooded periodically. The soil is free of gravel and stones.

This is a good soil for corn, most of the intensively grown cash crops, hay, and pasture. It is less well suited to spring grains because planting is delayed in spring. It is not well suited to alfalfa, but alfalfa may be used in mixtures with other legumes. It is an excellent soil for Ladino clover.

This soil is suited to intensive use for the rotations of group 1, table 10, and if so used, needs few or no supporting practices for the control of water. Its requirements for lime and phosphorus are medium, and for potassium its requirement is low. Many crops, especially intensively grown vegetables, respond well to higher rates of fertilization, including use of nitrogen.

Lordstown Series

These are shallow to moderately deep strongly acid soils that developed in loose glacial till deposited over sandstone and shale bedrock. Their profiles are typical of the strongly acid well-drained soils of these counties. An outstanding feature is the bright yellowish-brown color of their subsoils. These soils usually are strongly sloping and stony or channery. They resemble the well-drained Bath soils, except that the Bath soils are underlain by a deep firm glacial till.

Typical profile of Lordstown channery silt loam under forest:

A_0 Almost black humus, unmixed with mineral soil, held in a mat of fine roots; very strongly to extremely acid; 2 to 4 inches thick.

A_2 0 to 2 inches, pinkish-gray (7.5YR 6/2) channery silt; color may be masked by mixing in of organic matter; structureless or very weak fine crumb structure; friable; very strongly acid (pH 4.5 to 5.0); ½ to 3 inches thick.

B_{21} 2 to 8 inches, brownish-yellow (10YR 6/6) to strong-brown (7.5YR 5/6) channery silt loam; weak very fine crumb structure; very friable; a well-aerated layer depleted of bases and rich in iron oxide; contains many roots; strongly to very strongly acid; 5 to 8 inches thick.

B_{22} 8 to 18 inches, yellowish-brown (10YR 5/6) channery silt loam similar to horizon above but less yellowish; weak fine crumb structure; friable; contains large and medium-sized roots; strongly acid; 8 to 12 inches thick.

B_3 18 to 28 inches, light yellowish-brown (10YR 6/4) channery or flaggy silt loam; weak fine crumb structure; friable to slightly firm; permeable to roots and water; transitional to the parent material; strongly acid; 8 to 14 inches thick.

C 28 to 32 inches, grayish-brown (10YR 5/2) to light brownish-gray (10YR 6/2) very flaggy loam or silt loam; loose to slightly firm glacial till consisting mainly of material from the underlying thin-bedded, acid, fine-grained sandstone and shale; very weak structure; strongly acid; layer ranges up to 8 inches thick but may be absent in places.

D 32 inches +, interbedded acid Devonian sandstone and shale bedrock, in the upper part commonly somewhat broken and displaced by glacial action; occurs at depths ranging from 12 to more than 40 inches.

Where soil is shallow, all of B_3 and C and part of B_{22} horizons are lacking.

Lordstown channery silt loam, 5 to 15 percent slopes (Lw).—This soil is fair for cultivated crops, but not much of it is used, because most of it is located at high elevations that are not easily accessible. Machinery can be used on these slopes, but bedrock outcrops may interfere with tillage in some places. Most of the soil is deep enough to have a fair moisture supply and to allow normal tillage. Runoff is moderately rapid, and water control is a problem.

The soil is suited to corn for grain or silage, small grains, hay, pasture, and potatoes. Other crops can be grown, but choice of crops is limited by stoniness, low fertility, strong acidity, low moisture supply in the soil, or poor location for marketing. The rotations and supporting practices of group 3, table 10, are suitable. For maintaining fertility under these rotations, the soil has a high lime requirement and medium phosphorus and potassium requirements. Potatoes respond moderately well to heavier rates of fertilization, including use of nitrogen. Either alfalfa or birdsfoot trefoil can be grown successfully if enough lime and fertilizer are used.

Lordstown channery silt loam, 15 to 25 percent slopes (Lx).—This soil is restricted in use and in response to management by shallow depth, low water-holding capacity, moderately steep slopes, and a moderate erosion hazard. It most commonly lies on long continuous slopes flanked on the lower edge by less well-drained Mardin or Volusia soils and on the upper side by Fremont soils or sloping phases of Lordstown soils. This phase is shallower than the less sloping Lordstown soils. The depth to bedrock is between 15 and 25 inches in most places, but some areas are deeper. The soil is uneroded or only slightly eroded. The rapid runoff may result in moderate erosion. Steep slopes make the use of agricultural machinery difficult.

Rotation group 6, table 10, suggests some rotations and practices suitable for this soil. The rotations that have 2 or more years of sod crops are the best. The soil can be used for potatoes, but limited moisture supply and difficulty of cultivation make it less suitable than many other soils. Under the rotations of group 6, the soil has a high lime requirement and medium phosphorus and potassium requirements.

Most crops give little response to larger amounts of fertilizer, but potatoes require large applications for best yields. Where potatoes are grown, lime should be applied only in small amounts at the time of seeding the legume in the rotation.

Permanent native pastures can be improved by lime and fertilizer. More productive pastures are obtained by plowing and reseeding to mixtures of legumes and grasses. Ladino clover is an excellent legume, but birdsfoot trefoil may yield more over a long period of time.

Lordstown channery silt loam, eroded, 15 to 25 percent slopes (Ly).—This soil has lost most or all of its original plow layer by erosion. Organic matter is low, and the soil is 6 to 10 inches thinner over bedrock than the uneroded Lordstown channery silt loam, 15 to 25 percent slopes. Yields are lower, and crop suitability is more limited.

The soil is best suited to long-time stands of legume-grass mixtures for hay or pasture, but it can be used for the rotations of group 10, table 10. To maintain soil fertility, high rates of liming and medium rates of fertilization with phosphorus and potassium are needed. Response is small to larger amounts of phosphorus and potassium, but nitrogen is badly needed on this eroded soil.

This soil is suited to permanent pasture. Higher pasture yields and better soil conservation generally can be obtained by plowing at long intervals, or when the legume fails, and by reseeding with productive legumes and grasses.

Lordstown soils, 45 to 70 percent slopes (Lz).—Bedrock outcrops in many places on these very steep soils. Depth ranges from almost nothing to about 3 feet. The depth varies extremely within short distances.

These are nonagricultural soils. About 96 percent is covered with second-growth and third-growth forests. Open areas considered to be idle account for 3 percent of the total acreage, and 1 percent is within areas used for pasture or crops.

Lordstown and Manlius soils, 25 to 45 percent slopes (Lv).—This unit includes steep areas of the Lordstown soils just described and the Manlius soils described on this page. Both are very strongly acid well-drained soils, low in fertility and shallow to moderately deep over bedrock. The soils are unsuited to cropping because the slopes are too steep for the use of machinery.

These soils are in rotation group 12, table 10. They can be used for permanent pasture, but in most places they are better suited to forestry. Without lime and fertilizer, pasture produces very little. The steep slopes are so difficult to lime and fertilize that few pastures are improved. For maintenance of improved permanent pasture, the soil has a high lime requirement and medium phosphorus and potassium requirements. Such pasture produces well in spring and early in summer when moisture is usually plentiful, but produces little in other seasons.

Lyons Series

This very poorly drained series developed in highly calcareous medium-textured glacial till. It occupies level areas and depressions that have poor drainage outlets. It is associated with the well-drained Honeoye soils, the moderately well drained Lima soils, and the poorly drained Kendaia soils. This series is also associated with the Lansing soils and the Ontario soils. The black highly organic surface soil and the strongly mottled subsoil indicate the very poor drainage.

Typical profile of Lyons silt loam under forest:

A_1 0 to 6 inches, very dark gray (10YR 3/1) to black (10YR 2/1) silt loam; moderate medium crumb structure; friable when moist, slightly sticky when wet; high in organic matter and matted with small roots; neutral; 5 to 8 inches thick.

G_1 6 to 12 inches, gray (10YR 5/1) silt loam; rust-brown streaks occur along old root channels but there is little other mottling; weak medium blocky structure; firm when moist, slightly plastic when wet; an intensely reduced horizon; slightly alkaline; 4 to 8 inches thick.

G_2 12 to 24 inches, brown to dark-brown (10YR 4/3), gray (10YR 5/1), and strong-brown (7.5YR 5/8) mottled silt loam; moderately compact in place but breaks out as coarse blocky aggregates; firm when moist, slightly sticky when wet; only a few medium-sized roots penetrate along cracks; saturated with water most of the time; slightly alkaline; 8 to 16 inches thick.

CG 24 inches +, strongly mottled light brownish-gray (10YR 6/2) and dark yellowish-brown (10YR 4/4) gritty silt loam; compact and hard in place; firm when moist; calcareous; gradual transition to bluish-gray compact high-lime glacial till; permanent water table normally above the 36-inch depth.

Lyons silt loam, 0 to 1 percent slopes (LA).—When not drained, this soil is too wet for agricultural use. Few areas have been well drained artificially. Where the soil is partly drained by open ditches, the excess surface water is removed and the water table is lowered slightly. These areas are suitable for pasture, which produces well during dry weather.

Where good artificial drainage has been established, this is one of the most productive soils in the area and is well suited to the rotations of group 1, table 10. Intensively grown vegetable crops, corn, hay, and pasture are all good crops for the soil. These rotations have low requirements for lime and potassium and a medium requirement for phosphorus on this soil. The soil responds well to higher rates of fertilization if it is used for intensively grown vegetable crops.

Manlius Series

These very strongly acid well-drained soils developed in glacial till from acid thin-bedded shale. The depth to shale bedrock is generally shallow but may be 5 or more feet in some places. These soils resemble the Lordstown soils except that the parent material of the Manlius series is extremely shaly. These soils are very low in native fertility, but crops respond well to fertilizers. Where the shale bedrock is near the surface, the low supplies of moisture limit plant growth. The Manlius series is the well-drained member of the catena that includes the imperfectly drained Hornell soils and the poorly drained Allis soils. Manlius soils are not so clayey as the associated soils.

Typical profile of Manlius shaly silt loam under forest:

A_0 Raw humus mat; very strongly acid; 2 to 4 inches thick.

A_2 0 to 1 inch, very pale brown (10YR 7/3) silt loam; very weak very fine crumb structure; loose; contains many small and medium-sized roots; a leached horizon partly masked by organic matter; very strongly acid; ¼ to 1½ inches thick.

B_2 1 to 20 inches, yellowish-brown (10YR 5/6 to 5/4) shaly silt loam that becomes duller in color with depth; weak fine crumb structure; friable, slightly plastic when wet; roots penetrate easily; good water-holding capacity; very strongly acid; 12 to 24 inches thick.

C 20 to 36 inches, olive-gray (5Y 5/2) very shaly silt loam; friable when moist, slightly plastic when wet; readily penetrated by roots; medium water-holding capacity; contains large chunks of shale; strongly acid; 0 to 18 inches thick.

D 36 inches +, gray (10YR 6/1) thin-bedded flaky shale; strongly acid (pH 5.0 to 5.5).

Where bedrock is at shallow depth, C horizon and lower part of B_2 horizon are lacking.

Manlius shaly silt loam, 36 inches or more deep, 5 to 15 percent slopes (Ma).—This soil is extremely acid and low in fertility, but it responds well to fertilizer and lime and to other good management practices. It is moderately erodible. This restricts the rotations to which it is suited. Special attention should be paid to maintaining organic matter and controlling water. The soil has fair to good water-holding capacity.

This soil is suited to the rotations and supporting practices of group 7, table 10. It is fair to good for crops and pasture, but most of the soil is now poorly managed and produces low yields. It can be used for corn for grain or silage, small grains, potatoes and alfalfa, birdsfoot trefoil, and other sod crops. It could be used for cash crops other than potatoes, but it is not practical to grow such crops at this distance from markets.

The requirement of this soil for lime is high, and for phosphorus and potassium it is medium. These amounts should maintain fertility, but potatoes and other cash crops respond well to larger amounts of fertilizer. Hay and pasture show very small response to extra fertilizer.

Manlius shaly silt loam, 36 inches or more deep, eroded, 5 to 15 percent slopes (Mb).—This soil has lost most, or all, of the original surface layer through erosion, so that original subsoil material is now the plow layer. As a result the soil contains less organic matter, is less permeable to moisture, loses more of the water needed by plants, and erodes more easily than uneroded Manlius shaly silt loam, 36 inches or more deep, on 5 to 15 percent slopes. These problems make this phase more difficult to manage and less suited to most crops. Like the other Manlius soils, this phase is very acid and very low in fertility.

This soil is best suited to corn, small grains, and sod crops, but it can be used for potatoes or other cash crops if very intensive management is applied. The rotations and supporting practices of rotation group 9, table 10, are needed. Special attention should be paid to building up organic matter by the use of manure and long-lived stands of sod crops. Wherever possible, the sod should remain as long as the legume persists in the stand. Birdsfoot trefoil is one of the best legumes for this purpose. Alfalfa can be grown when limed and fertilized, but it normally persists only 2 or 3 years.

This soil has high requirements for lime and medium requirements for phosphorus and potassium. It generally needs liberal applications of nitrogen to replenish its supplies after erosion. Nitrogen is especially important where legumes are lacking in the sod crops.

Manlius shaly silt loam, 12 to 20 inches deep, eroded, 15 to 25 percent slopes (Mc).—Moderately steep slopes and low water-holding capacity make this a poor soil for agriculture. The strong slopes are difficult to till, and the lack of water allows little response to management. Over most of the area, the depth to bedrock and the water-holding capacity have been further reduced by severe erosion. The soil is very strongly acid and very low in fertility.

Wherever possible, this soil should be reforested or should be kept in sod as long as the legumes last. Where slopes are no longer than 300 feet, 1 year of intertilled crop can be rotated with 2 or more years of sod crops. In most places this soil needs the rotations of group 11, table 10. Shallow depth prevents construction of the diversion terraces needed to divert runoff and control erosion if more intensive rotations are used. Under the rotations that are suitable, the soil has a high lime requirement and medium requirements for phosphorus and potassium. It also needs nitrogen very much, and most crops respond well to use of manure or commercial nitrogen.

Manlius shaly silt loam, 36 inches or more deep, eroded, 15 to 25 percent slopes (Md).—Because of its greater depth to bedrock and consequently higher water-holding capacity, this is a much better soil than Manlius shaly silt loam, 12 to 20 inches deep, eroded, on 15 to 25 percent slopes. About 90 percent of the area has lost 5 to 10 inches of soil and is low in organic matter. Most of the uneroded 10 percent is in woods. This steeply sloping soil is hard to work.

This soil does not respond to management well enough to be used successfully for intensively grown cash crops. Hay and pasture are the best suited crops. The rotations of group 9, table 10, are suitable if the supporting practices shown in the table are followed. Restoring organic matter to the surface layer is one of the most important management needs. Under the rotations suggested, the soil has a high lime requirement and medium requirements for potassium and phosphorus. It also needs nitrogen, either as commercial fertilizer or in manure.

Improving native pastures with fertilizer and lime is difficult. Better results are generally obtained by using a rotation in which a grass-legume mixture is seeded in small grain and is allowed to remain as long as the legume persists.

Mardin Series

These moderately well drained very strongly acid soils have developed in glacial till consisting mainly of sandstone and shale. They have a very dense layer at about 20 inches. There is a gradual transition to hard, slowly permeable glacial till. The topmost 15 inches of the Mardin profile resembles that of the Bath soils. The mottled color below that depth shows that internal drainage is restricted.

The Mardin series is the moderately well drained member of the catena that includes the well-drained Bath soils, the poorly drained Volusia soils, and the very poorly drained Chippewa soils. Mardin soils are fair to good for hay, pasture, and potatoes, but not so good as the Bath soils.

Typical profile of Mardin channery silt loam in a virgin area:

A_0	Very dark gray to black humus, unmixed with mineral soil, held firmly in a mat of fine roots; extremely to very strongly acid; 1 to 3 inches thick.
A_2	0 to 1 inch, very thin light brownish-gray (10YR 6/2) silt, slightly stained by organic matter; structureless; very friable; an intensively leached layer; very strongly acid; ½ to 3 inches thick.
B_2	1 to 15 inches, yellowish-brown to brownish-yellow (10YR 5/8 to 6/8) channery silt loam; colors become more grayish with depth; very weak very fine crumb structure; very friable; a well-aerated layer strongly leached of bases and rich in iron oxide; contains medium-sized roots; strongly to very strongly acid; 8 to 15 inches thick.

A'_{2g}[7] 15 to 20 inches, light yellowish-brown (10YR 6/4) channery silt loam, strongly mottled with yellowish brown and light brownish gray; weak medium crumb structure; friable; contains medium-sized roots; layer is periodically waterlogged; strongly acid; 3 to 7 inches thick.

B'_{2gm} 20 to 30 inches, pale-brown (10YR 6/3), gray (10YR 5/1), and yellowish-brown (10YR 5/4) mottled channery silt loam, high in silts and low in clay; very weak coarse blocky structure; a hardpan layer, very firm to hard, dense; very slowly permeable to water; penetrated by very few roots; strongly acid; 10 to 18 inches thick.

B'_{3m} 30 to 60 inches, channery silt loam similar to layer above but less mottled and not quite so hard; strongly acid in the upper part but may be only medium to slightly acid in the lower part; 20 to 40 inches thick.

C 60 inches +, grayish-brown (10YR 5/2) channery silt loam or loam glacial till; weak platy structure; firm; channers are flat, fine-grained sandstone fragments 2 to 6 inches across; till consists mainly of acid sandstone and shale materials; medium to strongly acid, may be neutral at depths of 7 to 10 feet.

Mardin channery silt loam, 3 to 8 percent slopes (Me).—Restricted internal drainage somewhat limits the response of this soil to management, but it is a good soil for many crops. It is suited to corn for grain or silage, small grains, sod crops for hay or pasture, and small fruits, potatoes, and other cash crops. It cannot be used continuously for row crops without field terraces, and the hardpan at about 15 inches generally prevents the construction of such terraces. The soil can be used for most of the rotations and supporting practices of group 2, table 10. Alfalfa should not be used as the only legume in a sod crop, but it generally yields enough to justify its inclusion in the seeding mixture. The soil is very poorly suited to tree fruits.

Under the rotations suggested, this soil has a high lime requirement and medium requirements for potassium and phosphorus. Hay and pasture respond little to more fertilizer. Potatoes respond well if they receive more fertilizer and nitrogen.

Table 7 gives data on yields obtained from experimental plots on this soil that were treated for a period of 11 years with different combinations of lime, fertilizer, and manure. The plots are near Ithaca, New York.

Mardin channery silt loam, 8 to 15 percent slopes (Mf).—This sloping soil has a more serious water control problem than Mardin channery silt loam, 3 to 8 percent slopes. About the same crops are suited to this more strongly sloping soil, but they should be grown in longer rotations, and practices for control of runoff should be more intensive. Maintaining the fertility of this soil under the rotations and supporting practices of group 5, table 10, requires a high rate of liming and a medium rate of fertilization with phosphorus and potassium. Where legumes are not an important part of the rotations, and manure is not used liberally, application of commercial nitrogen is necessary. Sod crops respond little to larger amounts of fertilizer, but potatoes respond well to heavy fertilization.

Mardin channery silt loam, eroded, 8 to 15 percent slopes (Mg).—This soil has lost most of its original surface layer through erosion. Its depth to the very compact substratum is 5 to 10 inches less than that of Mardin channery silt loam, 8 to 15 percent slopes. The organic-matter content is low. This soil has lower water-holding capacity and less response to good management than the uneroded phase having the same slopes. The organic matter can be increased by growing sod crops most of the time or by applying manure liberally. This will lessen runoff and increase absorption of water.

Corn for silage, small grains, hay, and pasture are good crops for this soil. It can also be used for potatoes, but the returns are small for the large amounts of fertilizer required. The rotations and supporting practices of rotation group 7, table 10, are suited to this soil. Under these rotations, the soil has a high lime requirement and medium phosphorus and potassium requirements. In addition, it needs nitrogen, which can be obtained from legumes, manure, or commercial fertilizer.

Mardin channery silt loam, eroded, 15 to 25 percent slopes (Mh).—Low fertility and rapid runoff are the main problems on this soil. Its use is restricted by the strong

TABLE 7.—*Average acre yield of crops in a rotation of corn—oats—2 years of hay—wheat—1 year of hay on Mardin channery silt loam, 3 to 8 percent slopes, at Ithaca, N. Y.*

Amendments applied during rotation [1]	Crop and years of record				
	Corn for silage	Oats	Mixed hay after oats [3]	Winter wheat	Mixed hay after wheat [4]
	11	[2] 5	11	11	5
	Tons	*Bu.*	*Tons*	*Bu.*	*Tons*
a. 27 tons of manure per acre	7. 9	30	1. 2	15	------
b. 1,000 lbs. limestone, 60 lbs. phosphate (P_2O_5), and 18 tons manure per acre	9. 7	39	1. 7	18	2. 0
c. 1,000 lbs. limestone, 120 lbs. phosphate (P_2O_5), and 27 tons manure per acre	10. 0	48	1. 9	24	2. 5
d. 3,000 lbs. limestone, 60 lbs. phosphate (P_2O_5), and 18 tons manure per acre	10. 4	44	2. 0	25	2. 3
e. 3,000 lbs. limestone, 120 lbs. phosphate (P_2O_5), and 27 tons manure per acre	11. 5	48	2. 1	27	2. 7
f. 5,000 lbs. limestone, 120 lbs. phosphate (P_2O_5), and 27 tons manure per acre	12. 2	44	2. 2	30	2. 8

[1] Lime: 500 pounds is applied with each hay seeding in experiments b and c; another 2,000 pounds before plowing for corn in experiments d and e; and another 2,000 pounds after plowing for corn in f.

Phosphate: 30 pounds is applied with each hay seeding in experiments b and d; and another 30 pounds with oats, and 30 pounds with wheat in experiments c, e, and f.

Manure: Equal amounts are applied to corn, to 2nd-year hay after oats, and to wheat in the spring.

[2] Yields included for only the last 5 years because of introduction of Mohawk variety.

[3] Seeding mixture is timothy, Ladino clover, red clover, and alfalfa. The yields are an average of the 1st and 2nd hay years over an 11-year period.

[4] Seeding mixture is timothy and red clover.

[7] See footnote 4, page 31.

slope and the slow internal drainage. These slopes are difficult to work. Wherever possible, this soil should be used for long-term stands of hay or pasture. If necessary, an intertilled crop can be used 1 year in the rotation if care is taken to control runoff. Birdsfoot trefoil is probably the best legume for long stands of sod crops. Alfalfa is likely to be winterkilled, and the soil is too droughty for good yields of Ladino clover.

Rotation group 9, table 10, has suitable rotations and practices for this soil. Under these rotations, the soil has a high lime requirement and medium requirements for phosphorus and potassium. It also needs nitrogen, which can be obtained from the legumes used in the rotation, heavy manuring, or nitrogen fertilizer. Little response is received from heavier applications of fertilizer.

Mardin silt loam, 12 to 20 inches deep, 3 to 15 percent slopes (Mk).—The upper part of the profile of this soil is like that described for the series, but solid bedrock is only 12 to 20 inches from the surface. A layer 6 to 10 inches thick, just above the bedrock, is mottled. A few acres have slopes steeper than 15 percent.

The shallow depth makes the root zone 6 to 10 inches thinner than that of the deeper Mardin soils. Crops are less responsive to management because moisture is lacking in dry seasons. Diversion terraces cannot be constructed because the soil is shallow, and sod crops must be grown for a larger part of the rotation to control the runoff.

The soil can be used for the rotations of group 10, table 10, if simple practices for water control are followed. Under such rotations, the soil has a high lime requirement and medium phosphorus and potassium requirements. Nitrogen is usually needed, especially where legumes are not important in the rotations. Crops respond little to good management or to higher rates of fertilization.

Mardin and Langford soils, 25 to 45 percent slopes (Ml).—Steepness of slope limits agricultural use of both of these soils, so they have been shown by the same map symbol, even though they are in different parts of the counties. Both are moderately well drained. The Mardin soil is acid throughout, and the Langford soil is neutral in the substratum.

About 40 percent of this mapping unit has been used for crops or pasture, and most of the acreage used is at least moderately eroded. The soils are too steep for the use of machinery and are unsuited to cropping. These soils are in rotation group 12, table 10. They can be used for permanent pasture if necessary, but wherever possible they should be used for forestry.

Pastures produce little during the summer. The rapid runoff leaves little moisture for plants, and it is difficult to lime and fertilize the soils. For even fair production of pasture, the soils have a high lime requirement and medium requirements for phosphorus and potassium. Without lime, fertilizer, and enough moisture, the native plants produce a very poor cover, and that only during spring and early in summer. If cattle graze such poor pasture, erosion results.

Middlebury Series

These moderately well drained medium-acid soils developed on the first bottoms. The parent material is alluvium that washed from acid soils in the southern part of the surveyed area. New material is added to the surface when the streams overflow in the spring. These are young soils, and the principal evidence of profile development is the organic matter accumulated in the topmost 5 to 8 inches.

The Middlebury series is the moderately well drained member of the catena that includes the well-drained Tioga soil, the poorly drained Holly soil, and the very poorly drained Sloan soil.

Typical profile of Middlebury silt loam under forest:

- A_1 0 to 6 inches, dark grayish-brown (10YR 4/2) mellow silt loam; moderate medium crumb structure; friable when moist, slightly plastic when wet; contains many fine roots; medium acid; 5 to 8 inches thick.
- C_1 6 to 18 inches, light yellowish-brown (10YR 6/4) silt loam; weak medium crumb structure; friable when moist, slightly plastic when wet; readily penetrated by roots; medium acid; 8 to 15 inches thick.
- C_g 18 to 30 inches, grayish-brown (2.5Y 5/2) silt loam mottled with yellowish brown (10YR 5/8); closely resembles layer above except for the intense mottling; weak coarse crumb structure; firm when moist, slightly plastic when wet; medium acid; 8 to 16 inches thick.
- C_2 30 inches +, reddish-brown (2.5YR 5/4) heavy silt loam, weakly mottled with gray and rust brown in the upper part; varies from sandy loam to silty clay loam; moderately dense in place; plastic when wet; medium acid.

Middlebury silt loam, 0 to 2 percent slopes (Mm).—This productive soil is well suited to grasses, shallow-rooted legumes, corn for grain or silage, and some intensively grown cash crops. It is only fair for alfalfa, but alfalfa can be included with other legumes in the seeding mixtures. Spring grains can be grown, but they are likely to lodge and may have to be planted late because the soil is wet. The principal management problem is maintenance of fertility. Control of streambank erosion is necessary in some areas.

The soil is suited to the rotations of group 1, table 10, and needs few supporting practices to control water. Its requirement for lime is high and its requirements for phosphorus and potassium are medium. Intensively grown cash crops respond well to heavier rates of fertilization and the addition of nitrogen. This is a very good soil for pasture, especially for Ladino clover. Pasture on this soil produces well in midsummer when pastures on the uplands are producing little.

Morocco Series

These poorly drained sandy soils have developed in strongly acid deep sands on flats and depressions. The parent materials are lake-laid sands. The soil is poorly drained because it is in flats and depressions that have poor drainage outlets and because the material at depths of 5 feet or more is slowly permeable to water. This underlying material may be very dense glacial till or it may be layers of silt and clay.

This series is associated with the Allendale and Berrien series. The upper part of a typical profile is similar to that of the Allendale series, but sandy material extends to depths of several feet. The Allendale soil, in contrast, is underlain by clay at depths of 2 to 3 feet.

Typical profile of Morocco fine sandy loam under forest:

- A_0 Forest litter overlying a thin mat of raw humus; very strongly acid (pH 4.5 to 5.0); ½ to 2 inches thick.

A_1 0 to 3 inches, dark-gray (10YR 4/1) fine sandy loam; fine crumb structure; friable to loose when moist, nonplastic when wet; very high in organic matter and matted with fine roots; very strongly acid; 2 to 5 inches thick.

A_{2g} 3 to 8 inches, gray (10YR 6/1) to light brownish-gray (10YR 6/2) fine sandy loam, slightly mottled with brown; single-grain structure; firm in place; friable when moist, nonplastic when wet; contains many small roots; very strongly acid; 3 to 10 inches thick.

BG 8 to 28 inches, pale-brown (10YR 6/3) loamy fine sand, strongly mottled with yellowish brown (10YR 5/6); single-grain structure; contains very few roots; layer is saturated with water for long periods; very strongly acid; 15 to 30 inches thick.

C 28 inches +, light yellowish-brown (10YR 6/4) loamy fine sand, faintly mottled with yellowish brown (10YR 5/6); firm; very strongly acid.

Morocco fine sandy loam, 0 to 2 percent slopes (Mn).—Undrained areas of this soil are generally too wet for any crop other than grass hay. Most areas are now forested with soft maple, elm, willow, and alder. If this soil is partly drained, it can be used successfully for corn, hay, pasture, and some crops that are planted late. It does not respond to management very well if it is only partly drained.

If a system is installed that achieves good drainage, this soil is suited to intensively grown cash crops, corn, small fruits, and hay or pasture. The rotations of group 1, table 10, are suitable, but the soil has high lime and potassium requirements and a medium phosphorus requirement. Where the soil is well drained, intensively grown cash crops respond well to higher rates of fertilization and to nitrogen. Alfalfa is poorly suited to this soil, even after it is drained, but Ladino clover is well suited.

Muck, Acid (Unclassified), 0 to 1 Percent Slopes (Mo)

This soil consists of well-decomposed organic material more than 3 feet deep. It was derived from pieces of wood and sedges. The topmost 10 to 18 inches is black, granular, well-decomposed organic matter. This layer is underlain by dark-brown partially decomposed woody material in which original structure of plant material can be identified. The organic deposits range from 3 to more than 10 feet in thickness and rest on bluish-gray sand or sandy clay. The water that accumulates in these areas comes mainly from acid soils.

Without artificial drainage, this soil is too wet for agricultural use. It is covered by soft maple, elm, black ash, alder, and willow. If adequately drained, this is a productive soil used in much the same way as Carlisle muck, 0 to 1 percent slopes. It is well suited to intensively grown cash crops. It can be used continuously for intertilled crops, as well as for the rotations of group 1, table 10. Under these rotations, it has high requirements for lime, phosphorus, and potassium. The principal management problems are control of the water table and maintenance of fertility.

Newton Series

This very poorly drained strongly acid sandy series developed in lake-laid sands in depressions. It is the very poorly drained member of the catena that includes the well-drained Ottawa soils, the moderately well drained Berrien soil, and the poorly drained Morocco soil.

Typical profile of Newton fine sandy loam under forest:

A_0 Black (10YR 2/1) well-decomposed organic matter; coarsely granular; very strongly acid; in some places this is a layer of very shallow peat or muck.

A_{11} 0 to 3 inches, black (10YR 2/1) fine sandy loam; weak fine crumb structure; friable when moist, nonplastic when wet; high in organic matter, full of fine roots; very strongly acid; 2 to 5 inches thick.

A_{12} 3 to 7 inches, very dark gray (10YR 3/1) fine sandy loam, speckled with white quartz grains; nonplastic when wet; high in organic matter; very strongly acid; 4 to 8 inches thick.

G 7 to 20 inches, dark-gray (10YR 4/1) fine sandy loam mottled with yellowish brown (10YR 5/4); mottling increases with depth; weak fine crumb structure; firm in place; contains very few roots; very strongly acid (pH 4.5 to 5.0); 8 to 18 inches thick.

CG 20 inches +, dark-gray (10YR 4/1) sand; mottled with brownish yellow (10YR 6/6) in the upper part but little mottling below 3 feet; compact in place, firm when broken out; nonplastic when wet; layer is permanently saturated with water; very strongly acid.

Newton fine sandy loam, 0 to 1 percent slopes (Na).—Without artificial drainage this soil is too wet for crops or pasture. In most places it is difficult to drain because outlets are lacking. Most areas can be only partly drained, and these can be used for pasture or hay.

If this soil is drained, it is strongly acid and very low in fertility. It remains unproductive unless it is adequately limed and fertilized. It can be used for the rotations of group 1, table 10, but it has high requirements for lime and potassium and a medium requirement for phosphorus. Intensively grown cash crops need even higher rates of fertilization for good yields.

Nunda Series

These are well-drained moderately fine textured soils on glacial till. This till contains a large amount of lacustrine material which was picked up by the ice and mixed with the normal till when the glacier advanced over old lake beds. Nunda soils occur only on the moraine that blocks the old preglacial valley at a point south of Naples in Ontario County. Lacustrine sediments which were deposited between the glacier and this moraine were reworked by short advances of the ice and left as partly mixed till at the moraine. Since the final retreat of the glacier, erosion has modified the original topography and has in spots along the faces of the slopes exposed materials ranging from gravel to fine silt and clay. The Nunda soils have developed in this originally calcareous material. They are strongly acid in the upper layers but calcareous in the substratum.

Typical profile of Nunda silt loam in a cultivated field:

A_p 0 to 7 inches, grayish-brown (10YR 5/2) silt loam; moderate medium crumb structure; friable when moist; contains a few rock fragments; strongly acid where unlimed; 6 to 9 inches thick; in virgin areas the A_1 horizon is about 4 inches thick and has a pH near 6.0.

A_{21} 7 to 13 inches, yellowish-brown to light yellowish-brown (10YR 5/4 to 6/4) silt loam; weak medium to fine crumb structure; friable when moist; contains a few rock fragments; resembles the B_{21} horizon of a Brown Podzolic soil; strongly acid; 5 to 10 inches thick.

A_{22} 13 to 18 inches, pale-brown loam or silt loam; aggregates normally lightest in color on the outside; weak medium crumb to very weak medium or coarse platy structure;

friable when moist; contains a few rock fragments; strongly acid; 3 to 5 inches thick.

B_{21} 18 to 30 inches, brown (10YR 5/3) silt loam; contains more clay than horizon above; moderate to strong medium blocky structure; pale-brown silty material extends from horizon A_{22} as coatings around the aggregates in the topmost inch and throughout the rest of the horizon; the outside of the aggregates is darker than the inside; friable when moist, slightly sticky when wet; contains a few rock fragments; medium acid; 8 to 16 inches thick.

B_{22} 30 to 36 inches, brown (10YR 5/3) silty clay loam; well-developed medium to coarse blocky structure; aggregates slightly darker on outside than on inside; friable when moist, moderately plastic when wet; contains a few rock fragments; a zone of maximum clay accumulation; slightly acid to neutral; 5 to 8 inches thick.

C_1 36 to 44 inches, grayish-brown to light brownish-gray (10YR 5/2 to 6/2) silt loam, commonly somewhat stratified; may contain lenses of very fine sand, silt, or clay; weak coarse platy structure; contains a few rock fragments; neutral to weakly calcareous; 6 to 15 inches thick.

C_2 44 inches +, grayish-brown to light brownish gray (10YR 5/2 to 6/2) silt loam, loam, or silty clay loam; commonly contains lenses of very fine sand; slight stratification in some places; textures vary extremely from place to place and with depth; in many places texture varies so widely from that of horizons above that this horizon must be considered unconformable with the solum; moderately to strongly calcareous.

Nunda silt loam, 0 to 6 percent slopes (Nb).—This soil has good water-holding capacity, and runoff is slow enough to permit the soil to absorb water. The soil is moderately erodible for having such gentle slopes, but if proper precautions are taken against erosion, moderately intensive rotations can be used. The principal management problems are maintaining fertility and good structure.

Corn for grain or silage, small grains, sod crops, alfalfa, potatoes, and other intensively grown cash crops can be grown by using the rotations of group 4, table 10. Under these rotations, maintenance of fertility requires medium applications of lime, phosphorus, and potassium. Potatoes and intensively grown cash crops respond to heavier applications of fertilizer, including liberal use of nitrogen.

Nunda silt loam, 6 to 12 percent slopes (Nc).—These moderately sloping areas have not yet been seriously affected by erosion. The soil has good water-holding capacity and responds moderately well to fertilizer and other good management practices. In spite of having moderate slopes, the soil is severely restricted in its use by rapid runoff and serious erodibility. Intertilled crops should not be grown 2 years in succession. The rotations and supporting practices of rotation group 7, table 10, are suitable. Under these rotations the soil has medium requirements for lime, phosphorus, and potassium.

Nunda silt loam, eroded, 6 to 12 percent slopes (Nd).—This moderately sloping soil has lost most, or all, of the original plow layer through erosion. Organic matter is low, and the soil bakes or crusts very easily. Permeability to moisture is so slow that much of the water runs off. The soil erodes readily. It has good water-holding capacity and responds well to management if organic matter and good structure can be restored.

This well-drained soil is suited to most of the crops grown in the area, but it produces little if managed poorly. Restoring organic matter, controlling runoff, and maintaining fertility are the principal management problems. The soil is suited to the rotations and supporting practices of group 8, table 10. Under these rotations its requirements for lime, phosphorus, and potassium are medium. Its requirement for nitrogen is high. This need can be met by growing legumes in the rotation, by using large amounts of manure, or by applying nitrogen fertilizer.

Nunda silt loam, eroded, 12 to 20 percent slopes (Ne).—This moderately steep soil has a serious erosion problem. About 90 percent of the soil has lost most, or all, of the original plow layer. It is now very low in organic matter and has poor structure. This combination allows even more runoff and erosion.

This soil is poor for cultivated crops but fair for hay or pasture. Most crops on this soil show only a fair response to management. The soil can be used for all of the rotations of group 9, table 10, but it is best not to use row crops. The soil requires medium amounts of lime, phosphorus, and potassium to maintain fertility. It also needs nitrogen from legumes, manure, or commercial fertilizer.

Nunda silt loam, eroded, 20 to 45 percent slopes (Nf).—About 85 percent of this steep erodible soil has lost all, or most, of the original surface layer. This soil varies more in texture and other profile features than the other Nunda soils. Material ranging from sand or gravel to silty clay loam may be exposed in various places, but the most common profile is like that described for the Nunda series.

This steep soil is not suited to cultivation and is poor for pastures. Wherever possible, it should be returned to forest. The rotations of group 12, table 10, are the only ones suited. For even fair pastures, the soil needs medium amounts of lime, phosphorus, and potassium. These amendments are very difficult to apply on such slopes. The native pastures are not very good, and most farmers do not try to improve them. They allow the cattle to graze whatever is produced during the summer months. Special care should be taken not to overgraze the pastures. Such grazing will reduce the already sparse vegetation so much that erosion is certain to continue. This soil is too steep to permit plowing and seeding to the more productive pasture plants.

Odessa Series

These imperfectly drained soils have developed in reddish, calcareous, lake-laid clay and silt. They have the sequence of horizons typical of a Gray-Brown Podzolic soil, but they have very large amounts of clay in their subsoil and substratum. Because the materials are so fine textured, the soils must have appreciable slope to be even imperfectly drained. The Odessa series is the imperfectly drained member of the catena that includes the well-drained Schoharie soils, the poorly drained Lakemont soil, and the very poorly drained Poygan soil. The Odessa soils are very important in Ontario County.

Typical profile of Odessa silt loam under forest:

A_1 0 to 5 inches, dark-brown (7.5YR 3/2) silt loam; moderate medium granular structure; friable when moist, plastic when wet; moderately high in organic matter; contains many fine roots; slightly acid (pH 6.0 to 6.5); 4 to 6 inches thick.

A_{2g} 5 to 12 inches, light yellowish-brown (10YR 6/4) silt loam mottled with dark yellowish brown (10YR 4/4); moderate medium crumb structure; firm, slightly

plastic; contains many small and medium-sized roots; medium acid; 5 to 8 inches thick.

B_{21g} 12 to 18 inches, reddish-brown (5YR 5/4) to brown (7.5YR 5/4) silty clay, mottled with yellowish brown and gray; strong medium blocky structure; firm, plastic; roots penetrate along cracks; neutral to slightly acid; 4 to 7 inches thick.

B_{22g} 18 to 30 inches, reddish-brown to brown silty clay, faintly mottled with yellowish brown (10YR 5/4) and gray (10YR 6/1); strong coarse blocky structure; firm when moist, plastic when wet; roots penetrate along cracks; neutral to mildly alkaline (pH 7.0 to 7.5); 8 to 16 inches thick.

C 30 inches +, dark-brown (7.5YR 4/4) to reddish-brown (5YR 5/4) silty clay; commonly has strong coarse blocky structure within the layers of clay and silt that are the original lake deposit; firm when moist, plastic when wet; calcareous and has nodules and concretions of lime in places.

Odessa silt loam, 0 to 6 percent slopes (Oa).—Maintenance of good structure is the most important management problem on this silty, imperfectly drained soil. The soil is difficult to work. It puddles if plowed when too wet and breaks into clods if plowed when too dry. It is one of the more fertile soils of the county, but response to management is limited by the fine-textured subsoil and imperfect drainage.

Even though it has gentle slopes the soil is erodible. Rotations and supporting practices should be restricted to those of rotation group 4, table 10. This is a poor soil for most of the intensively grown cash crops, although they can be grown if needed. It is a fair soil for corn, for grain or silage, and for spring grains. It is a good soil for winter wheat and hay or pasture. Alfalfa is not well suited, but it can be used to supplement other legumes in the seeding mixtures. Ladino clover, birdsfoot trefoil, and red clover are better suited to this soil. Under the rotations of group 4, table 10, the soil has low requirements for lime and potassium and a medium requirement for phosphorus. Response to larger amounts of fertilizer is small, but most crops, except legumes, respond to the addition of nitrogen.

Odessa silty clay loam, eroded, 6 to 12 percent slopes (Ob).—About 80 percent of this moderately fine textured imperfectly drained soil has been seriously eroded. Most of the original surface soil has been lost, and the present plow layer is in the material of the original subsoil. The supply of organic matter is lower and the structure is poorer than in the uneroded soil. This allows greater runoff and results in a serious erosion problem.

This soil needs long-time stands of legume-grass mixtures for hay or pasture or extremely heavy applications of manure to help restore organic matter and structure to the plow layer. Suitable rotations and supporting practices that will control water and maintain organic matter are given in rotation group 8, table 10. The rotations that have 3 or more years of sod crops to 1 year of row crop are best for this soil. This soil is poor for intertilled crops but fair for small grains and sod crops. Alfalfa should not be used as the only legume in mixtures, but it can supplement other legumes.

Under the rotations suggested, this soil has low requirements for lime and potassium and a medium requirement for phosphorus. Response to larger amounts of phosphorus and potassium fertilizer is small, but most crops except legumes need additional nitrogen from manure or commercial fertilizer.

Ontario Series

These well-drained medium-textured soils have clayey subsoils. They have developed on firm loam glacial till derived from sandstone and limestone material. They most commonly occur on drumlins but may occur also on undulating till plains. The Ontario series differs from the Honeoye series in being derived from limestone and sandstone instead of from limestone and shale, in being redder, and in having lime at greater depth.

The well-drained Ontario soils are associated with the moderately well drained Lima soils, the poorly drained Kendaia soils, and the very poorly drained Lyons soil in these counties. In areas farther west in New York, the moderately well drained associate of these soils is mapped in the Hilton series and has a distinct claypan in the B horizon.

Typical profile of Ontario loam under forest:

A_1 0 to 5 inches, very dark brown (10YR 2/2, moist) loam; moderate medium crumb structure; very friable; high in organic matter; contains many roots and some gravel; neutral to slightly acid; 3 to 6 inches thick.

A_{21} 5 to 8 inches, yellowish-brown to brown (10YR 5/4 to 7.5YR 5/4) loam; weak medium crumb structure; friable; layer is the upper part of the zone of leaching; strongly acid to medium acid; 2 to 10 inches thick.

A_{22} 8 to 14 inches, pale-brown (10YR 6/3) heavy loam; weak coarse crumb structure; friable; layer is the lower part of the zone of leaching; strongly to medium acid; 3 to 6 inches thick.

B_1 14 to 18 inches, brown (7.5YR 5/4) loam with pale-brown streaks and coatings; moderate medium blocky structure; friable to slightly firm; a layer in which the zone of leaching is encroaching on a layer of clay accumulation; medium to slightly acid; 3 to 6 inches thick.

B_{21} 18 to 25 inches, brown (7.5YR 5/4) clay loam; strong medium blocky structure; slightly firm, moderately sticky; a layer of clay accumulation, the clays occurring as coatings on the nutlike pieces and in the soil pores; medium to slightly acid; 6 to 8 inches thick.

B_{22} 25 to 38 inches, brown (7.5YR 5/4) clay loam; moderate coarse blocky structure; slightly firm, moderately sticky; layer is the lower part of the zone of clay accumulation; neutral to mildly alkaline, but commonly weakly calcareous in the lower part; 12 to 16 inches thick.

C 38 inches +, pale brown when moist, pinkish gray when dry; a loam from firm glacial till; moderate medium or coarse platy structure; layer consists mainly of limestone and sandstone material; strongly calcareous.

Ontario fine sandy loam, 3 to 10 percent slopes (Oc).—This soil is in the drumlin section in the northern part of Ontario County. Most of the sandstone material is red, but in an area between Gorham and Seneca Lake the sandstone material is gray. In that area the soil is less reddish than is typical of the series. The surface layer of this soil is a fine sandy loam, and the subsoil is a fine sandy clay loam to heavy loam.

This highly productive soil is well suited to almost all crops grown in the area. It absorbs water rapidly and has good water-holding capacity. Runoff is moderately rapid but can be controlled by simple management. The soil is very well suited to crops that need intensive cultivation. It is also suited to alfalfa, spring grains, corn for silage or grain, winter wheat, field beans, and pasture. The rotations and supporting practices listed in rotation group 2, table 10, are suitable for this soil. Under these rotations, the soil has a low lime requirement and medium phosphorus and potassium requirements. Response to

larger amounts of fertilizer and to nitrogen is generally high.

Ontario fine sandy loam, 10 to 20 percent slopes (Od).—This soil is mapped only in the 3-mile to 6-mile wide belt of Ontario, Palmyra, and associated soils that stretch across the northern edge of Ontario County. It lies mainly on the sides of drumlins. Its moderately steep slopes cause rapid runoff and some erosion. The principal management problems are controlling this runoff and maintaining organic matter and fertility.

The soil can be used for most crops grown in the county, but lack of moisture restricts its response to management. This response is so small that use of the soil for intensively grown crops is a poor practice. Alfalfa is the best legume for stands to last 3 years or less, but birdsfoot trefoil is better if longer stands are desired. Under the rotations and supporting practices of rotation group 5, table 10, the soil has a low requirement for lime and medium requirements for phosphorus and potassium.

Ontario fine sandy loam, eroded, 10 to 20 percent slopes (Oe).—The present plow layer of this moderately steep eroded soil consists mainly of subsoil material. The organic-matter content is low, and special management practices are necessary to restore it. The response to management is low for most crops, especially for intensively grown cash crops.

The soil is moderately well suited to corn, small grains, and sod crops for hay or pasture. It can be used for the rotations of group 8, table 10. Under these rotations, the soil has a low lime requirement and medium phosphorus and potassium requirements. The response to higher rates of fertilization is generally small.

Ontario gravelly loam, 3 to 10 percent slopes (Of).—All of the Ontario soils contain some gravel, but this type has enough gravel to interfere moderately with cultivation. This is a good soil, suited to all of the crops commonly grown in the county. It is excellent for alfalfa, small grains, and corn for hay or silage. It can be used for vegetable crops, but gravel interferes with cultivation.

The rotations and supporting practices of group 2, table 10, are good ones for this soil. Under these rotations, the soil has a low lime requirement and medium phosphorus and potassium requirements. The response is good when larger amounts of fertilizer and nitrogen are used on intensively grown cash crops. Yields of suited crops are about the same as on Ontario loam, 3 to 10 percent slopes, but this soil may need more potassium fertilizer.

Ontario gravelly loam, eroded, 10 to 20 percent slopes (Og).—So much of the fine material of the surface of this soil has been lost by erosion that the present surface layer consists mainly of gravel and cobblestones. The water-holding capacity is good, but little water enters the soil because erosion has destroyed the original plow layer and exposed the less permeable subsoil. Runoff is rapid and erosion is serious.

If necessary, this soil can be used for most crops grown in the area. It shows less response to management than the uneroded and less sloping Ontario soils; therefore it is not practical to use it so intensively. The rotations listed in group 8, table 10, are suitable. Under these rotations, the soil has a low lime requirement and medium phosphorus and potassium requirements. It also needs large amounts of nitrogen fertilizer or manure. Wherever possible, this soil should be used for long rotations of sod crops that are mostly legumes, or it should be very heavily manured until organic matter has been restored.

Ontario loam, 3 to 10 percent slopes (Ok).—This is one of the more productive soils of the area. It is medium textured and well drained. It is suited to most crops commonly grown in the area and is highly responsive to good management. Good soil structure is somewhat more difficult to maintain than on sandier soils.

On most farms this soil can well be used intensively in short rotations. Those suggested in rotation group 2, table 10, are suitable. Under these rotations, the soil has low requirements for lime and potassium and a medium requirement for phosphorus. For intensive growing of cash crops, the soil generally responds well to higher rates of fertilization and to addition of nitrogen. Alfalfa is one of the best suited legumes for this soil, but birdsfoot trefoil lasts better if the hay stand is to be kept for a long time.

Ontario loam, 10 to 20 percent slopes (Ol).—This soil loses so much of its water by runoff that it is more droughty in midsummer than the more gently sloping Ontario soils. This makes the soil poorly suited to crops that require intensive management. It is a fair soil for small grains, alfalfa, and sod crops. It can be used successfully for corn for grain or silage. The rotations and supporting practices of group 5, table 10, are suitable. When used for these rotations, the soil has low requirements for lime and potassium and a medium requirement for phosphorus. Response to heavier applications of phosphorus and potassium is small, but a good response is obtained from nitrogen.

Ontario loam, eroded, 10 to 20 percent slopes (Om).—This soil has lost most, or all, of the original plow layer. Most areas have lost 6 to 12 inches of soil material. Because the supply of organic matter is low, the surface soil bakes and moisture penetrates slowly. This increases runoff, so that much of the water is lost and serious erosion continues.

The soil can be used for the rotations of group 8, table 10, with the supporting practices listed. Under these rotations, the soil has low requirements for lime and potassium and a medium requirement for phosphorus. Response to higher rates of fertilization is small. The soil is poorly suited to intensively grown crops. It is used successfully for corn for grain or silage, small grains, and sod crops. Alfalfa is one of the best suited crops. The organic matter should be built up in the soil by using long rotations of sod crops or by applying very large amounts of manure.

Ontario soils, eroded, 20 to 30 percent slopes (On).—In this survey Ontario loam, fine sandy loam, and gravelly loam on slopes of 20 to 30 percent are mapped as one unit. All areas except those in undisturbed woodlots have been seriously eroded. The present plow layer is a mixture of the lower part of the original surface layer and the upper part of the original subsoil. In a few areas, the calcareous substratum is exposed.

These are poor soils for either crops or pasture. Rapid runoff makes them droughty. Steep slopes make the use of machinery extremely difficult or impossible. Response to management is small.

The uses listed in rotation group 11, table 10, are most

suitable for these soils. The soils have low lime and potassium requirements and medium requirements for phosphorus. It is difficult to apply these fertilizers for improvement of pastures.

On most farms these soils are left for permanent pasture because they cannot be tilled. Birdsfoot trefoil is the best suited legume. If phosphorus is supplied, it will produce fair yields of birdsfoot trefoil, but good stands are difficult to establish. Most native pastures have been overgrazed and now consist mostly of undesirable grasses and weeds. If pastures are not improved by fertilizers or reseeding, special care should be taken to prevent overgrazing, which allows more serious erosion.

Ontario, Lansing, and Honeoye soils, 30 to 60 percent slopes (Oh).—These are the steepest areas of all the well-drained high-lime and medium-lime soils from glacial till in Ontario and Yates Counties. Most areas are either Lansing or Ontario soils, because these series normally occur on topography that has the steepest slopes. These steep slopes prohibit the use of machinery. The excessive runoff from such slopes leaves little water to be absorbed, and the soils are droughty in midsummer. Nearly all of these steep soils that are not forested have been seriously eroded. In many places the calcareous substratum is exposed.

These soils are in rotation group 12, table 10. Forestry is the most suitable use for them, but they can be used for permanent pasture. Birdsfoot trefoil is the best pasture plant, but it is very difficult to establish a stand. Highly productive pastures require phosphorus fertilizer. Fair pastures for spring and early summer can be obtained without lime or fertilizer. Native plants produce mostly in spring and early summer.

Ottawa Series

These strongly acid well-drained sandy soils developed in acid sandy deposits in old glacial lakes. The soils have low water-holding capacity and are droughty, even though roots penetrate deeply and obtain water and nutrients from a large volume of soil. The uniform yellowish-brown colors of the subsoil indicate good drainage and good aeration. This series is the well to excessively drained member of the catena that includes the moderately well drained Berrien soil, the poorly drained Morocco soil, and the very poorly drained Newton soil.

Typical profile of Ottawa loamy fine sand:

A_0 Very dark brown to black humus, unmixed with mineral material, held in a mat of fine roots; very strongly acid; 1 to 3 inches thick.

A_2 0 to 1 inch, light-gray (10YR 7/2) loamy fine sand, gray color commonly masked by mixing of organic matter from layer above; single-grain structure; loose; very strongly acid; ½ to 1 inch thick.

B_{21} 1 to 9 inches, yellowish-brown (10YR 5/8) loamy fine sand; very weak very fine crumb structure; very friable to loose; contains many roots; a zone of concentration of iron oxide; very strongly acid; 6 to 10 inches thick.

B_{22} 9 to 21 inches, yellowish-brown (10YR 5/4) loamy fine sand; similar to the horizon above but less strongly yellowish brown in color; single-grain to very weak very fine crumb structure; loose; contains medium-sized and large roots; very strongly acid; 8 to 16 inches thick.

B_3 21 to 32 inches, light yellowish-brown (10YR 6/4) loamy fine sand; single-grain structure; loose; contains large roots; transitional to the parent material; strongly acid; 8 to 14 inches thick.

C 32 inches +, light brownish-gray (2.5Y 6/2) stratified coarse, medium, and fine sand; single-grain structure; loose; strongly acid; may include thin lenses of silts; layer is commonly underlain by silts and clays at depths greater than 10 feet.

Ottawa loamy fine sand, 0 to 6 percent slopes (Oo).—This very sandy strongly acid soil has very low fertility. It is easy to work and can be worked within a wide range of moisture content. The soil has low water-holding capacity and is droughty. Yields of crops and response to management are determined by the amount of water supplied to plants.

The soil is suited to the rotations and supporting practices of group 3, table 10. Deep-rooted legumes and tree fruits are well suited. Early fresh vegetables are good because they can be grown and harvested before the midsummer dry period. Under the rotations of group 3, table 10, the soil has high requirements for lime and potassium and medium requirements for phosphorus. For crops that can be harvested early, the response to larger amounts of fertilizer, including nitrogen, is high. Most other crops also need nitrogen.

This soil is only fair for alfalfa, but alfalfa can be grown if the soil is heavily limed and fertilized. Birdsfoot trefoil lives longer than alfalfa, if it can be established. This is a very poor soil for Ladino clover and other shallow-rooted crops. Pasture on this soil produces little forage in midsummer.

Ottawa loamy fine sand, 6 to 12 percent slopes (Op).—This sandy soil is very acid. The topography is complex in most places. The soil absorbs water rapidly, but the uniform size of its particles makes it erode easily. It erodes especially rapidly in the spring when the subsoil is frozen and a few inches of the surface soil are thawed. This soil is even more droughty than Ottawa loamy fine sand on 0 to 6 percent slopes.

This soil is suited to corn, small grains, sod crops, and vegetables. It is a good soil for early vegetables for the fresh market if practices to prevent erosion are used. Group 6, table 10, suggests some suited rotations and supporting practices. Under these rotations, the soil has high requirements for lime and potassium and a medium requirement for phosphorus. Response to higher rates of fertilization, including the use of nitrogen, is good for crops which mature early. Response to management is small for those crops which continue to grow during the dry season after the middle of July.

Ovid Series

These are moderately fine textured imperfectly drained high-lime soils. The parent material is a mixture of lake-laid silt and clay with loamy glacial till such as that underlying the Honeoye series. It appears that a layer of lacustrine silt and clay, mostly less than 3 feet thick, was deposited over highly calcareous glacial till. The two materials were later mixed by falling trees, burrowing animals, frost action, and soil creep. The mixed material has the properties of fine-textured till. Most commonly, the soils have a silty surface soil, a silty clay subsoil, and a silt loam or loam substratum.

The Ovid series is the imperfectly drained member of the catena that includes the well-drained Cayuga soils. The

poorly and very poorly drained associates are classified in the Kendaia and Lyons series. The Ovid series is also used in this area for the imperfectly drained associates of the Cazenovia soils, which were derived from reworked lacustrine deposits.

Typical profile of Ovid silt loam under forest:

- A_1 0 to 5 inches, dark grayish-brown (10YR 4/2) silt loam; moderate medium crumb structure; friable, slightly plastic; high in organic matter; contains many fine roots; slightly acid; 4 to 6 inches thick.
- A_2 5 to 12 inches, very pale brown (10YR 7/3) to light-gray (10YR 7/2) smooth silt loam with low-contrast mottling; moderate fine crumb structure; friable when moist, slightly sticky and plastic when wet; well supplied with medium-sized and small roots; medium acid; 5 to 8 inches thick.
- B_{21} 12 to 16 inches, yellowish-brown (10YR 5/4) silty clay loam mottled with light gray (10YR 7/2) and dark yellowish brown (10YR 4/4); strong fine blocky structure; firm when moist, plastic when wet; readily penetrated by roots; good moisture-holding capacity; slightly acid; 3 to 8 inches thick.
- B_{22} 16 to 28 inches, dark-brown (7.5YR 4/4) to reddish-brown (5YR 4/4) silty clay; strong fine to medium blocky structure; firm when moist, plastic when wet; layer is firm in place but does not restrict root penetration; has good water-holding capacity; contains varying amounts of angular stones; neutral; 8 to 16 inches thick.
- C 28 inches +, grayish-brown (10YR 5/2) gritty silt loam glacial till; strong coarse platy structure; highly calcareous; similar to the material underlying Honeoye soils.

Ovid silt loam, 0 to 3 percent slopes (Or).—This is an imperfectly drained moderately fine textured fertile soil. It is moderately productive and well suited to fall-sown grains and forage crops. It is moderately well suited to corn for silage or grain, and is an excellent soil for Ladino clover or red clover. Alfalfa winterkills and should be used as a supplementary legume in seeding mixtures. The soil is poorly suited to tree fruits but can be used successfully for grapes and small fruits. It is not so well suited to intensive growing of vegetable crops as coarser textured soils. The response to management is small because of the fine texture and restricted internal drainage. The soil can be used in the rotations and with the supporting practices suggested in rotation group 2, table 10. Under these rotations the soil has low requirements for lime and potassium and a medium requirement for phosphorus.

Ovid silt loam, 3 to 8 percent slopes (Os).—This moderately fine textured fertile soil has good water-holding capacity. Like other Ovid soils, it puddles and forms clods if worked when too wet. The soil is moderately erodible for such gentle slopes. Response to management is small because the soil has restricted drainage and a fine texture.

The soil is suited to corn for grain or silage, small grains, hay, and pasture. It is suited to a few cash crops, but it should not be used for crops that require large amounts of labor or intensive management. Alfalfa should not be the only legume in sod mixtures, because it winterkills. The soil is poor for tree fruits.

The soil needs the rotations of group 4, table 10, and the supporting practices listed. Under these rotations, the soil has low requirements for lime and potassium and a medium requirement for phosphorus. Larger amounts of potassium or phosphorus bring little response. The soil commonly responds well to nitrogen fertilizer, especially if legumes are lacking in the sod crop.

Ovid silty clay loam, eroded, 3 to 8 percent slopes (Ot).—This soil is like Ovid silt loam on 3 to 8 percent slopes except that it has lost most of its original plow layer through erosion. The present surface soil consists mainly of fine-textured subsoil material. This surface layer is low in organic matter, and good structure is very difficult to maintain. Erosion is serious because water penetrates slowly and runoff is large.

The crops suited to Ovid silt loam on 3 to 8 percent slopes are suited to this soil. Response to management is less on this eroded soil, and crops that require intensive management are less suitable. The soil needs the rotations and supporting practices of rotation group 7, table 10. For these rotations, the soil has low requirements for lime and potassium and a medium requirement for phosphorus. It also needs nitrogen if it is to produce well. Where possible, it is well to keep this soil in sod crops for long periods. Ladino clover, red clover, and birdsfoot trefoil are the best suited legumes, but alfalfa can be used as a supplementary legume in seeding mixtures.

Ovid silty clay loam, eroded, 8 to 15 percent slopes (Ou).—This moderately fine textured, imperfectly drained soil has lost its original surface layer by erosion. The present plow layer consists of fine-textured material from the original subsoil. Water penetrates slowly. The large runoff and the erodible material make the soil erode very easily. Organic matter is low, and good soil structure is difficult to obtain. The soil needs rotations and supporting practices like those suggested in group 8, table 10. With this management, it has low requirements for lime and potassium and a medium requirement for phosphorus.

Palmyra Series

These well-drained high-lime soils have developed in glacial outwash gravel and sand. The rock material is mostly limestone with some sandstone. The soils occur on nearly level glacial outwash terraces and also on hilly or hummocky moraines and kames.

These are some of the most productive soils in Ontario and Yates Counties. They would be droughty if they did not have a layer of clay in the subsoil. This clay layer is a good storage place for water and plant nutrients.

The Palmyra series is the well-drained member of a catena that includes the moderately well drained Phelps soil, the poorly drained Homer soils, and the very poorly drained Westland soil.

Typical profile of Palmyra gravelly loam under forest:

- A_1 0 to 5 inches, very dark grayish-brown (10YR 3/2) gravelly loam; moderate fine crumb structure; loose when moist; high in organic matter; neutral; 4 to 7 inches thick.
- A_2 5 to 11 inches, brown (10YR 5/3) mellow gravelly loam; fine crumb structure; very friable when moist, nonplastic when wet; contains medium-sized and small roots; good water-holding capacity; 6 to 11 inches thick.
- B_{21} 11 to 18 inches, dark-brown (10YR 4/3 to 7.5YR 3/2) heavy gravelly silt loam to sandy clay loam; weak medium blocky structure; friable, slightly plastic; readily penetrated by roots; excellent water-holding capacity; neutral; 6 to 9 inches thick.
- B_{22} 18 to 22 inches, dark-brown (7.5YR 4/4) gravelly clay loam; moderate medium blocky structure; alkaline to calcareous; 4 to 8 inches thick.
- C 22 inches +, light brownish-gray (10YR 6/2) to pale-brown (10YR 6/3) mixed gravel and sand; has good

permeability to roots; low water-holding capacity; the gravel contains large quantities of limestone; calcareous; layer overlies stratified sand and gravel that is highly calcareous.

Palmyra cobbly loam, 0 to 5 percent slopes (Pb).—A very large amount of pebbles and cobbles is on the surface and mixed through the soil. The stones range from less than 1 inch to more than 3 inches in diameter. These cobblestones and pebbles seriously interfere with cultivation but do not seem to reduce crop yields. In spite of the difficulty in tilling this stony soil, it is one of the best of the area.

This soil is suited to the rotations of group 1, table 10, and it needs few, or no, special practices for control of water. Practically all of the crops grown in the area are suitable. The soil responds well to good management. Under the rotations suggested, the soil has a low lime requirement, a medium phosphorus requirement, and a high potassium requirement. Larger amounts of fertilizer and addition of nitrogen bring good response from crops, especially vegetable crops grown under intensive management.

Palmyra fine sandy loam, 0 to 5 percent slopes (Pc).—This is one of the most productive Palmyra soils. It is a very good soil to cultivate, because it has excellent structure and is almost free from surface gravel and stones. It absorbs water rapidly and has moderately good water-holding capacity. A few acres on terrace faces have slopes of more than 5 percent.

The soil profile is similar to that described as typical for Palmyra gravelly loam, but it has little or no gravel on the surface. The surface soil is fine sandy loam instead of gravelly loam, and the subsoil is heavy loam rather than sandy clay loam.

This soil is suited to nearly all of the crops grown in the area. It responds well to intensive management. It can be used for all of the rotations of group 1, table 10, with few or no supporting practices for control of runoff. Under this management, it has a low requirement for lime, a medium requirement for phosphorus, and a high requirement for potassium. Most vegetable crops respond very well to the addition of nitrogen and to larger amounts of phosphorus and potassium.

Palmyra gravelly loam, 0 to 5 percent slopes (Pd).—This is the most extensive of the Palmyra soils. It is a well-drained high-lime soil that has moderately good water-holding capacity. It can be used for all of the rotations of group 1, table 10. It is suited to nearly all of the crops grown in the area. It is especially well suited to vegetable crops grown intensively. Alfalfa is the best suited legume.

This soil responds well to good management. It needs almost no management practices for control of runoff. Special practices to maintain nitrogen and organic matter should be followed if the soil is to be used intensively. The soil has a low lime requirement, a medium phosphorus requirement, and a high potassium requirement. Higher rates of fertilization with phosphorus and potassium and addition of nitrogen bring good results on intensively grown vegetable crops (see table 8).

Palmyra gravelly loam, 5 to 15 percent slopes (Pe).—This soil has complex slopes that are steep enough to interfere moderately with tillage. Runoff is greater than from Palmyra gravelly loam on 0 to 5 percent slopes. The loss of water is fairly serious from this soil, which has only moderately good water-holding capacity. The same crops are grown on this soil as are grown on the nearly level phase, but response to management is generally less, and dry weather does more harm to crops.

Practically all of the crops grown in these two counties are suited to this soil, if they are grown under the rotations and simple management practices suggested in group 3, table 10. When the soil is used for these rotations, it has a low lime requirement, a medium phosphorus requirement, and a high potassium requirement. Its response to heavier rates of fertilization is only fair. Where adequately fertilized, native pastures produce well in spring and early in summer but produce little in midsummer. Birdsfoot trefoil and other deep-rooted legumes produce more on this soil than shallow-rooted plants.

Palmyra gravelly loam, 15 to 25 percent slopes (Pf).—This soil typically has very irregular moderately steep slopes. Soils with slopes like these were named Groton in older surveys. About 90 percent of this soil unit is gravelly loam, but some areas are the gravelly sandy loam. Much of the soil has been seriously eroded; these eroded areas are shown on the soil map by erosion symbols. Runoff is rapid, and the soil is somewhat droughty. Lack of moisture is especially serious in midsummer and makes response to management small.

The soil is very resistant to erosion, considering its strong slopes, but the rotations and supporting practices listed in group 6, table 10, are the most intensive that can safely be used. Wherever possible, intertilled crops should be omitted from the rotations and the sod crops kept for long periods. In such rotations, birdsfoot trefoil is the longest-lived legume. Alfalfa is well suited

TABLE 8.—*Ten-year average acre yield on Palmyra gravelly loam, 0 to 5 percent slopes, under 2 rates of fertilization*

[For both rates of fertilization, the rotation consisted of a row crop, a close-growing crop, and a sod crop. Tests made at Tully, N. Y.]

Amendments applied during rotation	Potatoes	Cabbage	Corn silage	Wheat	Oats	Peas	Alfalfa and timothy	Red clover and timothy
	Bu.	*Tons*	*Tons*	*Bu.*	*Bu.*	*Lb.*	*Tons*	*Tons*
10 tons manure per acre on the row crop; 100 lbs. phosphate (P_2O_5) and 50 lbs. potash (K_2O) per acre for the rest of the rotation	241	13.1	12.6	36	40	1,650	2.9	2.6
10 tons manure, 100 lbs. phosphate (P_2O_5), and 100 lbs. potash (K_2O) per acre on the row crop; 100 lbs. phosphate (P_2O_5) and 50 lbs. potash (K_2O) per acre for the rest of the rotation	294	16.9	12.4	37	----	1,700	2.9	----

but generally dies out after 3 or 4 years. For maintenance of fertility, the soil has a low lime requirement, a medium phosphorus requirement, and a high potassium requirement.

Palmyra gravelly sandy loam, 0 to 5 percent slopes (Pg).—This is the coarsest textured of the Palmyra soils on gentle slopes. In arrangement, structure, consistence, and reaction, the layers are like those described for a typical Palmyra gravelly loam. The surface soil, however, is a gravelly sandy loam and the subsoil is a gravelly loam. The water-holding capacity of this gravelly sandy loam and crop yields it produces are slightly lower than on the gravelly loam described.

This is a moderately good soil, suited to nearly all of the crops grown in this area. Alfalfa is the best suited legume, but red clover and birdsfoot trefoil are also well suited. Except in spring and early in summer the soil is somewhat too droughty for good growth of Ladino clover. All of the rotations of group 1, table 10, are suitable for this soil, and they need no special management for controlling runoff.

Under the rotations suggested, the soil has a low requirement for lime, a medium requirement for phosphorus, and a high requirement for potassium. Nitrogen is needed for most crops except legumes. Response to larger amounts of phosphorus and potassium is good, but not so good as the response from Palmyra gravelly loam on 0 to 5 percent slopes.

Palmyra gravelly sandy loam, 5 to 15 percent slopes (Ph).—This is a fair soil for crops in spite of its coarse texture and moderate droughtiness. It can be used for nearly all of the crops commonly grown in the area. Under the rotations of group 3, table 10, the soil has a low lime requirement, a medium phosphorus requirement, and a high potassium requirement. Because this soil has a lower moisture supply, its response to management is less than that of other soils of the Palmyra series on 5 to 15 percent slopes.

Palmyra and Howard soils, 25 to 35 percent slopes (Pa).—This unit consists of areas of Palmyra and Howard soils so steep that their slope outweighs all other soil characteristics in determining use and management. These steep soils are difficult or impossible to till with ordinary kinds of farm machinery.

These soils are in rotation group 11, table 10. Forestry is their best use. They can be pastured, but the soils are droughty and the pastures are difficult to improve. They provide limited grazing in spring and early in summer. If the soils must be used for pasture, birdsfoot trefoil is a possible choice as a long-lived and fairly productive legume. But it is difficult to establish and maintain the high fertility this crop needs.

For improved pastures, the soils have a low requirement for lime, a medium requirement for phosphorus, and a high requirement for potassium. The slopes make it difficult to apply these amendments. These soils are a good source of gravel and sand for building purposes.

Phelps Series

This medium-textured moderately well drained high-lime soil has developed in poorly sorted glacial outwash material. Its parent materials were derived mainly from limestone, but they may contain considerable red sandstone where the soils are associated with Palmyra soils. Where they are associated with Howard soils, the parent material may contain gray sandstone and shale material. The Phelps series is most commonly associated with the well-drained Palmyra soils, the poorly drained Homer soils, and the very poorly drained Westland soil. It is also mapped as the moderately well drained associate of the Howard soils.

The Phelps soil normally has a smaller amount of gravel and a finer texture than the associated Palmyra or Howard soils. The slow drainage through the soil is caused by the very slowly permeable silty or sandy clay layers in the substratum.

A typical profile of Phelps gravelly silt loam under forest:

- A_1 0 to 5 inches, dark grayish-brown (10YR 4/2) silt loam; moderate medium crumb structure; friable; high in organic matter, full of fine roots; neutral; 4 to 6 inches thick.
- A_2 5 to 9 inches, pale-brown (10YR 6/3) to brown (10YR 5/3) silt loam; weak medium crumb structure; friable; contains roots; slightly acid; 3 to 6 inches thick.
- B_2 9 to 18 inches, brown (7.5YR 5/4) sandy clay; may be mottled at lower depths in layer; moderate medium blocky structure; firm when moist, slightly plastic when wet; layer somewhat gravelly but has good water-holding capacity; easily penetrated by roots; this layer is the zone of maximum clay content; 6 to 12 inches thick.
- B_{2g} 18 to 26 inches, brown (10YR 5/3) silt loam, mottled with dark yellowish brown (10YR 4/4) and light brownish gray (10YR 6/2); weak blocky structure; friable, slightly plastic; somewhat gravelly; neutral to weakly calcareous; 4 to 10 inches thick.
- C 26 inches +, light brownish-gray (10YR 6/2) mixed sand and gravel; glacial outwash from limestone, shale, sandstone, crystalline rocks, and considerable fine material; dense slowly permeable silty strata commonly are at 36 inches but in places may be within 24 inches of the surface; strongly calcareous; a few inches to 2 feet or more in thickness; layer underlain by loose sand and gravel.

Phelps gravelly silt loam, 0 to 5 percent slopes (Pk).—This soil is well suited to most crops commonly grown in these countries. Restricted internal drainage makes it a poor soil for tree fruits. Alfalfa is good only as a supplementary legume sown in mixtures of other legumes and grasses. Potatoes develop scab because the soil is nearly neutral in reaction.

The rotations of group 1, table 10, are suited for use on this soil. Few or no supporting practices are needed to control runoff, but the soil would be improved by artificial drainage. Under the rotations given, the soil has a low lime requirement and medium phosphorus and potassium requirements. Most of the intensively grown cash crops show only moderate response to larger amounts of phosphorus and potassium and to addition of nitrogen. If vegetable crops are grown intensively, the response to management is generally less than on the associated Palmyra or Howard soils.

This is a better soil for pasture than the Palmyra or Howard soils because it has a better moisture supply in midsummer. On most farms, a better supply of forage can be obtained by pasturing hay crops grown in a regular rotation than by depending on improved native pastures.

Poygan Series

This fine-textured very poorly drained high-lime soil has developed in lake-laid clay and silt. It occupies flats and depressed areas in the old lake plains. The substratum and subsoil are very slowly permeable. There are no natural outlets for the surface water. The very dark colored highly organic surface layer and the strongly reduced subsoil are typical of permanently saturated soils. This series is the wettest member of the catena that includes the well-drained Schoharie soils, the imperfectly drained Odessa soils, and the poorly drained Lakemont soil.

Typical profile of Poygan silty clay loam under forest:

- A_0 Black highly organic material; granular; neutral; 1 to 3 inches thick.
- A_1 0 to 8 inches, very dark gray (10YR 3/1) to black (10YR 2/1) silty clay loam; strong coarse granular structure; firm when moist, plastic when wet; very high in organic matter; neutral; 6 to 10 inches thick.
- G 8 to 18 inches, light-brown (7.5YR 6/4) to pinkish-gray (7.5YR 6/2) silty clay mottled with brown (7.5YR 5/2) and strong brown (7.5YR 5/8); mottling normally faint or absent in the uppermost 4 inches; moderate medium blocky structure; firm when moist, very plastic when wet; contains a few roots; neutral.
- CG 18 inches +, pinkish-gray (7.5YR 6/2) dense silty clay to clay, strongly mottled with rust brown and gray; mottling decreases with depth; weak coarse blocky structure; very firm when moist, very plastic when wet; contains no roots; layer is permanently saturated with water; calcareous; pinkish colors are inherited from the original deposit.

Poygan silty clay loam, 0 to 1 percent slopes (Pl).—Unless it is drained, this soil is too wet for crops or pasture. When partly drained by ditches, it is dry enough to be used for pasture. It is extremely difficult to drain the soil because the material is so slowly permeable. Even if it were drained, the soil is so clayey it would be difficult to crop and would give small response to management. The rotations of group 1, table 10, that do not include row crops would be most suitable. The soil has low lime and potassium requirements and a medium phosphorus requirement.

Red Hook Series

This poorly drained strongly acid series has developed in glacial outwash derived from acid sandstone and shale materials. The topography is nearly level or slightly depressed. Very slowly permeable layers of compact gravelly silts or clays are in the substratum. The poor drainage is shown by the dark-colored surface soil and the mottling just below the plow layer. This series is the poorly drained member of the catena that includes the well-drained Chenango soils, the moderately well drained Braceville soil, and the very poorly drained Atherton soil.

Typical profile of Red Hook gravelly silt loam under forest:

- A_1 0 to 5 inches, dark grayish-brown (10YR 4/2) gravelly silt loam; strong fine crumb structure; friable when moist, slightly plastic when wet; contains many small and medium-sized roots; medium acid; 4 to 7 inches thick.
- A_{2g} 5 to 12 inches, light brownish-gray (10YR 6/2) silt loam mottled with light yellowish brown (10YR 6/4); moderate medium crumb structure; slightly plastic when wet; strongly acid; 5 to 10 inches thick.
- BG_1 12 to 21 inches, light yellowish-brown (10YR 6/4) gravelly silt loam mottled with light brownish gray (10YR 6/2); moderate medium blocky structure; friable when moist, slightly plastic when wet; medium acid; 6 to 12 inches thick.
- BG_2 21 to 30 inches, gravelly silt loam strongly mottled with yellowish brown (10YR 5/8) and light brownish gray (10YR 6/2); weak medium blocky structure; firm when moist, slightly plastic when wet; medium acid; 6 to 12 inches thick.
- C 30 inches +, gray (10YR 6/1) mixed sand and gravel, mottled in upper part with yellowish brown; mottling decreases with depth; moderately compact; medium acid; layers of compact, very slowly permeable silty or clayey material are included.

Red Hook gravelly silt loam, 0 to 3 percent slopes (Ra).—This soil is saturated during winter and spring, but it dries enough during the growing season to be used for hay and, in some places, for corn. If the natural drainage is slightly improved by ditches or tile, the soil can be used for hay, corn, and spring grains. The rotations of group 1, table 10, are suitable. Under these rotations, the soil has a high requirement for lime and medium requirements for phosphorus and potassium. Response to management above that required for maintenance is small. In most places the soil gives only moderate yields of intertilled crops. It is best used for sod crops that can be left for a long time. The soil is poorly suited to alfalfa. It is moderately good for Ladino clover and can be used for birdsfoot trefoil.

Romulus Series

These fine-textured poorly drained soils have developed in shaly glacial till. The till was derived principally from rock like the shale bedrock that underlies these soils at depths ranging from 3 to 6 feet or more. The Romulus soils are associated with the imperfectly drained Darien soils.

Typical profile of Romulus silt loam under forest:

- A_1 0 to 5 inches, dark grayish-brown (10YR 4/2) silt loam; moderate medium granular structure; friable when moist, plastic when wet; high in organic matter; contains many small and medium-sized roots; slightly acid; 4 to 6 inches thick.
- A_{2g} 5 to 12 inches, light brownish-gray (2.5Y 6/2) heavy silt loam with low-contrast mottling of light yellowish brown; moderate medium blocky structure; firm when moist, sticky and plastic when wet; contains moderate number of small and medium-sized roots; high moisture-holding capacity; slightly acid to neutral; 4 to 9 inches thick.
- BG 12 to 28 inches, olive-gray (5Y 5/2) silty clay loam with high-contrast mottling of yellowish brown (10YR 5/6); aggregates are olive gray on the outside and mottled inside; strong coarse blocky structure; very firm when moist, sticky and plastic when wet; material is dense and tight in place; roots penetrate along cracks of structural aggregates; neutral; 12 to 18 inches thick.
- C 28 to 42 inches, olive-brown (2.5Y 4/4) heavy shaly till with silty clay loam or silty clay texture; coarse blocky structure; very firm when moist, very plastic when wet; calcareous; 8 to 48 inches thick.
- D 42 inches +, olive-gray calcareous shale bedrock at depths ranging from 36 to 72 inches or more.

Romulus silt loam, 0 to 3 percent slopes (Rb).—This soil has higher native fertility than most soils, but its fine texture and poor drainage allow little response to management. The plow layer is moderately sticky and plastic

and it puddles if plowed when too wet. This plow layer is made conspicuous by its grayish color.

This soil is best used for sod crops. Ladino clover is the best suited legume. Alfalfa is not suited for use on this soil. Corn and fall-sown small grains can be grown with fair success. Sweet corn and peas for canning can be grown, but disease and late planting keep the yields low. Oats usually yield poorly because planting is delayed until late in spring. Generally, crops that require large amounts of labor and careful management are not well suited to this soil because it has such a small response to management practices.

The soil can be used for the rotations of group 2, table 10, with the supporting practices listed. Under these rotations, it has low requirements for lime and potassium and a medium requirement for phosphorus. Larger amounts of potassium or phosphorus bring little response. Nitrogen is needed early in spring when the soil is cold and wet.

Drainage and maintenance of good soil structure are the main management problems. In most areas, movement of water through the soil is so slow that tile drainage is not effective. Drainage can be improved somewhat by open ditches or drainage-type diversion terraces.

Romulus silt loam, 3 to 8 percent slopes (Rc).—Even though its slopes are gentle, this silty soil erodes easily. Fine texture and restricted internal drainage limit its response to management. The soil is best suited to sod crops. Ladino clover, red clover, and birdsfoot trefoil are the best suited legumes. Alfalfa is not suited. Corn and small grains can be grown successfully. Winter wheat is more productive than spring-sown grains. The soil responds poorly to intensive management; it is better suited to crops that require little labor or special management.

The rotations of group 4, table 10, are suited to this soil. Under such rotations, the soil has low requirements for lime and potassium and a medium requirement for phosphorus. The response to higher rates of fertilization is very small. Drainage can be improved somewhat by ditches or drainage-type diversion terraces. Tile is only slightly effective because water moves slowly through the soil.

Romulus silty clay loam, 0 to 3 percent slopes (Rd).—This poorly drained soil has silty clay loam or finer texture in both the surface soil and the subsoil. The profile, except for the finer textured and grayer surface soil, is like that of the Romulus silt loam described. This soil is quite high in natural fertility, but its fine texture and poor drainage seriously restrict its response to good management.

The rotations suggested in group 2, table 10, with the supporting practices listed, are most suitable for this soil. When these rotations are used, the soil has low requirements for lime and potassium and a medium requirement for phosphorus. Small grains are suited to this soil, and winter wheat is the most productive of these. Sod crops other than alfalfa are suitable. Other suitable crops are corn for silage and some of the less intensively cultivated cash crops. The soil is too fine-textured and wet for crops that require intensive management. Drainage can be improved somewhat by ditches or by drainage-type diversion terraces. Tile is not effective unless it is very closely spaced.

Schoharie Series

These fine-textured well drained to moderately well drained soils have developed from lake-laid clay and silt. They have well-developed Gray-Brown Podzolic profiles. They are slightly to medium acid in the upper part but calcareous at depths ranging from 24 to 36 inches. This series is the best drained member of the catena that includes the imperfectly drained Odessa soils, the poorly drained Lakemont soil, and the very poorly drained Poygan soil. Little of this soil occurs on slopes of less than 3 percent. The very fine-textured material impedes movement of water. On gentler slopes parent material of the same kind as that for Schoharie soils has developed into soils of one of the more poorly drained series.

Typical profile of Schoharie silt loam under forest:

- A_1 0 to 5 inches, dark-brown (7.5YR 3/2) silt loam; well-defined medium crumb structure; friable when moist, plastic when wet; contains many fine and medium-sized roots; neutral; 4 to 6 inches thick.
- A_2 5 to 10 inches, pale-brown (10YR 6/3) to light-brown (7.5YR 6/4) silt loam; weak coarse crumb structure; friable; well supplied with roots; a leached layer; slightly to medium acid; 4 to 9 inches thick.
- B_{21} 10 to 17 inches, reddish-brown (5YR 4/3) silty clay loam; strong medium blocky structure; firm when moist, very plastic when wet; easily penetrated by roots; good water-holding capacity; tongues of pale-brown material extend into this horizon from the A_2 above; slightly acid to neutral; 3 to 6 inches thick.
- B_{22} 17 to 26 inches, reddish-brown (5YR 5/4) to brown (7.5YR 5/4) silty clay; strong medium blocky structure; firm when moist, very plastic when wet; good root penetration; high water-holding capacity; neutral; 6 to 10 inches thick.
- C 26 inches +, light reddish-brown (5YR 6/4) silty clay; strong angular blocky structure; aggregates hard when dry, firm when moist, very plastic when wet; roots penetrate mainly along the faces of structural blocks; high water-holding capacity; calcareous, contains free lime in nodules and concretions. The deep substratum is composed of laminated silt and clay.

Schoharie silt loam, 0 to 6 percent slopes (Sa).—This is one of the most fertile soils in the two counties, but it responds rather poorly to management for intensively grown crops. It is well drained to moderately well drained. The soil material is erodible, and even on mild slopes control of runoff is a moderate problem. Maintaining good soil structure is difficult.

The soil can be used for most crops grown in the area, but it is best suited to hay and pasture crops. It is less well suited to vegetable crops than coarser textured soils, but some of the less intensive cash crops can be grown successfully. This is one of the best soils in the area for alfalfa. It is also well suited to the clovers, including Ladino clover, and to birdsfoot trefoil. It is a very good soil for winter wheat.

The rotations of group 4, table 10, and the supporting practices suggested are suited to this soil. Under this management, the requirements for lime and potassium are low and the requirement for phosphorus is medium. This soil probably has the largest supply of available potassium of any soil in the county. More phosphorus or potassium brings only a small response from most crops. Nitrogen commonly gives a good response on crops other than legumes.

Schoharie silt loam, 6 to 12 percent slopes (Sb).—Control of erosion and maintenance of soil structure are major problems on this well-drained, fine-textured, sloping soil. Bean seedlings have difficulty in emerging through the surface crust after soil structure has been destroyed by loss of organic matter. The soil is well suited to sod crops for hay or pasture and to small grains, including winter wheat. It is not so well suited to corn for grain or silage, sweet corn, and the less intensively grown vegetable crops. Cash crops that require intensive management are poorly suited to this soil because it responds so poorly to management. This is only a fair soil for tree fruits.

The rotations of group 7, table 10, are suited to this soil, and the supporting practices listed should be used. Under these rotations, the soil has low requirements for lime and potassium and a medium requirement for phosphorus. Response to larger amounts of potassium or phosphorus is generally small, but most crops except legumes will respond to the addition of nitrogen.

Schoharie silty clay loam, 0 to 6 percent slopes (Sc).—This fine-textured soil responds less to management and is more difficult to maintain in good tilth than Schoharie silt loam on 0 to 6 percent slopes. The soil is well drained and is one of the more fertile soils of the area. Its fine texture makes it difficult to work.

This is a fair to good soil for corn for silage or grain, small grains, hay, and pasture. It is a good soil for winter wheat. Well-suited legumes are alfalfa, birdsfoot trefoil, red clover, and Ladino clover. The soil can be used for field beans, canning peas, and sweet corn, but these crops give small response to good management. The rooting of fruit trees is somewhat restricted, but trees can be grown.

The soil is suited to the rotations of group 4, table 10, with the suggested practices for control of runoff. Under this management, the soil has low requirements for lime and potassium and a medium requirement for phosphorus. Response to heavier rates of fertilization with potassium and phosphorus is small. Crops other than legumes generally respond to nitrogen. Cash crops should be grown on more responsive soil if possible.

Schoharie silty clay loam, 6 to 12 percent slopes (Sd).—This fine-textured sloping soil is difficult to keep in good tilth and is extremely erodible for having such gentle slopes. It is best suited to sod crops, small grains, and corn for grain or silage. It can be used for tree fruits, although root growth is restricted. Response to management is so small that it is generally not practical to use this soil intensively. It can be used for the less intensively grown vegetable crops.

The soil needs the rotations and supporting practices of group 7, table 10, to maintain organic matter and to control runoff. Under these rotations, it has a low lime requirement, a medium phosphorus requirement, and a low potassium requirement. Response to larger amounts of phosphorus or potassium is small. Most crops respond to nitrogen, except legumes. It is very important to maintain the organic-matter content and keep the soil in good tilth.

Schoharie silty clay loam, eroded, 6 to 12 percent slopes (Se).—This unit includes the eroded areas of Schoharie silty clay loam and Schoharie silt loam on 6 to 12 percent slopes. Where the silt loam has been eroded and the subsoil mixed with the plow layer, the surface soil has become a silty clay loam in texture. This eroded soil is lower in organic-matter content and is poorer in surface soil structure than the uneroded Schoharie silty clay loam on 6 to 12 percent slopes.

Although this soil can be used for almost the same crops as the uneroded soil on similar slopes, its response to management is slightly less, and its need for sod crops or manure to restore the organic-matter content is much greater. The soil should be kept in sod crops as much of the time as possible. Alfalfa or birdsfoot trefoil are the best suited legumes. Ladino clover can be used for pasture, but red clover is not as long-lived a sod crop as this soil needs. The rotations of group 8, table 10, and the management practices suggested are suitable for use on this soil. Under these rotations, the soil has low requirements for lime and potassium and a medium requirement for phosphorus.

Schoharie silty clay loam, 12 to 20 percent slopes (Sf).—Control of erosion and maintenance of good soil structure are the most important management needs of this well-drained soil. Wherever possible, intertilled crops should be left out of the rotations and the soil kept in sod crops most of the time. All of the rotations of group 9, table 10, are suitable, if used with the supporting practices listed. When cropped in this way, the soil has low requirements for lime and potassium and a medium requirement for phosphorus. Response to larger amounts of potassium and phosphorus is small. Nitrogen is generally needed by all crops except legumes.

Alfalfa and birdsfoot trefoil are the best suited legumes for sod crops. Ladino clover is well suited for pastures grown in crop rotations. Growing pasture crops in a regular rotation will generally provide better yields and soil conservation than attempts to improve native pasture.

Schoharie silty clay loam, eroded, 12 to 20 percent slopes (Sg).—It is difficult to control erosion and keep this soil in good tilth because the organic-matter content is low. This is a fair soil for hay or pasture, but it should not be used for intertilled crops. Alfalfa is one of the best suited legumes, and birdsfoot trefoil is also well suited. This soil can be used for the rotations of group 11, table 10. It will have a low lime requirement, a medium phosphorus requirement, and a low potassium requirement.

Schoharie silty clay loam, eroded, 20 to 45 percent slopes (Sh).—This unit includes all steep areas of Schoharie soils. Some uneroded areas are included, but more than 80 percent of this soil has lost most, or all, of the original surface soil.

Steep slopes prevent the use of this soil for crops, but it can be used for pasture or forestry. Native pastures, even when fertilized with phosphorus, produce poorly. Special care must be taken to prevent overgrazing of native pastures, because continued serious erosion may result. These are good soils for birdsfoot trefoil, which provides a long-lived legume pasture. A medium amount of phosphorus will be required. In many places where it is not practical to grow birdsfoot trefoil for pasture, the soil is best used for forestry.

Sloan Series

This is a very poorly drained soil on the first bottom where the alluvial deposits are high in lime. It is the most poorly drained member of the catena that includes the well-drained Genesee soils, the moderately well drained Eel soils, and the poorly drained Wayland soils.

Typical profile of Sloan silt loam under forest:

- A_1 0 to 8 inches, dark-gray (10YR 4/1) to very dark gray (10YR 3/1) mucky silt loam; moderate medium granular structure; slightly plastic when wet; very high in organic matter, matted with fine roots; neutral; 8 to 12 inches thick.
- CG 8 to 36 inches, gray (10YR 5/1) silt loam strongly mottled with light yellowish brown (10YR 6/4), yellowish brown (10YR 5/6), and grayish brown (10YR 5/2); moderate coarse granular to medium blocky structure; friable; neutral; 20 to 36 inches thick.
- C 36 inches +, stratified alluvial deposits, generally fine sand and silt but silty clay in places; may have layers of mixed gravel and sand; usually light brownish gray (10YR 6/2) mottled with gray and rust brown in the upper part; neutral to calcareous.

Sloan silt loam, 0 to 1 percent slopes (Sk).—This is a very fertile soil, but it is so poorly drained that it is not suited to agriculture. Most areas cannot be drained artificially because there are no outlets for the water. If the drainage can be improved slightly by open ditches, pasture or hay can be grown. The soil does not need lime, but some increase in yield of forage can be obtained by adding phosphorus, potassium, and nitrogen.

Steep broken land, 35 to 60 percent slopes (Sl)

This consists of very steep slopes along the sides of valleys and the nearly perpendicular walls of gorges where the mantle of soil is very thin or may be entirely lacking. These areas are scattered throughout the rough southwestern parts of the two counties where the steep valley walls have been notched by streams cutting into them at right angles to the main north-south valleys. This unit has no agricultural value, and very little of it has ever been cleared. On much of the area, the trees are scrubby and widely spaced and have little value except as cover for wildlife. They also help retard runoff.

Toledo series

This very poorly drained high-lime series has developed in gray lake-laid silts and clays. It is similar to the Poygan series, except that the Poygan soil was derived from pink or reddish-brown lacustrine sediments and contains less silt. The Toledo soil is the very poorly drained associate of the imperfectly to poorly drained Fulton soil. The poor drainage is caused by its slightly depressed position in areas of very slowly permeable material. The very poor drainage shows in the high organic-matter content and dark color of the surface layers and in the gray highly mottled color of the subsoil.

Typical profile of Toledo silty clay loam under forest:

- A_{11} 0 to 3 inches, black (10YR 2/1) silty clay loam; medium crumb structure; plastic when wet; very high in organic matter; neutral to slightly acid; 2 to 4 inches thick.
- A_{12} 3 to 10 inches, very dark gray (10YR 3/1) silty clay loam; moderate coarse granular structure; plastic when wet; high in organic matter; contains many medium-sized and fine roots; neutral to slightly acid; 5 to 9 inches thick.
- G_1 10 to 18 inches, gray (5Y 5/1) silty clay weakly mottled with yellowish brown (10YR 5/4); massive to coarse blocky structure; plastic; contains very few roots; neutral; 6 to 10 inches thick.
- G_2 18 to 28 inches, dark yellowish-brown (10YR 4/4) silty clay with high-contrast mottling of gray and pinkish gray; massive to coarse blocky structure; very plastic and sticky when wet; somewhat less dense than overlying layer; contains no roots; slightly calcareous in the lower part; 10 to 20 inches thick.
- C 28 inches +, light brownish-gray (10YR 6/2) to gray (10YR 5/1) tight, dense clay; contains thin lenses of silt; massive structure; very sticky and plastic; calcareous.

Toledo silty clay loam, 0 to 1 percent slopes (Ta).—This soil is too wet for crops if it is not drained artificially. Much of it is pastured, but it furnishes poor grazing. If the surface water is removed by open ditches and phosphorus fertilizer is applied, the soil supports good pastures. If drainage is slightly better, very productive pastures can be obtained by plowing and seeding to mixtures that include Ladino clover.

Good drainage is difficult to obtain, but it can be done more easily in the Toledo soil than in the Poygan soil. When this Toledo soil is fairly well drained, it is suited to corn, some vegetable crops, small grains, hay, and pasture. The improvement in drainage is usually not enough to permit the growing of high-value vegetable crops. The drained soil is suited to the rotations of group 1, table 10. Under these rotations, the soil has low requirements for lime and potassium and a medium requirement for phosphorus.

Valois Series

These well-drained, medium-textured, acid soils have developed in glacial till derived mainly from shale and sandstone. The substratum is typically firm or very firm till, but a few areas on complex topography have a loose till substratum. These soils are neutral or weakly calcareous below depths of 3½ to 5 feet. Soils of this series occupy a belt between the medium-lime Lansing soils on the north and the very acid Woostern and Bath soils on the south. This series is the well-drained member of the catena that includes the moderately well drained Langford soils, the poorly drained Erie soils, and the very poorly drained Alden soil.

Typical profile of Valois gravelly silt loam under forest:

- A_0 Black (10YR 2/1) finely granular humus, matted with fine roots; very strongly acid; 2 to 4 inches thick.
- A_1 0 to 1 inch, dark grayish-brown (10YR 4/2) gravelly silt loam, speckled with light gray; weak medium crumb structure; friable, nonplastic; very strongly acid; ½ to 2 inches thick.
- B_{21} 1 to 7 inches, yellowish-brown (10YR 5/6) gravelly silt loam; weak fine crumb structure; friable, nonplastic; contains many small and medium-sized roots; good water-holding capacity; 6 to 10 inches thick.
- B_{22} 7 to 20 inches, light yellowish-brown (10YR 6/4) mellow gravelly silt loam; weak fine crumb structure; friable; good root distribution; good water-holding capacity; strongly acid; 8 to 16 inches thick.
- B_3 or A'_2[8] 20 to 28 inches, light olive-brown (2.5Y 5/4) gravelly silt loam or silt loam; contains coarse material that may be rounded gravel or angular sandstone fragments; weak fine to medium blocky structure; firm

[8] See footnote 4, page 31.

when moist; readily penetrated by roots; good water-holding capacity; medium acid.

B'_2 28 to 50 inches, light olive-brown (2.5Y 5/4) gravelly loam; weak medium to fine subangular blocky structure within very coarse prisms; thin coatings of dark yellowish-brown (10YR 4/4) slightly sticky clay on some of the blocks; vertical streaks of light yellowish-brown coarse silt surround the large prisms; firm to very firm; strongly acid in the upper part but only slightly acid or neutral in the lower part; 15 to 30 inches thick.

C_2 50 inches +, grayish-brown (2.5Y 5/2) gravelly loam; moderate thick platy structure; firm; neutral in the upper part, generally calcareous below 72 inches.

Valois gravelly silt loam, 5 to 15 percent slopes (Va).—This is a well-drained, medium-textured soil with good water-holding capacity. It can be planted early in spring. It responds well to good management. It absorbs water rapidly and, except during heavy rains, does not erode seriously. Its moderate slopes somewhat restrict the intensity with which this soil should be cropped.

All of the crops grown in Ontario and Yates Counties are suited to this soil, provided they are grown in the rotations of group 5, table 10, and with the supporting practices listed. Under this management, the soil has a high lime requirement and medium phosphorus and potassium requirements. Potatoes and most vegetable crops respond to larger amounts of phosphorus and potassium fertilizers and to nitrogen.

Valois gravelly silt loam, eroded, 5 to 15 percent slopes (Vb).—This soil has lost most, or all, of the original surface layer. The present plow layer consists mainly of subsoil material. It is lower in organic-matter content and has poorer tilth than the Valois gravelly silt loam, 5 to 15 percent slopes. The surface soil absorbs water more slowly and runoff is greater, so that danger of erosion is greater.

Most of the crops grown in the two counties are suited to this soil, but only 1 year of row crops should be in a rotation. The soil is suited to the rotations of group 7, table 10, and the supporting practices suggested. Under these rotations, the soil has a high lime requirement and medium phosphorus and potassium requirements. The response to higher rates of fertilization is less than on the uneroded soil, except where organic matter has been restored to the plow layer. Native pastures consist of undesirable plants. They produce little forage after the first of July. Good pastures can be obtained by fertilizing, liming, and seeding to grass-legume mixtures.

Valois gravelly silt loam, 15 to 25 percent slopes (Vc).—This moderately steep Valois soil has rapid runoff. Erosion is difficult to control. Use of machinery is difficult on these steep slopes. The soil does not respond so well to good management as the more gently sloping soils of the Valois series, because more of the water needed by crops is lost in runoff. The soil can be used for the rotations suggested for group 8, table 10, if the practices to control runoff are used. It would be best to use this soil for rotations that contain only close-growing crops and sod crops, unless there is no better soil available for intertilled crops. Alfalfa is a well-suited crop for this soil; birdsfoot trefoil and red clover are also well suited. Under the rotations of group 8, this soil has a high lime requirement and medium phosphorus and potassium requirements.

Valois gravelly silt loam, eroded, 15 to 25 percent slopes (Vd).—About 80 percent of the Valois soils on moderately steep slopes are severely eroded and are included in this unit. The present plow layer is composed mainly of subsoil material. It is low in organic-matter content. It is more slowly permeable than the plow layer of the uneroded soil. This allows greater runoff and more serious erosion.

The soil is suited to the rotations of group 10, table 10, except that the rotation with a row crop should not be used. The soil needs the management practices suggested and has a high lime requirement and medium phosphorus and potassium requirements.

Native pastures yield poorly. Better pastures and better erosion control can be obtained by plowing and seeding to grass-legume mixtures. Birdsfoot trefoil is a good legume to use. Lime, phosphorus, and potassium are needed to establish and maintain pastures on this soil.

Volusia Series

The Volusia series is well known throughout southern New York as a problem soil. Drainage is poor. The soils have developed on moderate nearly uniform or slightly concave slopes where seepage water from nearby higher areas keeps the soil wet for long periods in the spring or after heavy rains. The surface soil is gray, the subsoil is highly mottled but friable, and a dense almost impermeable hardpan lies at 15 to 19 inches. Water seeps into the soil above this pan. Tile drainage is not practical over most of these soils because of the pan, but it can be used to drain depressions in which seepage concentrates. The soils are low in fertility and their response to management is small. The Volusia series is the poorly drained member of the catena that includes the well-drained Bath soils, the moderately well drained Mardin soils, and the very poorly drained Chippewa soils. In large areas where these soils are associated, Volusia soils account for most of the acreage.

Typical profile of Volusia channery silt loam under forest:

A_0 Nearly black raw humus is present on slight knolls, but commonly absent in slight depressions; very strongly to strongly acid; up to 1½ inches thick.

A_1 0 to 4 inches, dark grayish-brown (10YR 4/2) channery silt loam; moderate medium and coarse crumb structure; friable; very strongly to strongly acid; 3 to 6 inches thick.

B_{2g} 4 to 6 inches, yellowish-brown (10YR 5/4 to 5/6) channery silt loam with few distinct mottles; weak fine and medium crumb structure; friable; a discontinuous layer, present on slight knolls, absent in slight depressions; layer is mixed into the plow layer in cultivated areas; very strongly to strongly acid; up to 4 inches thick.

A'_{2g} [9] 6 to 12 inches, light olive-brown to light yellowish-brown (2.5Y 5/4 to 6/4) coarse silt loam to loam with many medium and large distinct yellowish-brown mottles; weak or very weak medium platy to massive; friable; roots are common; strongly acid; 4 to 7 inches thick.

B'_{2gm} 12 to 25 inches, olive-brown (2.5Y 4/4) channery silt loam with many faint gray and brown mottles and few to many very dark brown stains; vertical streaks, mainly less than ¾ inches across, divide the horizon into prisms 10 to 30 inches across; these streaks consist of light brownish-gray (2.5Y 6/2) silt or silty clay and have natural breakage planes down the middles and have yellowish-brown borders; interiors of prisms have weak to very weak coarse blocky structure; blocks break to very weak medium blocks;

[9] See footnote 4, page 31.

faces of blocks are coated with thin films of gray silt; very firm, extremely hard; fine roots in cracks, but none in prisms; strongly acid; 10 to 20 inches thick.

B'_{3m} 25 to 48 inches, olive-brown to light olive-brown (2.5Y 4/4 to 5/3) very channery silt loam or loam; extensions of gray streaks from horizon above divide this horizon into gray-coated prisms 2 to 4 feet across; weak to very weak medium blocky structure; very firm, very hard; contains very few roots; strongly acid in the upper part but may be only medium acid below a depth of 3½ feet; 20 to 40 inches thick.

C_1 48 inches +, pale-olive to olive (5Y 6/4 to 5/3) very channery loam or silt loam; weak medium blocky or thick platy structure; aggregates have very thin gray coatings; layer firm but less brittle than layer above; strongly to slightly acid in the upper part, and acidity generally decreases with depth; may be calcareous below 4½ or 5 feet.

Volusia channery silt loam, 0 to 3 percent slopes (Ve).—This soil is in small areas where seepage water collects. It is one of the poorest of the Volusia soils. Runoff is relatively slow. Improving the drainage is very difficult. Diversion terraces may intercept some of the seepage water and improve the drainage slightly. Tile lines properly located may tap the sources of seepage water.

This soil is poorly suited to crops that require much labor or special management for good yields. It is best suited to sod crops. Shallow-rooted legumes are best for mixing with grasses, but birdsfoot trefoil grows fairly well. The soil can be used for corn for silage and for small grains. Winter wheat produces well, but yields of oats are commonly low because of late planting in the spring.

The rotations of group 3, table 10, with very simple management practices to control erosion, are suitable for this soil. Under these rotations, the soil has a high requirement for lime and medium requirements for phosphorus and potassium. Response to higher rates of fertilization is very small, except that crops other than inoculated legumes respond to nitrogen.

Volusia channery silt loam, 3 to 8 percent slopes (Vf).—This is the best of the Volusia soils. The moderate slopes allow excess water to drain off but they do not cause serious erosion. Response to management is small, and crops that require much intensive management are poorly suited. Small grains, hay, pasture, and corn for silage can be grown with reasonable success under good management. Alfalfa is very poorly suited; Ladino clover, red clover, and birdsfoot trefoil can be used. Winter wheat produces fairly well, but oats give low yields because they cannot be planted until late in spring.

The soil can be used for the rotations of group 4, table 10, with the supporting practices listed. Under these rotations, the soil has a high lime requirement and medium requirements for phosphorus and potassium. Response to larger amounts of phosphorus or potassium is small, but most crops except legumes respond to nitrogen. Yields resulting from different levels of management of this soil during an experiment are given in table 9.

Volusia channery silt loam, 8 to 15 percent slopes (Vg).—The rapid runoff and slow infiltration of water on this soil creates a moderate erosion problem. In addition, this soil has the other limitations of Volusia soils. Like other Volusia soils, it is best suited to sod crops but can be used with fair success for corn for silage and for small grains. Ladino clover, red clover, and birdsfoot trefoil are suitable legumes. Wheat is productive, but oats have low yields because they cannot be planted until late. When used for the rotations of group 7, table 10, with the supporting practices listed, this soil has a high lime requirement and medium requirements for phosphorus and potassium.

TABLE 9.—*Average acre yield on Volusia channery silt loam, 3 to 8 percent slopes, under 5 rates of fertilization*

[For all rates of fertilization the rotation consists of 1 year of corn, 1 year of oats, 2 years of hay, 1 year of wheat, and 1 year of hay. Tests made at Ithaca, N. Y.]

Amendments applied during rotation [1]	Crop and years of record				
	Corn for silage 11	Oats [2] 5	Mixed hay after oats [3] 11	Winter wheat 11	Mixed hay after wheat [4] 5
	Tons	*Bu.*	*Tons*	*Bu.*	*Tons*
a. 1,000 lbs. limestone, 60 lbs. phosphate (P_2O_5), and 18 tons manure per acre	7. 6	38	1. 7	14	1. 8
b. 1,000 lbs. limestone, 120 lbs. phosphate (P_2O_5), and 27 tons manure per acre	9. 0	45	1. 8	17	2. 3
c. 3,000 lbs. limestone, 60 lbs. phosphate (P_2O_5), and 18 tons manure per acre	9. 8	42	1. 9	18	2. 2
d. 3,000 lbs. limestone, 120 lbs. phosphate (P_2O_5), and 27 tons manure per acre	10. 0	45	2. 0	22	2. 4
e. 5,000 lbs. limestone, 120 lbs. phosphate (P_2O_5), and 27 tons manure per acre	11. 5	50	2. 1	23	2. 3

[1] Amendments applied as follows:

Lime:
Rates a and b: 500 lbs. drilled in row at each hay seeding.
Rates c and d: 500 lbs. drilled in row at each hay seeding and 2,000 lbs. before plowing sod for corn.
Rate e: 500 lbs. drilled in row at each hay seeding, 2,000 lbs. before plowing sod for corn, and 2,000 lbs. when corn is planted.

Phosphate:
Rates a and c: 30 lbs. applied at each hay seeding.
Rates b, d, and e: 30 lbs. applied at each hay seeding, 30 lbs. on oats, and 30 lbs. on wheat.

Manure:
Rates a, b, c, d, and e: Total tons of manure for the rotation to be divided equally among the corn crop, the 2nd year of hay after the oat crop, and the wheat crop.

[2] Record for only the last 5 years of the 11-year experiment because an improved variety of oats, the Mohawk, was introduced.

[3] Seeding mixture is timothy, Ladino clover, red clover, and alfalfa. Yields are averages for the 1st- and 2nd-year hay crops through the 11-year period.

[4] Seeding mixture is timothy and medium red clover.

Volusia channery silt loam, eroded, 8 to 15 percent slopes (Vh).—Most or all of the original plow layer of this soil has been lost through erosion. The present plow layer consists mainly of subsoil material. The depth to the hardpan is 6 to 9 inches less than on the same soil before it was eroded. The soil is highly erodible. The organic-matter content is low, and water filters into the soil slowly. This soil has a low moisture supply during the dry season. Response to management is less than on

the uneroded Volusia channery silt loam on 8 to 15 percent slopes.

Hay and pasture are the crops best suited to this soil. Alfalfa is poorly suited, but Ladino clover, red clover, and birdsfoot trefoil are good legumes for this soil. Corn for silage and small grains can also be grown. Wheat is more productive than oats. The soil can be used for the rotations of group 8, table 10, with the supporting practices listed for control of runoff. Under this management, the soil has high requirements for lime and medium requirements for potassium and phosphorus.

Volusia channery silt loam, eroded, 15 to 25 percent slopes (Vk).—This poorly drained soil is of small extent. About 80 to 90 percent of it has been seriously eroded. The hardpan is 10 inches or less below the surface. The organic-matter content is low in the plow layer. Response to management is low.

The soil should not be used for intertilled crops. It is suited to the rotations of group 11, table 10. In these rotations, wheat is a more productive small grain than oats, and birdsfoot trefoil is probably the best legume. The soil has a high lime requirement and medium requirements for potassium and phosphorus. Where the sod crops do not include legumes, nitrogen fertilizer gives very large increases in yield. Native pastures can be improved by lime and fertilizer, but better soil conservation and better production are obtained by growing pasture crops in a rotation with small grains. A legume-grass pasture mixture is seeded in a small grain and left as long as the legume persists in the stand.

Warners series

This very poorly drained black soil series is developing on flats and depressions from alluvium that lies over shell marl. Water usually stands on the surface for long periods. The soil is closely associated with Edwards muck, 0 to 1 percent slopes. The Warners soil is forming in shallow depressions or basins where alluvium has been deposited over the marl that underlies the Edwards series. Most of the Warners soil in this area is loam, but some areas of silt loam and very fine sandy loam are included in the single unit of the Warners series mapped in these counties.

Typical profile of Warners loam under cultivation:

- A_1 0 to 7 inches, black (10YR 2/1) loam; strong fine to medium granular structure; loose and mellow when moist, slightly sticky when wet; mildy alkaline; 6 to 9 inches thick.
- C 7 to 24 inches, very dark gray (10YR 3/1) loam; granular structure; loose and mellow when moist, slightly plastic when wet; contains small white shells in places; commonly slightly calcareous; 10 to 20 inches thick.
- D 24 inches +, chalk-white to light-gray (10YR 7/1) shell marl; 10 inches to several feet thick; layer is underlain by compact light-gray calcareous sand.

Warners loam, 0 to 1 percent slopes (Wa).—Without artificial drainage, this soil cannot be used for agriculture. Cleared undrained areas are commonly included in pastures, but the vegetation is mainly sedges and cattails. Where the soil is partly drained by open ditches, timothy and redtop hay are produced, and Ladino clover could be grown.

Where the soil is completely drained, it is suited to cabbage, celery, onions, hay, and pasture. The drained soil is suited to the rotations of group 1, table 10. For maintenance of fertility under these rotations, the soil has a low lime requirement and medium phosphorus and potassium requirements. Larger amounts of potassium and phosphorus and some nitrogen bring a generally good response from the soil if it has been well drained.

Wayland Series

These poorly drained soils are developing in neutral recent alluvium on the first bottom lands. The parent material is derived almost entirely from the high-lime soils of the nearby uplands. Material is added to the surface every year during floods. The Wayland series is the poorly drained member of the catena that includes the well-drained Genesee soils, the moderately well drained Eel soils, and the very poorly drained Sloan soil. It is also mapped as the poorly drained associate of the Chagrin series.

Typical profile of Wayland silt loam under forest:

- A_1 0 to 8 inches, very dark grayish-brown (10YR 3/2) silt loam, with rust-colored mottling along root channels and worm holes; coarse granular structure; friable; contains many fine roots; neutral; 6 to 10 inches thick.
- CG_1 8 to 24 inches, dark grayish-brown (10YR 4/2) to gray (10YR 5/1) silt loam, mottled with rust brown, especially along root channels; weak coarse blocky structure; slightly plastic when wet; neutral; 10 to 20 inches thick.
- CG_2 24 inches +, dark-gray (10YR 4/1) silt loam with rust-brown mottling; massive to coarse blocky structure; firm when moist, plastic when wet; mildly alkaline; this material grades into bluish-gray clay; permanent water table is 18 inches or less from the surface.

Wayland silt loam, 0 to 1 percent slopes (Wb).—This poorly drained soil is too wet for most crops except hay and pasture. Unimproved and undrained native pastures support low-quality forage, but they produce well late in summer and early in autumn when the upland pastures provide the least feed. This soil occupies some of the lowest parts of the first bottom lands, where outlets for artificial drainage are few.

Generally, drainage cannot be improved enough for success with crops that require intensive management. Where drainage can be improved, the soil is suited to corn, hay, or pasture. Ladino clover is the best suited legume. It makes excellent pasture even when the soil is only partly drained. The soil can be used for the rotations of group 1, table 10, but in most places continuous sod is a better use. The soil has low requirements for lime and potassium and a medium requirement for phosphorus.

Wayland silty clay loam, 0 to 1 percent slopes (Wc).—This soil is similar to Wayland silt loam on 0 to 1 percent slopes, but it is finer in texture throughout the profile. Like the silt loam, this soil is too wet for most crops except hay or pasture. Even where outlets are available for artificial drainage, the soil drains so slowly that sod crops are generally the only ones that will do well. Ladino clover is the best suited legume. In some places the soil can be drained enough to be used for corn in drier seasons. The soil has low requirements for lime and potassium and a medium requirement for phosphorus.

Westland Series

This very poorly drained series has developed in calcareous glacial outwash material. It occupies low-lying positions where much more fine material was deposited than in the higher lying sites where the well-drained soils later developed. The very poor drainage shows in the very dark colored surface soil and the highly mottled gray and yellowish-brown subsoil. The Westland series is the very poorly drained member of the catena that includes the well-drained Palmyra soils, the moderately well drained Phelps soil, and the poorly drained Homer soils. It is also mapped as the very poorly drained associate of the Howard series.

Typical profile of Westland silt loam under forest:

- A_1 0 to 6 inches, very dark gray (10YR 3/1) to black (10YR 2/1) silt loam; moderate coarse granular structure; friable; very high in organic matter; filled with fine roots; neutral; 5 to 8 inches thick.
- G_1 6 to 12 inches, gray (10YR 5/1) silt loam or gravelly silt loam, weakly mottled with yellowish brown (10YR 5/6) and light brownish gray (10YR 6/2); firm in place, nonplastic when wet; neutral; 4 to 8 inches thick.
- G_2 12 to 24 inches, light brownish-gray (10YR 6/2) heavy silt loam or silty clay loam; weak medium blocky structure; firm, slightly plastic; neutral; 8 to 16 inches thick.
- CG 24 inches +, gray to light brownish-gray (10YR 6/1 to 6/2) layers of silt, gravel, and sand; glacial outwash composed of shale, sandstone, and limestone; calcareous; saturated with water during most of the year.

Westland silt loam, 0 to 1 percent slopes (Wd).—If this soil is not drained, it is too wet for crops and is very poor for pasture. Native plants are coarse grasses, sedges, and rushes. In most places it is possible to drain the soil artificially. Where it is well drained by tile or open ditches, this soil is suited to corn, small grains, hay, pasture, and most of the intensively grown cash crops. For the rotations of group 1, table 10, it requires few or no supporting practices except drainage. Its requirement for lime is low, and its requirements for phosphorus and potassium are medium. On the drained soil, larger amounts of phosphorus and potassium bring a good response from intensively grown crops. Nitrogen also brings a good response.

Woostern Series

These well-drained strongly acid soils have developed on loose to slightly firm glacial till derived from acid sandstone and shale. They are weak podzols similar to the Bath soils but are underlain by more rapidly permeable material. Rolling or irregular topography is typical of the Woostern soils. They commonly occur on the lower slopes of valleys just above the terraces where the Chenango soils lie. Woostern soils are also associated with the moderately well drained Mardin soils and the poorly drained Volusia soils.

Typical profile of Woostern gravelly loam under forest:

- A_0 Almost black humus, unmixed with mineral material; held in a mat of fine roots; very strongly acid; 1 to 3 inches thick.
- A_2 0 to 2 inches, pinkish-gray (7.5YR 6/2) loam; color commonly masked by organic matter in cutover areas; very weak very fine crumb structure; very friable; very strongly or extremely acid; 1 to 3 inches thick.
- B_{21} 2 to 7 inches, yellowish-brown (10YR 5/6 to 5/8) gravelly loam; very weak very fine crumb structure; very friable; well aerated, strongly leached of bases, and rich in iron oxide; contains medium-sized and fine roots; very strongly acid; 5 to 8 inches thick.
- B_{22} 7 to 20 inches, yellowish-brown (10YR 5/4) gravelly loam, lighter in color than layer above; weak fine crumb structure; friable, well aerated, and leached of bases; moderately rich in iron oxide; strongly acid (pH 5.1 to 5.5); 10 to 16 inches thick.
- B_3 20 to 30 inches, light yellowish-brown (10YR 6/4) gravelly loam, lighter in color than horizon above; weak medium crumb structure; friable; contains large roots; strongly acid; 6 to 16 inches thick.
- C 30 inches +, grayish-brown to light brownish-gray (2.5Y 5/2 to 6/2) very gravelly loam; loose to slightly firm glacial till consisting mainly of acid sandstone and shale and a smaller amount of crystalline rocks; permeable to water; upper part is penetrated by plant roots; material may be weakly water sorted in some places.

Woostern gravelly loam, 5 to 15 percent slopes (Wf).—This sloping Woostern gravelly loam generally has irregular relief so that different parts of the same field slope in different directions. Contour tillage is generally not possible on these complex slopes. The soil has good structure and good water-holding capacity. It responds well to good management.

This soil is suited to most crops grown in the area if properly managed. It can be used for the rotations of group 3, table 10, which require only simple practices to control runoff. To maintain fertility under these rotations, large amounts of lime and medium amounts of phosphorus and potassium are needed. Larger amounts of phosphorus and potassium and also nitrogen generally give good response on potatoes and other crops that need intensive management.

Woostern gravelly loam, eroded, 5 to 15 percent slopes (Wg).—This soil is like Woostern gravelly loam, 5 to 15 percent slopes, except that most of the original surface layer has been lost. The present plow layer is within part of the original subsoil. The organic-matter content of the soil is low.

Most crops grown in the two counties are at least moderately well suited to this soil. The soil is moderately productive when well managed. It is suited to the rotations of group 6, table 10. It needs only simple practices to control runoff, but it requires special practices, such as heavy manuring, to restore the organic-matter content. Wherever possible, the rotation should contain only 1 year of a close-growing crop and at least 2 years of a sod crop until the organic-matter content has been restored to the soil. Under the rotations suggested, the soil has a high requirement for lime and medium requirements for phosphorus and potassium. Response to heavier rates of phosphorus and potassium fertilization is moderately good on intensively grown cash crops. Response to the addition of nitrogen is generally high for all crops except legumes.

Woostern gravelly loam, 15 to 25 percent slopes (Wh).—The slopes are usually complex on this soil. Runoff is rapid, and it is important to control erosion and conserve moisture for crops. The soil tends to be droughty. The moderately steep slopes interfere with the use of machinery.

This soil is poorly suited to crops that require intensive management. Sod crops are best, and this soil should be used as seldom as possible for intertilled crops. The rotations of group 6, table 10, are good if simple supporting practices for controlling runoff are used. Under this

management, the soil has a high lime requirement and medium requirements for phosphorus and potassium.

Native pastures can be improved by fertilization and liming, but better soil conservation and better production can be obtained by plowing periodically and seeding to grass-legume mixtures. Birdsfoot trefoil is one of the best legumes for this soil.

Woostern gravelly loam, eroded, 15 to 25 percent slopes (Wk).—This soil is like Woostern gravelly loam, 15 to 25 percent slopes, except that most of the original surface layer has been lost through erosion. The organic-matter content is low. This increases runoff so that erosion control is difficult. Contour tillage is not practical because the slopes are moderately steep and also complex in most places.

The rotations of group 10, table 10, require only simple supporting practices for control of runoff on this soil. Under these rotations, the soil has a high lime requirement and medium requirements for phosphorus and potassium. Response is small when larger amounts of phosphorus and potassium are applied. Good response is commonly obtained from the use of nitrogen for crops other than legumes. Alfalfa and birdsfoot trefoil are both well suited as the sod crop in these rotations. The yield and quality of the forage on native pastures can be increased by liming and fertilization. Better production and better soil conservation can be obtained, however, by using birdsfoot trefoil. The trefoil is seeded with a companion crop and reseeded in the same way whenever it fails to produce a stand.

Woostern, Bath, and Valois soils, 25 to 45 percent slopes (We).—These are steep well-drained acid soils from glacial till. Soils of the Woostern, Bath, and Valois series are not shown separately on the map because the slope is the controlling factor in use and management. The soils are too steep to be used for crops.

In most places, native pastures are so poor that the soil would be better used for forestry. If necessary, fair pastures can be grown on the less steep parts of these soils by seeding birdsfoot trefoil. Such pastures have a high lime requirement and medium requirements for phosphorus and potassium. Lime and fertilizer can also improve native pastures, but applying these materials is so difficult and expensive and the response is so small that their use generally does not pay. Native pastures that are not improved produce little and erode seriously. Most of the soil used for pasture at the time of this survey was already seriously eroded. Production of either improved or unimproved pastures is fair in the spring and early summer but is low during midsummer when moisture is scarce.

Soil Management Systems

This section is designed to help the farmer choose a combination of practices suitable for the soils on his farm and appropriate for conditions prevailing at the time he makes his choice. The section is based on three tables. Table 10 gives for each soil mapped: (1) suitable crop rotations or uses; (2) practices to be used with these rotations for maintaining organic matter and controlling erosion; and (3) need for lime, nitrogen, phosphorus, and potassium at three levels of management (A, B, C). Table 11 converts the word ratings (low, medium, and high) of table 10 into pounds per acre of nitrogen (N), phosphate (P_2O_5), and potash (K_2O) to be applied yearly. Finally, table 12 shows yields to be expected from each soil at one or more of the three levels of fertilization.

Study of these tables will show that the increased yields at B and C levels are achieved by increasing the amounts of fertilizer and lime, not by changing the crop rotations or supporting practices. The rotations, with the supporting management for control of erosion and maintenance of organic matter, are basic to sound management. Generally, level B of fertilizer and lime is the minimum for effective soil maintenance under the rotation. Level A is not recommended. To obtain the estimated yields at the various levels, artificial drainage should be applied where needed, and choice of crop varieties, timeliness of work, control of weeds and insects, and other practices that make for good husbandry are necessary. In the following pages the various practices necessary for good management are discussed in more detail.

Crop Rotations and Supporting Practices To Maintain Organic Matter and Control Runoff

A good crop rotation, with proper supporting management, will maintain the soil and provide good yields. In planning a rotation, you must take into account the effect of each crop on the supply of organic matter. Row crops (intertilled crops) take from the soil, each year, about 2 percent of its total reserve of organic matter. Small grains or similar close-growing crops remove, each year, about half as much as a row crop. In contrast, grass-legume mixtures for hay or pasture add about 2 percent to the total supply of organic matter the first year they are grown on land used for a crop rotation. Consequently, a legume-grass sod, in the first year, will just about offset the depleting effect of a row crop. In the second year, a legume-grass sod is about one-fourth as effective as it was the first year. Grass crops, if they receive nitrogen, add about as much organic matter as a sod made up of legumes and grasses. Grass sods not fertilized with nitrogen do not make sufficient growth and therefore supply much less organic matter.

To maintain organic matter, you should try to get the most favorable balance between soil-depleting and soil-conserving crops. But a combination of crops ideal for maintaining organic matter may not provide the crops you need. Usually, the crops most needed on the farm cannot maintain organic matter by themselves. If, for example, you need to grow more corn to make your farming pay, you will have to supply at least part of the organic matter by other means than growing sod crops.

TABLE 10.—*Soils arranged by rotation groups, and management needs for soils of each group*

[Crop rotations or uses, practices to maintain organic matter, and practices to control erosion listed at top of each rotation group apply to all soils in that group. A, B, and C levels of liming and fertilization are interpreted in terms of crop yields in table 12. The words "low," "medium," and "high" are defined in terms of pounds per acre of nitrogen, phosphate, and potash on p. 94, and tons per acre of lime on p. 94]

ROTATION GROUP 1

Suitable rotation or use	*Practices to maintain organic matter*	*Practices to control runoff*
Row crops continuously	Apply 12 to 15 tons manure per acre per year; use cover crop or green manure crop if less manure is applied.	May need widely spaced terraces where water from a large watershed flows across field.
Row crops for 2 years, close-growing crop for 1 year, and sod for 1 or 2 years.	Apply 20 tons manure per acre in 4 or 5 years, or use less manure and grow cover crops.	Same.
Row crop for 1 year, close-growing crop for 1 or 2 years, and sod for 1 year.	Apply 6 to 12 tons manure per acre in 3 or 4 years or use less manure and grow cover crops.	None.
Row crop for 1 year, close-growing crop for 1 year, and sod for 2 or 3 years.	Other practices for maintenance of organic matter not needed if legumes dominate in sod; use nitrogen fertilizer if sod is grass.	None.
Close-growing crop for 1 year and sod for 3 or 4 years.	Same	None.
Sod continuously	Same	None.
Forest	None	None.

Map Symbol	Soil Name	Lime and Fertilizer				
		Level	Lime	Nitrogen	Phosphorus	Potassium
Aa	Alden silty clay loam, 0 to 1 percent slopes (drained)	B	Low	Low	Medium	Low.
Ab	Allendale fine sandy loam, 0 to 2 percent slopes (drained).	B	Medium	Medium	Medium	High.
		C	Medium	High	High	High.
Ap	Arkport loamy fine sand, 0 to 5 percent slopes	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	High.
		C	Medium	High	High	High.
As	Atherton silt loam, 0 to 1 percent slopes (drained)	B	Medium	Low	Medium	Medium.
		C	Medium	High	High	High.
Bd	Bono silty clay, 0 to 1 percent slopes (partially drained).	B	Low	Low	Medium	Low.
Be	Braceville gravelly silt loam, 0 to 5 percent slopes	A	Low	Low	Medium	Medium.
		B	High	Medium	Medium	Medium.
		C	High	High	High	High.
Ce	Carlisle muck, 0 to 1 percent slopes (drained)	B	Low	Medium	Medium	High.
		C	Low	High	High	High.
Cf	Carlisle muck, shallow, 0 to 1 percent slopes (drained)	B	Low	Medium	Medium	High.
		C	Low	High	High	High.
Cp	Chagrin silt loam, 0 to 2 percent slopes	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	Low.
		C	Low	High	High	High.
Cr	Chagrin silt loam, alluvial fan, 2 to 8 percent slopes	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	Low.
		C	Low	High	High	High.
Cs	Chagrin shaly silt loam, alluvial fan, 2 to 8 percent slopes.	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	Low.
		C	High	High	High	High.
Ct	Chenango and Tioga gravelly silt loams, alluvial fan, 2 to 5 percent slopes.	A	Low	Low	Medium	Medium.
		B	High	Medium	Medium	Medium.
		C	High	High	High	High.
Cu	Chenango gravelly loam, 0 to 5 percent slopes	A	Low	Low	Medium	Medium.
		B	High	Medium	Medium	High.
		C	High	High	High	High.
Cy	Chippewa silt loam, 0 to 1 percent slopes (drained)	A	Low	Low	Medium	Low.
		B	High	Low	Medium	Medium.
CC	Colwood silt loam, 0 to 1 percent slopes (drained)	B	Low	Medium	Medium	Medium.
		C	Low	High	High	High.

TABLE 10.—*Soils arranged by rotation groups, and management needs for soils of each group*—Continued

ROTATION GROUP 1—Continued

Map symbol	Soil Name	Lime and Fertilizer				
		Level	Lime	Nitrogen	Phosphorus	Potassium
Ea	Edwards muck, 0 to 1 percent slopes (drained)	B	Low	Medium	Medium	High.
		C	Low	High	High	High.
Eb	Eel silt loam, 0 to 2 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium to low	Low.
		C	Low	High	High	High.
Ec	Eel silty clay loam, 0 to 2 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
		C	Low	High	High	High.
Gb	Genesee fine sandy loam, 0 to 2 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	High.
		C	Low	High	High	High.
Gc	Genesee silt loam, 0 to 2 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
		C	Low	High	High	High.
Gd	Genesee silt loam, high bottom, 0 to 2 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
		C	Low	High	High	High.
Ge	Granby fine sandy loam, 0 to 1 percent slopes (drained).	B	Low	Medium	Medium	High.
		C	Low	High	High	High.
Ha	Holly silt loam, 0 to 1 percent slopes (slightly drained)	B	High	Low	Medium	Medium.
		C	High	High	High	High.
Hb	Homer sandy loam, 0 to 3 percent slopes:					
	Slightly drained	B	Low	Medium	Medium	High.
	Drained	B	Low	Medium	Medium	High.
		C	Low	High	High	High.
Hc	Homer silt loam, 0 to 3 percent slopes:					
	Slightly drained	B	Low	Medium	Medium	Medium.
	Drained	B	Low	Medium	Medium	Medium.
		C	Low	High	High	High.
Hd	Honeoye fine sandy loam, 0 to 3 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Medium.
		C	Low	High	High	High.
Hh	Honeoye silt loam, 0 to 3 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
		C	Low	High	High	High.
Hu	Howard gravelly loam, 0 to 5 percent slopes	A	Low	Low	Medium	Medium.
		B	Medium	Medium	Medium	High.
		C	Medium	High	High	High.
Ja	Junius fine sandy loam, 0 to 2 percent slopes:					
	Slightly drained	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	High.
	Drained	B	Low	Medium	Medium	High.
		C	Low	High	High	High.
Ka	Kendaia loam, 0 to 3 percent slopes:					
	Slightly drained	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Medium.
	Drained	B	Low	Medium	Medium	Medium.
		C	Low	High	High	High.
Kb	Kendaia silt loam, 0 to 3 percent slopes:					
	Slightly drained	B	Low	Medium	Medium	Low.
	Drained	B	Low	Medium	Medium	Low.
		C	Low	High	High	High.
Ln	Lima fine sandy loam, 0 to 3 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Medium.
		C	Low	High	High	High.

TABLE 10.—*Soils arranged by rotation groups, and management needs for soils of each group*—Continued

ROTATION GROUP 1—Continued

Map symbol	Soil Name	Lime and Fertilizer				
		Level	Lime	Nitrogen	Phosphorus	Potassium
Lp	Lima silt loam, 12 to 20 inches deep, 0 to 3 percent slopes.	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
Lr	Lima silt loam, 0 to 3 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
		C	Low	High	High	High.
Lu	Lobdell silt loam, 0 to 2 percent slopes	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	Low.
		C	Medium	High	High	High.
LA	Lyons silt loam, 0 to 1 percent slopes (drained)	B	Low	Medium	Medium	Low.
		C	Low	High	High	High.
Mm	Middlebury silt loam, 0 to 2 percent slopes	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.
		C	High	High	High	High.
Mn	Morocco fine sandy loam, 0 to 2 percent slopes:					
	Slightly drained	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.
	Drained	B	High	Medium	Medium	High.
		C	High	High	High	High.
Mo	Muck, acid (unclassified), 0 to 1 percent slopes (drained).	B	High	Medium	Medium	High.
		C	High	High	High	High.
Na	Newton fine sandy loam, 0 to 1 percent slopes (drained).	B	High	Medium	Medium	High.
		C	High	High	High	High.
Pb	Palmyra cobbly loam, 0 to 5 percent slopes	A	Low	Low	Medium	Medium.
		B	Low	Medium	Medium	High.
		C	Low	High	High	High.
Pc	Palmyra fine sandy loam, 0 to 5 percent slopes	A	Low	Low	Medium	Medium.
		B	Low	Medium	Medium	High.
		C	Low	High	High	High.
Pd	Palmyra gravelly loam, 0 to 5 percent slopes	A	Low	Low	Medium	Medium.
		B	Low	Medium	Medium	High.
		C	Low	High	High	High.
Pg	Palmyra gravelly sandy loam, 0 to 5 percent slopes	A	Low	Low	Medium	Medium.
		B	Low	Medium	Medium	High.
		C	Low	High	High	High.
Pk	Phelps gravelly silt loam, 0 to 5 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Medium.
		C	Low	High	High	High.
Pl	Poygan silty clay loam, 0 to 1 percent slopes (partially drained).	B	Low	Medium	Medium	Low.
Ra	Red Hook gravelly silt loam, 0 to 3 percent slopes (slightly drained).	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.
Ta	Toledo silty clay loam, 0 to 1 percent slopes (drained)	B	Low	Medium	Medium	Low.
Wa	Warners loam, 0 to 1 percent slopes (drained)	B	Low	Low	Medium	Medium.
		C	Low	High	High	High.
Wb	Wayland silt loam, 0 to 1 percent slopes (partially drained).	B	Low	Low	Medium	Low.
Wc	Wayland silty clay loam, 0 to 1 percent slopes (partially drained).	B	Low	Low	Medium	Low.
Wd	Westland silt loam, 0 to 1 percent slopes (drained)	B	Low	Medium	Medium	Medium.
		C	Low	High	High	High.

TABLE 10.—*Soils arranged by rotation groups, and management needs for soils of each group*—Continued

ROTATION GROUP 2

Suitable rotation or use	*Practices to maintain organic matter*	*Practices to control runoff*
Row crops continuously	Apply 12 to 15 tons manure per acre per year, or use less manure and grow green-manure crop or cover crop.	Field terraces spaced 100 feet apart and contour tillage.
Row crop for 2 years, close-growing crop for 1 year, and sod for 1 or 2 years.	Apply 20 tons manure per acre in 4 or 5 years, or use less manure and grow cover crops.	Diversion terraces spaced 600 feet or more apart, stripcropping, and contour tillage.
Row crop for 1 year, close-growing crop for 1 or 2 years, and sod for 1 year.	Apply 6 to 12 tons manure per acre in 3 or 4 years, or use less manure and grow cover crops.	Diversion terraces spaced 600 feet or more apart and contour tillage.
Row crop for 1 year, close-growing crop for 1 year, and sod for 2 or 3 years.	Other practices for maintenance of organic matter not needed if legumes dominate in sod; use nitrogen fertilizer if sod is grass.	Across-slope tillage.
Close-growing crop and sod for 3 or 4 years	Same	Same.
Sod continuously	Same	None.
Forest	None	None.

Map symbol	Soil Name	Lime and Fertilizer				
		Level	Lime	Nitrogen	Phosphorus	Potassium
CD	Canandaigua silt loam, 0 to 3 percent slopes:					
	Undrained	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Medium.
	Drained	B	Low	Medium	Medium	Medium.
		C	Low	High	High	High.
Da	Darien silt loam, 0 to 3 percent slopes	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	Low.
Fc	Fremont channery silt loam, 0 to 3 percent slopes	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.
Fg	Fulton silt loam, 0 to 3 percent slopes:					
	Slightly drained	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
	Drained	B	Low	Medium	Medium	Low.
Ga	Galen fine sandy loam, 0 to 6 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	High.
		C	Low	High	High	High.
Kc	Kendaia silt loam, 3 to 8 percent slopes:					
	Slightly drained	B	Low	Medium	Medium	Low.
	Drained	B	Low	Medium	Medium	Low.
		C	Low	High	High	High.
La	Lakemont silty clay loam, 0 to 2 percent slopes:					
	Slightly drained	B	Low	Medium	Medium	Low.
	Drained	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
Lb	Langford gravelly silt loam, 3 to 8 percent slopes	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.
		C	High	High	High	High.
Me	Mardin channery silt loam, 3 to 8 percent slopes	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.
		C	High	High	High	High.
Oc	Ontario fine sandy loam, 3 to 10 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Medium.
		C	Low	High	High	High.
Of	Ontario gravelly loam, 3 to 10 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Medium.
		C	Low	High	High	High.
Ok	Ontario loam, 3 to 10 percent	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
		C	Low	High	High	High.
Or	Ovid silt loam, 0 to 3 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
		C	Low	High	High	High.
Rb	Romulus silt loam, 0 to 3 percent slopes:					
	Slightly drained	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
	Drained	B	Low	Medium	Medium	Medium.
		C	Low	High	High	High.
Rd	Romulus silty clay loam, 0 to 3 percent slopes:					
	Slightly drained	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
	Drained	B	Low	Medium	Medium	Medium.

TABLE 10.—*Soils arranged by rotation groups, and management needs for soils of each group*—Continued

ROTATION GROUP 3

Suitable rotation or use	*Practices to maintain organic matter*	*Practices to control runoff*
Row crop for 2 years, close-growing crop for 1 year, and sod for 1 or 2 years.	Apply 20 tons manure per acre in 4 or 5 years, or use less manure and grow cover crops.	Stripcropping and across-slope tillage.
Row crop for 1 year, close-growing crop for 1 or 2 years, and sod for 1 year.	Apply 6 to 12 tons manure per acre in 3 or 4 years, or use less manure and grow cover crops.	Across-slope tillage.
Row crop for 1 year, close-growing crop for 1 year, and sod for 2 or 3 years.	Other practices for maintenance of organic matter not needed if legumes dominate in sod; use nitrogen fertilizer if sod is grass.	Same.
Close-growing crop and sod for 3 or 4 years	Same	Same.
Sod continuously	Same	None.
Forest	None	None.

Map symbol	Soil Name	Lime and Fertilizer				
		Level	Lime	Nitrogen	Phosphorus	Potassium
Ah	Angola silt loam, 0 to 3 percent slopes:					
	Undrained	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	Medium.
	Drained	A	Low	Low	Medium	Low.
		B	Medium	High	High	High.
Bc	Berrien fine sandy loam, 0 to 6 percent slopes	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	High.
		C	High	High	High	High.
Cv	Chenango gravelly loam, 5 to 15 percent slopes	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	High.
		C	High	High	High	High.
Ed	Erie gravelly silt loam, 0 to 3 percent slopes	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	Medium.
Fa	Farmington loam, 12 to 30 inches deep, 2 to 8 percent slopes.	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
Hv	Howard gravelly loam, 5 to 15 percent slopes	A	Low	Low	Medium	Medium.
		B	Medium	Medium	Medium	High.
		C	Medium	High	High	High.
Lw	Lordstown channery silt loam, 5 to 15 percent slopes	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.
		C	High	High	High	High.
Oo	Ottawa loamy fine sand, 0 to 6 percent slopes	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	High.
		C	High	High	High	High.
Pe	Palmyra gravelly loam, 5 to 15 percent slopes	A	Low	Low	Medium	Medium.
		B	Low	Medium	Medium	High.
		C	Low	High	High	High.
Ph	Palmyra gravelly sandy loam, 5 to 15 percent slopes	A	Low	Low	Medium	Medium.
		B	Low	Medium	Medium	High.
		C	Low	High	High	High.
Ve	Volusia channery silt loam, 0 to 3 percent slopes	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.
Wf	Woostern gravelly loam, 5 to 15 percent slopes	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.
		C	High	High	High	High.

TABLE 10.—*Soils arranged by rotation groups, and management needs for soils of each group*—Continued

ROTATION GROUP 4

Suitable rotation or use	*Practices to maintain organic matter*	*Practices to control runoff*
Row crop for 2 years, close-growing crop for 1 year, and sod for 1 or 2 years.	Apply 20 tons manure per acre in 4 or 5 years, or use less manure and grow cover crops.	Diversion terraces spaced 600 feet or more apart, contour tillage, and stripcropping.
Row crop for 1 year, close-growing crop for 1 or 2 years, and sod for 1 year.	Apply 6 to 12 tons manure in 3 or 4 years, or use less manure and grow cover crops.	Diversion terraces spaced 600 feet or more apart, contour tillage, and stripcropping.
Row crop for 1 year, close-growing crop for 1 year, and sod for 2 or 3 years.	Other practices for maintenance of organic matter not needed if legumes dominate in sod; use nitrogen fertilizer if sod is grass.	Across-slope tillage.
Close-growing crop for 1 year and sod for 3 or 4 years.	Same	Same.
Sod continuously	Same	None.
Forest	None	None.

Map symbol	Soil Name	Lime and Fertilizer				
		Level	Lime	Nitrogen	Phosphorus	Potassium
Am	Arkport fine sandy loam, 0 to 5 percent slopes	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	High.
		C	Medium	High	High	High.
At	Aurora silt loam, 3 to 8 percent slopes	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	Low.
Ba	Bath channery silt loam, 5 to 15 percent slopes	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.
		C	High	High	High	High.
Bf	Burdett silt loam, 0 to 6 percent slopes	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	Low.
Ca	Camillus silt loam, 0 to 8 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
		C	Medium	High	High	High.
Cb	Camillus silt loam, imperfectly drained variant, 0 to 5 percent slopes.	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
		C	Medium	High	High	High.
Cc	Caneadea silty clay loam, 0 to 6 percent slopes	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Low.
Cg	Cayuga silt loam, 3 to 8 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
		C	Low	High	High	High.
Cn	Cazenovia silt loam, 3 to 10 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
		C	Low	High	High	High.
Cz	Chippewa silt loam, 3 to 8 percent slopes (drained)	A	Low	Low	Medium	Low.
		B	High	Low	Medium	Medium.
CA	Collamer silt loam, 0 to 6 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Medium.
		C	Low	High	High	High.
Db	Darien silt loam, 3 to 8 percent slopes	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	Low.
De	Dunkirk fine sandy loam, 0 to 6 percent slopes	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	High.
		C	Medium	High	High	High.

TABLE 10.—*Soils arranged by rotation groups, and management needs for soils of each group*—Continued

ROTATION GROUP 4—Continued

Map symbol	Soil Name	Lime and Fertilizer				
		Level	Lime	Nitrogen	Phosphorus	Potassium
Dg	Dunkirk silt loam, 0 to 6 percent slopes	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	Medium.
		C	Medium	High	High	High.
Ee	Erie gravelly silt loam, 3 to 8 percent slopes	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	Medium.
Fd	Fremont channery silt loam, 3 to 8 percent slopes	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.
		C	High	High	Medium	High.
He	Honeoye fine sandy loam, 3 to 10 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Medium.
		C	Low	High	High	High.
Hk	Honeoye silt loam, 3 to 10 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
		C	Low	High	High	High.
Ho	Hornell silt loam, 36 inches or more deep, 3 to 8 percent slopes.	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Low.
		C	High	High	High	High.
Lg	Lansing silt loam, 3 to 10 percent slopes	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	Medium.
		C	Medium	High	High	High.
Lo	Lima fine sandy loam, 3 to 10 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Medium.
		C	Low	High	High	High.
Ls	Lima silt loam, 3 to 10 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
		C	Low	High	High	High.
Nb	Nunda silt loam, 0 to 6 percent slopes	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	Medium.
		C	Medium	High	High	High.
Oa	Odessa silt loam, 0 to 6 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
		C	Low	High	High	High.
Os	Ovid silt loam, 3 to 8 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
Rc	Romulus silt loam, 3 to 8 percent slopes:					
	Slightly drained	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
	Drained	B	Low	Medium	Medium	Medium.
		C	Low	High	High	High.
Sa	Schoharie silt loam, 0 to 6 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
Sc	Schoharie silty clay loam, 0 to 6 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
Vf	Volusia channery silt loam, 3 to 8 percent slopes	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.
		C	High	High	Medium	High.

TABLE 10.—*Soils arranged by rotation groups, and management needs for soils of each group*—Continued

ROTATION GROUP 5

Suitable rotation or use	*Practices to maintain organic matter*	*Practices to control runoff*
Row crops for 2 years, close-growing crop for 1 year, and sod for 1 or 2 years.	Apply 20 tons manure per acre in 4 years, or use less manure and grow cover crops.	Diversion terraces spaced 300 feet apart, contour tillage, and strip-cropping.
Row crop for 1 year, close-growing crop for 1 or 2 years, and sod for 1 year.	Apply 6 to 12 tons manure per acre in 3 or 4 years, or use less manure and grow cover crops.	Diversion terraces spaced 600 feet apart, contour tillage, and strip-cropping.
Row crop for 1 year, close-growing crop for 1 year, and sod for 2 or 3 years.	Other practices for maintenance of organic matter not needed if legume is dominant in sod; use nitrogen fertilizer if sod is grass.	Diversion terraces spaced 400 feet apart, and contour tillage.
Close-growing crop for 1 year, and sod for 3 or 4 years.	Same	Across-the-slope tillage.
Sod continuously	Same	None.
Forest	None	None.

Map symbol	Soil Name	Lime and Fertilizer				
		Level	Lime	Nitrogen	Phosphorus	Potassium
Ad	Allis silt loam, 36 inches or more deep, 3 to 8 percent slopes (undrained).	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.
Ch	Cayuga silt loam, eroded, 3 to 8 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
		C	Low	High	High	High.
Hf	Honeoye fine sandy loam, 10 to 20 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Medium.
		C	Low	High	High	High.
Hl	Honeoye silt loam, 10 to 20 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
		C	Low	High	High	High.
Lc	Langford gravelly silt loam, 8 to 15 percent slopes	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.
Mf	Mardin channery silt loam, 8 to 15 percent slopes	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.
		C	High	High	High	High.
Od	Ontario fine sandy loam, 10 to 20 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Medium.
Ol	Ontario loam, 10 to 20 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
Va	Valois gravelly silt loam, 5 to 15 percent slopes	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.
		C	High	High	High	High.

TABLE 10.—*Soils arranged by rotation groups, and management needs for soils of each group*—Continued

ROTATION GROUP 6

Suitable rotation or use	*Practices to maintain organic matter*	*Practices to control runoff*
Row crop for 1 year, close-growing crop for 1 or 2 years, and sod for 1 year.	Apply 6 to 12 tons manure per acre in 3 or 4 years, or use less manure and grow cover crops.	Across-the-slope tillage and strip-cropping.
Row crop for 1 year, close-growing crop for 1 year, and sod for 2 or 3 years.	Other practices for maintenance of organic matter not needed if legume is dominant in sod; use nitrogen if sod is grass.	Across-the-slope tillage.
Close-growing crop for 1 year, and sod for 3 or 4 years.	Same	Same.
Sod continuously	Same	None.
Forest	None	None.

Map symbol	Soil Name	Lime and Fertilizer				
		Level	Lime	Nitrogen	Phosphorus	Potassium
Cw	Chenango soils, 15 to 25 percent slopes	A	Low	Low	Medium	Medium.
		B	High	Medium	Medium	High.
Hw	Howard soils, 15 to 25 percent slopes	A	Low	Low	Medium	Medium.
		B	Medium	Medium	Medium	High.
Ld	Lansing and Danley silt loams, 12 to 20 inches deep, 3 to 8 percent slopes.	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	Medium.
Lx	Lordstown channery silt loam, 15 to 25 percent slopes	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.
Op	Ottawa loamy fine sand, 6 to 12 percent slopes	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	High.
		C	High	High	High	High.
Pf	Palmyra gravelly loam, 15 to 25 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	High.
Wg	Woostern gravelly loam, eroded, 5 to 15 percent slopes	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.
		C	High	High	High	High.
Wh	Woostern gravelly loam, 15 to 25 percent slopes	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.

TABLE 10.—*Soils arranged by rotation groups, and management needs for soils of each group*—Continued

ROTATION GROUP 7

Suitable rotation or use	*Practices to maintain organic matter*	*Practices to control runoff*
Row crop for 1 year, close-growing crop for 1 or 2 years, and sod for 1 year.	Apply 6 to 12 tons manure per acre in 3 or 4 years, or use less manure and grow cover crops.	Diversion terraces spaced 600 feet apart, contour tillage, and stripcropping.
Row crop for 1 year, close-growing crop for 1 year, and sod for 2 or 3 years.	Other practices for maintenance of organic matter not needed if legume is dominant in sod; use nitrogen if sod is grass.	Diversion terraces spaced 600 feet apart, across-the-slope tillage, and stripcropping.
Close-growing crop for 1 year, and sod for 3 or 4 years.	Same	Across-the-slope tillage.
Sod continuously	Same	None.
Forest	None	None.

Map symbol	Soil Name	Lime and Fertilizer				
		Level	Lime	Nitrogen	Phosphorus	Potassium
Ak	Arkport-Dunkirk fine sandy loams, 6 to 12 percent slopes.	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	High.
		C	Medium	High	High	High.
An	Arkport fine sandy loam, 6 to 12 percent slopes	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	High.
		C	Medium	High	High	High.
Au	Aurora silt loam, eroded, 3 to 8 percent slopes	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	Low.
Av	Aurora silt loam, 8 to 15 percent slopes	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	Low.
Cd	Caneadea silty clay loam, eroded, 6 to 15 percent slopes	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Low.
Ck	Cayuga silt loam, 8 to 15 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
		C	Low	High	High	High.
CB	Collamer silt loam, 6 to 12 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Medium.
		C	Low	High	High	High.
Dc	Darien silt loam, 8 to 15 percent slopes	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	Low.
Df	Dunkirk fine sandy loam, 6 to 12 percent slopes	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	High.
		C	Medium	High	High	High.
Dh	Dunkirk silt loam, 6 to 12 percent slopes	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	Medium.
		C	Medium	High	High	High.
Ef	Erie gravelly silt loam, 8 to 15 percent slopes	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	Medium.
Fe	Fremont channery silt loam, 8 to 15 percent slopes	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.
Hr	Hornell silt loam, 36 inches or more deep, 8 to 15 percent slopes.	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Low.
Lh	Lansing silt loam, 10 to 20 percent slopes	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	Medium.
		C	Medium	High	High	High.
Ma	Manlius shaly silt loam, 36 inches or more deep, 5 to 15 percent slopes.	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.
		C	High	High	High	High.
Mg	Mardin channery silt loam, eroded, 8 to 15 percent slopes.	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.
		C	High	High	High	High.
Nc	Nunda silt loam, 6 to 12 percent slopes	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	Medium.
		C	Medium	High	High	High.
Ot	Ovid silty clay loam, eroded, 3 to 8 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
Sb	Schoharie silt loam, 6 to 12 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
Sd	Schoharie silty clay loam, 6 to 12 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
Vb	Valois gravelly silt loam, eroded, 5 to 15 percent slopes.	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.
		C	High	High	High	High.
Vg	Volusia channery silt loam, 8 to 15 percent slopes	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.

TABLE 10.—*Soils arranged by rotation groups, and management needs for soils of each group*—Continued

ROTATION GROUP 8

Suitable rotation or use	*Practices to maintain organic matter*	*Practices to control runoff*
Row crop for 1 year, close-growing crop for 1 or 2 years, and sod for 1 year.	Apply 6 to 12 tons manure per acre in 3 or 4 years, or use less manure and grow cover crops.	Diversion terraces spaced 300 feet apart, contour tillage, and strip-cropping.
Row crop for 1 year, close-growing crop for 1 year, and sod for 2 or 3 years.	Other practices for maintenance of organic matter not needed if legume is dominant in sod; use nitrogen if sod is grass.	Diversion terraces spaced 600 feet apart, contour tillage, and strip-cropping.
Close-growing crop for 1 year and sod for 3 or 4 years.	Same	Same.
Sod continuously	Same	None.
Forest	None	None.

Map symbol	Soil Name	Lime and Fertilizer				
		Level	Lime	Nitrogen	Phosphorus	Potassium
Bb	Bath channery silt loam, 15 to 25 percent slopes	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.
		C	High	High	High	High.
Hg	Honeoye fine sandy loam, eroded, 10 to 20 percent slopes.	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Medium.
		C	Low	High	High	High.
Hm	Honeoye silt loam, eroded, 10 to 20 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
		C	Low	High	High	High.
Lk	Lansing silt loam, eroded, 10 to 20 percent slopes	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	Medium.
Lt	Lima silt loam, 10 to 20 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
Nd	Nunda silt loam, eroded, 6 to 12 percent slopes	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	Medium.
		C	Medium	High	High	High.
Ob	Odessa silty clay loam, eroded, 6 to 12 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
Oe	Ontario fine sandy loam, eroded, 10 to 20 percent slopes.	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Medium.
Og	Ontario gravelly loam, eroded, 10 to 20 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Medium.
Om	Ontario loam, eroded, 10 to 20 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
Ou	Ovid silty clay loam, eroded, 8 to 15 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
Se	Schoharie silty clay loam, eroded, 6 to 12 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
Vc	Valois gravelly silt loam, 15 to 25 percent slopes	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.
Vh	Volusia channery silt loam, eroded, 8 to 15 percent slopes.	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.

TABLE 10.—*Soils arranged by rotation groups, and management needs for soils of each group*—Continued

ROTATION GROUP 9

Suitable rotation or use	*Practices to maintain organic matter*	*Practices to control runoff*
Row crops for 1 year, close-growing crop for 1 year, and sod for 2 or 3 years.	Other practices for maintenance of organic matter not needed if legume dominates in sod; use nitrogen if sod is grass.	Diversion terraces spaced 300 feet apart, contour tillage, and stripcropping.
Close-growing crop for 1 year, and sod for 3 or 4 years.	Same	Across-the-slope tillage.
Sod continuously	Same	None.
Forest	None	None.

Map symbol	Soil Name	Lime and Fertilizer				
		Level	Lime	Nitrogen	Phosphorus	Potassium
Al	Arkport-Dunkirk fine sandy loams, eroded, 12 to 20 percent slopes.	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	High.
		C	Medium	High	High	High.
Ao	Arkport fine sandy loam, eroded, 12 to 20 percent slopes.	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	High.
		C	Medium	High	High	High.
Cl	Cayuga silt loam, eroded, 8 to 15 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
		C	Low	High	High	High.
Co	Cazenovia silt loam, 10 to 20 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
Dd	Darien silt loam, eroded, 8 to 15 percent slopes	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	Low.
Dk	Dunkirk silt loam, eroded, 12 to 20 percent slopes	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	Medium.
		C	Medium	High	High	High.
Ht	Hornell silt loam, 36 inches or more deep, eroded, 8 to 15 percent slopes.	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Low.
Mb	Manlius shaly silt loam, 36 inches or more deep, eroded, 5 to 15 percent slopes.	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.
		C	High	High	High	High.
Md	Manlius shaly silt loam, 36 inches or more deep, eroded, 15 to 25 percent slopes.	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.
Mh	Mardin channery silt loam, eroded, 15 to 25 percent slopes.	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.
Ne	Nunda silt loam, eroded, 12 to 20 percent slopes	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	Medium.
Sf	Schoharie silty clay loam, 12 to 20 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.

TABLE 10.—*Soils arranged by rotation groups, and management needs for soils of each group*—Continued

ROTATION GROUP 10

Suitable rotation or use	*Practices to maintain organic matter*	*Practices to control runoff*
Row crop for 1 year, close-growing crop for 1 year, and sod for 2 or 3 years.	Other practices for maintenance of organic matter not needed if legume dominates in sod; use nitrogen if sod is grass.	Across-the-slope tillage.
Close-growing crop for 1 year and sod for 3 or 4 years.	Same	Same.
Sod continuously	Same	None.
Forest	None	None.

Map symbol	Soil Name	Lime and Fertilizer				
		Level	Lime	Nitrogen	Phosphorus	Potassium
Ae	Allis silt loam, 12 to 20 inches deep, 3 to 8 percent slopes (undrained).	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.
Af	Allis silt loam, 12 to 20 inches deep, eroded, 8 to 15 percent slopes (undrained).	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.
Hp	Hornell silt loam, 12 to 20 inches deep, 3 to 8 percent slopes.	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Low.
Le	Lansing and Danley silt loams, 12 to 20 inches deep, eroded, 8 to 15 percent slopes.	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	Medium.
Ly	Lordstown channery silt loam, eroded, 15 to 25 percent slopes.	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.
Mk	Mardin silt loam, 12 to 20 inches deep, 3 to 15 percent slopes.	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.
Vd	Valois gravelly silt loam, eroded, 15 to 25 percent slopes.	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.
Wk	Woostern gravelly loam, eroded, 15 to 25 percent slopes.	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.

ROTATION GROUP 11

Suitable rotation or use	*Practices to maintain organic matter*	*Practices to control runoff*
Close-growing crop for 1 year and sod for 3 or 4 years.	Other practices for maintenance of organic matter not needed if legume dominates in sod; use nitrogen if sod is grass.	Across-the-slope tillage.
Sod continuously	Same	None.
Forest	None	None.

Map symbol	Soil Name	Lime and Fertilizer				
		Level	Lime	Nitrogen	Phosphorus	Potassium
Ac	Allis channery silt loam, 12 to 20 inches deep, eroded, 15 to 25 percent slopes (undrained).	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.
Aw	Aurora silt loam, eroded, 8 to 15 percent slopes	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	Low.
Cm	Cayuga silt loam, eroded, 15 to 25 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
Dl	Dunkirk silt loam, eroded, 20 to 45 percent slopes	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	Medium.
Hn	Honeoye soils, eroded, 20 to 30 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
Hs	Hornell silt loam, 12 to 20 inches deep, eroded, 8 to 15 percent slopes.	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Low.
Lf	Lansing and Danley silt loams, 12 to 20 inches deep, eroded, 15 to 25 percent slopes.	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	Medium.
Ll	Lansing silt loam, 20 to 30 percent slopes	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	Medium.
Lm	Lansing silt loam, eroded, 20 to 30 percent slopes	A	Low	Low	Medium	Low.
		B	Medium	Medium	Medium	Medium.
Mc	Manlius shaly silt loam, 12 to 20 inches deep, eroded, 15 to 25 percent slopes.	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.
On	Ontario soils, eroded, 20 to 30 percent slopes	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
Pa	Palmyra and Howard soils, 25 to 35 percent slopes	A	Low	Low	Medium	Medium.
		B	Low	Medium	Medium	High.
Sg	Schoharie silty clay loam, eroded, 12 to 20 percent slopes.	A	Low	Low	Medium	Low.
		B	Low	Medium	Medium	Low.
Vk	Volusia channery silt loam, eroded, 15 to 25 percent slopes.	A	Low	Low	Medium	Low.
		B	High	Medium	Medium	Medium.

TABLE 10.—*Soils arranged by rotation groups, and management needs for soils of each group*—Continued

ROTATION GROUP 12

Suitable rotation or use	*Practices to maintain organic matter*	*Practices to control runoff*
Sod continuously	Other practices for maintenance of organic matter not needed if legume dominates in sod; use nitrogen if sod is grass.	None.
Forest	None	None.

Map symbol	Soil Name	Lime and Fertilizer				
		Level	Lime	Nitrogen	Phosphorus	Potassium
Aa	Alden silty clay loam, 0 to 1 percent slopes (undrained).					
Ab	Allendale fine sandy loam, 0 to 2 percent slopes (undrained).					
Ag	Alluvial soils, undifferentiated, 0 to 2 percent slopes					
Ar	Arkport soils, 20 to 45 percent slopes	B	Medium		Medium	High.
As	Atherton silt loam, 0 to 1 percent slopes (undrained)					
Ax	Aurora silt loam, eroded, 15 to 30 percent slopes (undrained).	A B	Low Medium	Low Medium	Medium Medium	Low. Low.
Bd	Bono silty clay, 0 to 1 percent slopes (undrained)					
Ce	Carlisle muck, 0 to 1 percent slopes (undrained)					
Cf	Carlisle muck, shallow, 0 to 1 percent slopes (undrained).					
Cx	Chenango soils, 25 to 45 percent slopes	B	High		Medium	High.
Cy	Chippewa silt loam, 0 to 1 percent slopes (undrained)					
Cz	Chippewa silt loam, 3 to 8 percent slopes (undrained)					
CC	Colwood silt loam, 0 to 1 percent slopes (undrained)					
Ea	Edwards muck, 0 to 1 percent slopes (undrained)					
Fb	Farmington loam, 0 to 12 inches deep, 2 to 15 percent slopes.					
Ff	Fresh water marsh, 0 to 1 percent slopes (undrained)					
Ge	Granby fine sandy loam, 0 to 1 percent slopes (undrained).					
Ha	Holly silt loam, 0 to 1 percent slopes (undrained)					
Lv	Lordstown and Manlius soils, 25 to 45 percent slopes	B	High	Medium	Medium	Medium.
Lz	Lordstown soils, 45 to 70 percent slopes					
LA	Lyons silt loam, 0 to 1 percent slopes (undrained)					
Ml	Mardin and Langford soils, 25 to 45 percent slopes	B	High	Medium	Medium	Medium.
Mn	Morocco fine sandy loam, 0 to 2 percent slopes (undrained).					
Mo	Muck, acid (unclassified), 0 to 1 percent slopes (undrained).					
Na	Newton fine sandy loam, 0 to 1 percent slopes (undrained).					
Nf	Nunda silt loam, eroded, 20 to 45 percent slopes	B	Medium	Medium	Medium	Medium.
Oh	Ontario, Lansing, and Honeoye soils, 30 to 60 percent slopes.					
Pl	Poygan silty clay loam, 0 to 1 percent slopes (undrained).					
Sh	Schoharie silty clay loam, eroded, 20 to 45 percent slopes.	B	Low	Medium	Medium	Low.
Sk	Sloan silt loam, 0 to 1 percent slopes:					
	Undrained					
	Partially drained	B	Low	Medium	Medium	Low.
Sl	Steep broken land, 35 to 60 percent slopes					
Ta	Toledo silty clay loam, 0 to 1 percent slopes (undrained).					
Wa	Warners loam, 0 to 1 percent slopes (undrained)					
Wb	Wayland silt loam, 0 to 1 percent slopes (undrained)					
Wc	Wayland silty clay loam, 0 to 1 percent slopes (undrained).					
Wd	Westland silt loam, 0 to 1 percent slopes (undrained)					
We	Woostern, Bath, and Valois soils, 25 to 45 percent slopes.	B	High	Medium	Medium	Medium.

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TABLE 11.—*Rates of fertilization corresponding to the terms "high," "medium," and "low," expressed in pounds per acre per year*

Crop	Nitrogen (N)			Phosphate (P_2O_5)		Potash (K_2O)		
	Low	Medium	High	Medium	High	Low	Medium	High
Corn	10–15	20–40	40+	20–30	20–30	0–10	15–20	30+
Oats	5–15	20–30	30+	20–30	20–30	0–10	20–30	40+
Wheat	10–15	30–40	40+	20–30	20–30	0–10	20–30	40+
Legume hay	0	0	0	20–30	20–30	0–10	20–30	40+
Grass hay	0–10	20–30	30+	20–30	20–30	0–10	10–15	20+
Potatoes	50	75–100	150	75–125	150–200	40–60	75–125	150–200
Beans	10–15	20–30	40+	20–30	50–70	0–10	20–40	40–60
Sweet corn	10–15	20–30	40+	20–30	50–70	0–10	15–20	30+
Peas	10–20	40–50	50+	20–30	50–90	10–20	30–50	50+
Cabbage	30–50	75–100	150	75–125	150–200	30–50	75–100	100+
Tomatoes	20–40	50–75	80	50–100	125–175	30–50	75–100	100+

If you use a rotation that consists of 2 years of row crops and only 1 or 2 years of sod, you will need to make up the loss of organic matter by adding manure, growing cover crops, adding large amounts of commercial fertilizer, or some combination of these. If you do not make up this loss, you can expect a gradual decline in supply of organic matter and increasing difficulty in keeping your soils in good tilth. Some soils will be more seriously affected than others, but yields on most soils will decrease as the supply of organic matter is lowered.

By applying 12 to 15 tons of manure per acre, you can offset the effects of 1 year of intertilled crop. Cover crops that make a good growth before they are plowed under in spring help offset the effects of row crops. A legume crop plowed under for green manure may substitute for manure or for sod crops, but growing such a legume usually means loss of 1 year of cropping.

Heavy fertilization is a way of partly offsetting lack of manure or sod crops. The high rate of fertilization produces more crop growth to be plowed under as organic matter, but the full advantage of the fertilizer is not realized in this way. It is better to fertilize heavily and follow the main crop with a cover crop. The cover crop uses the fertilizer not used by the main crop to produce organic matter. Under this practice, a fertilizer carrying 100 pounds of nitrogen can be as effective as 6 to 8 tons of manure.

Wherever possible, a winter cover crop should be sown after a row crop. It protects the soil from erosion, uses fertilizer that otherwise would be leached out, and provides organic matter to be plowed under.

Maintaining Fertility

The importance of selecting a suitable crop rotation and desirable supporting practices already has been emphasized. Nevertheless, if the full advantage of a rotation is to be realized, the soils must have lime, nitrogen, phosphorus, and potassium in amounts that will permit vigorous growth. Scattered, slow-growing plants can supply little organic matter or protection from erosion.

To maintain organic matter and provide protection from erosion, the soils of Ontario and Yates Counties will need to be fertilized and limed at level B (see table 10). If they are fertilized at level A, there will be a gradual decline in supply of organic matter and usually a corresponding decline in yield. Fertilization and liming at level C will produce higher yields than at level B and will also maintain the soils.

Table 10 does not give lime and fertilizer ratings for some soils at the A and C levels. If a soil does not have a rating at the A level, it means that the additional cost to achieve the B level is so small that few capable farmers would fail to practice the B level. If a soil does not have a rating at the C level, it means that the soil does not respond well to fertilization rates higher than level B.

At all levels of fertilization, the time and method of applying fertilizer have important effects on the response of the soils. In the following pages liming and application of nitrogen, phosphorus, and potassium are discussed more thoroughly.

Lime

Most crops grown in Ontario and Yates Counties, especially legumes, yield best when the soil is neutral in reaction, that is, at or above pH 6.5. The amount of lime needed to get this reaction depends both on the native acidity of the soil and on previous liming practice. For this reason, exact recommendations as to amount of lime needed cannot be made for specific soils. Soil tests for lime requirement are accurate and inexpensive. They should be used to find out how much lime the soil needs to start with. After the original acid reaction has been brought to neutral, most soils of these counties will need about one-fourth ton an acre, per year, to maintain a neutral reaction. This may be supplied in a 1-ton per acre application every 4 years or a 1½-ton application every 6 years.

According to their natural supply of lime, the soils of these counties can be placed in three broad groups: High-, medium-, and low-lime soils. The high-lime soils have a low requirement for additional lime. In table 10 their need for lime is indicated by the word "low." Correspondingly, medium-lime soils have a "medium" requirement, and low-lime soils have a "high" requirement.

Soils with a "low" lime requirement have a natural supply of lime within 24 to 36 inches of the surface. They are neutral to medium acid above that depth. These soils need less than 1½ tons of lime to correct initial acidity and,

after that, one-fourth ton of lime a year will maintain neutral reaction. Legumes on these soils need no lime after they are established.

Soils with a "medium" lime requirement are strongly or very strongly acid to depths of 20 or 30 inches but have abundant lime at 2½ to 3½ feet. These soils need 2 to 6 tons of lime an acre to bring the initial acidity of the plow layer to pH 6.5. This reaction can be maintained by adding one-fourth ton of lime per acre each year. The lime is most needed when legumes are seeded or crops such as cabbage are planted.

Soils with a medium lime requirement actually need as much lime to start a good stand of legumes as the soils that are acid throughout. Once the legume is established, however, it will last longer and tolerate higher acidity in the upper part of the profile than it would on a soil with a high lime requirement. A well-established legume is able to survive higher acidity in the upper layers of these soils because its roots draw from the supply of lime in the layers farther down.

Soils with a "high" lime requirement are strongly to very strongly acid throughout. They require regular liming to establish legumes and to maintain the stand. The amount of lime to be used initially is the same as for the soils that have a medium lime requirement, but lime will have to be added more frequently to maintain deep-rooted legumes. This is necessary because there is no supply of lime in the subsoil.

As indicated in the preceding paragraphs, the amount of lime needed to get a pH of 6.5 or above in the plow layer ranges from none at all to 8 tons per acre. It is most important to get the desired reaction in the plow layer. Further response may be obtained if some of the lime is placed below the plow layer. A distribution of lime in both the plow layer and farther down is ideal, especially for deep-rooted legumes. But regardless of how the lime is distributed, it is essential that the plow layer be brought to a pH near neutral.

It is not efficient to apply more than 4 tons of lime per acre in any one year, nor is it advisable to use more than 2 tons in any single year if the lime is applied to the surface. If a soil needs more than 2 tons of lime, the first choice is to plow part of the lime down and then spread 1 to 2 tons on the surface after plowing. The second choice is to apply 2 tons to the surface and harrow or disk it into the top 3 inches of the soil. The third choice is to apply up to 4 tons and plow all of it down.

The best time to apply lime is at the seeding of the legume, cabbage, or other crop that will not tolerate soil acidity. For most crop rotations, lime should be applied when the legume-grass mixture is seeded for hay or pasture. In an emergency, lime can be applied as a topdressing after a legume has been seeded. If a rotation includes a legume and potatoes, less lime must be used, because potato scab becomes troublesome if the pH of the soil goes higher than 6.0. Legumes such as red clover or Ladino clover can be grown in the same rotation with potatoes if ¼ to ¾ ton of limestone per acre is applied near the legume seed at planting time.

Nitrogen

Crops need nitrogen in varying amounts, according to the requirements of each kind of plant, the previous management of the soil, and the season. Some soils have more nitrogen than others, and for this reason table 10 gives for each soil a rating of its need for nitrogen at three levels of fertilization (A, B, and C). The ratings—low, medium, and high—at each level are converted into pounds per acre of nitrogen in table 11. This nitrogen is needed in addition to the amount that normally will be released from the organic matter if the crop rotations and supporting practices given in table 10 are followed.

At "low" rates of nitrogen application, most soils get less nitrogen than is needed to support the crops and maintain organic matter. At these low rates, nitrogen should be applied at planting time in spring. This is true for all crops except winter wheat, which should receive the nitrogen in the fall.

The "medium" rates for supplying nitrogen will give satisfactory crop growth and maintain organic matter in most of the soils. For all the crops except winter wheat, the nitrogen should be applied at planting time in the spring. Winter wheat should get half of the nitrogen at planting time in fall, and the other half in spring.

The "high" rates of nitrogen application provide more nitrogen than is needed to maintain organic matter. Fertilizer is applied at the high rates to get yields above those to be expected at the medium rates. The choice between high and medium rates is made by the farmer. In choosing, he considers, among other things, the need for soil maintenance, yield, and probable prices for his produce.

In applying nitrogen, there are several things to be considered. Almost all of the nitrogen reserve in soils is held in the organic matter. The total organic-matter content of a soil is a good measure of its nitrogen reserve. This nitrogen becomes available to crops only when the organic matter is broken down by micro-organisms, and they can work efficiently only when temperature and moisture conditions are favorable.

A soil like Honeoye silt loam can be expected to release about 2 percent of its nitrogen to crops each year. Other soils release much more or much less.

The nitrogen reserve can be changed rapidly by management. When first cultivated, Honeoye silt loam contains between 4,000 and 6,000 pounds of nitrogen in the plow layer. The same soil, in fields that have been 50 years in row crops and small grains, has about 2,000 pounds of nitrogen per acre in the plow layer. Under the management systems suggested in this report for maintenance, Honeoye silt loam normally has 3,500 to 4,500 pounds of nitrogen per acre in the plow layer. Consequently, this soil, under good management, can be expected to supply twice as much nitrogen for crops as it will under ordinary management.

The nitrogen reserve, considered alone, is not a good measure of the amount of nitrogen that will be released for crops, nor will it indicate how much of this nitrogen will be available when the crop needs nitrogen most. The micro-organisms that decompose organic matter work very slowly in cold wet soils. Poorly drained soils release a much smaller part of their reserve than do well-drained soils. Nevertheless, the poorly drained soils generally contain more organic matter than the well-drained soils, and, therefore, during a season, may release as much nitrogen as the well-drained soils.

In Ontario and Yates Counties, most crops need commercial nitrogen to get a good start, because all of the

soils stay cold until late in May or early in June. In spring, even the well-drained soils release too little nitrogen for good growth of crops such as winter wheat. Corn, on almost all the soils, will respond to nitrogen applied at planting time. Ordinarily, they do not supply enough nitrogen until early in summer. Nitrogen fertilizer is especially needed to get crops started on poorly drained soils, because they stay cold and wet much longer.

Some soils hold nitrogen better than others, but almost all of the nitrogen fertilizer applied is either taken up rapidly by plants or is soon washed away. Little available nitrogen is carried over in the soil from fall to spring. Consequently, enough nitrogen must be supplied each year to meet the needs of the crop grown.

Phosphorus

The soils of Ontario and Yates Counties have a moderate total reserve of phosphorus. Probably the average for the plow layer is less than 2,000 pounds of phosphorus, as the element (P), per acre (*1*). Part of this phosphorus is stored in organic matter, but most of it is in the inorganic part of the soil. The phosphorus generally is released too slowly to provide the amounts crops need for good growth. On practically all of the soils commercial phosphorus is needed. Enough phosphorus can be applied at one time to meet the needs of 4 or 5 years of crops, provided they are not intensively grown vegetable crops. The phosphorus can be applied at one time because it is slowly soluble and little of it is lost by leaching.

Rates for applying phosphorus are given in table 10 in terms of the oxide (P_2O_5) as used in fertilizer guarantees. Only two rates are given—medium and high. The medium rate shows the amount needed for soil maintenance and efficient growth of crops. The high rate provides additional phosphorus for higher yields.

Because phosphorus stays in the soil a long time, past management is important in deciding how much phosphorus fertilizer to apply. On dairy farms, superphosphate is commonly used on stable floors at a rate of 1 to 2 pounds per cow per day. This fertilizer is mixed in with the manure that is spread on the fields. Where this practice has been followed for a long time and the manure has been applied liberally, phosphorus reserves have been built up until the addition of phosphorus fertilizer will bring no response from corn, small grains, and hay. This surplus may last several years. But if application of phosphorus, alone or in manure, is discontinued, the soils gradually become deficient in phosphorus again.

Large reserves of phosphorus may accumulate in soils fertilized at a rate of 100 pounds of phosphate (P_2O_5) per acre per year for long periods. On soils thus fertilized, common field crops show no response when additional phosphorus is applied. Potatoes, on these same soils, usually respond to phosphorus fertilizer. The soil should be tested to find out if it has a high phosphorus reserve.

Except where the phosphorus reserves have already been built up by special management, the soils of these counties have a nearly uniform requirement of 20 to 30 pounds of phosphate (P_2O_5) an acre per year (table 11). The phosphate can be supplied separately or in manure. There is little evidence that a higher rate of phosphorus fertilization will increase yields of corn, small grains, and hay. But with increasing use of nitrogen and generally higher yields, crops will demand more phosphorus and may, at some future time, show response to more phosphorus than is now suggested.

Potassium

The soils of Ontario and Yates Counties generally have very large total reserves of potassium, most of which is held in the clay particles. Clayey soils such as those of the Schoharie series have 40,000 to 50,000 pounds per acre of potassium, expressed as the element (K), in the plow layer (*1*). These clayey soils generally release the most potassium to crops. Sandy soils, those of the Ottawa series for example, have less than half of the reserve of the Schoharie and usually do not provide enough potassium for crops. Most of the clayey soils and the medium-textured soils that have a clayey subsoil release enough potassium to produce moderate yields of those crops that do not feed heavily on potassium.

The sandy soils and the medium-textured soils that do not have a clayey subsoil need potassium fertilizer for legume crops and for high yields of most other crops. Most soils of this area need potassium fertilizer if they are to produce high yields of intensively grown vegetable crops.

Table 10 lists for each soil rates of potassium fertilization at three levels. The ratings in table 10—low, medium, and high—are converted in table 11 into pounds per acre of potash (K_2O), as used in fertilizer guarantees. Manure, as it is commonly handled, contains about 3 to 5 pounds of potassium per ton. Most of the potassium is in the liquid part, and almost all of it is available the first year. In calculating addition of commercial potassium, the amount supplied by manure can be subtracted from the potassium requirements shown in this report.

Potassium, like nitrogen, is soon washed out of the soil. It should be applied every year to meet the needs of the crop for which it is applied. Legumes and intensively grown vegetable crops are heavy users of potassium.

Artificial Drainage

Restricted soil drainage seriously limits crop suitability and yields on 17 percent of Ontario County and on 25 percent of Yates County. Some of the soils with restricted drainage are in depressions where water accumulates. Others on long slopes are kept wet by seepage water that moves downhill above a slowly permeable layer. Some soils can be drained, and when drained, become highly productive. Others can be improved only slightly or not at all, unless a very expensive drainage system is installed.

The technical problems of artificial drainage are not covered in this report, but the general kinds of drainage that might be used are mentioned in the descriptions of the various soils. For those soils most easily drained, estimated yields are given for the soil when drained and when not drained (table 12). If the soil is said to be drained, the yield is given for the soil when it is drained by the most effective method that can be efficiently installed. Tiling systems, for example, vary from an occasional tile line to very closely spaced lines. Estimated yields in table 12 are for tile lines spaced no closer than 30 feet. Within that limitation, it is assumed that the

technical problems of installing an efficient system—outlets, spacing, and so on—have been solved.

A competent drainage engineer should determine whether or not a field can be efficiently drained. After getting cost estimates, you can decide whether it would pay to drain your field.

Capability Groups of Soils

The capability grouping is an arrangement of soils to show relative suitability for crops, grazing, forestry, wildlife, or other uses, and difficulties or risks in using them. It is based upon the capability of the land to produce. It reflects the natural limitations of the soil. Each soil is placed in one of eight broad classes by a group of persons who have studied the soils and worked with them. The capability grouping is used in helping farmers plan for good land use and application of needed soil and water conservation measures.

Capability classes

Soils that are nearly level, well drained, free from overflow, fairly fertile, and not otherwise limited in use and management are placed in capability class I. These soils are widely adaptable and their user has many choices. He can use his class I land for crops without special practices, and can choose one of several cropping systems; or he may use the soils for pasture, woodland, or some other purpose.

Soils are placed in capability class II if they are a little less widely adaptable or have greater need for conservation than the soils in class I. For example, the best and most fertile of the gently sloping soils are in capability class II. A gently sloping soil must be farmed on the contour, or kept covered with vegetation more of the time, or managed in some other way to control runoff and erosion. Other kinds of class II land require special management because of excess water on or in the soil, because of low moisture-holding capacity resulting from sandy texture or lack of depth, or because of heavy texture that makes them difficult to work and highly erodible.

Soils are placed in capability class III if they are still less adaptable or have more stringent management requirements than those in class II but can be used on a longtime basis in a satisfactory cropping system. Soils even less adaptable than those in class III but usable for tillage part of the time or with special precautions are in class IV.

Soils not suitable for the frequent tillage required by ordinary field crops are in capability classes V, VI, VII, or VIII. Class V is not used in Ontario or Yates Counties. Capability class VI contains the soils, many of them steep, that can be used for forage or forest products but should not be cultivated for annual crops. Soils in class VII are more limited than those in class VI; they are not suited for cultivation but some of them can be used for pasture; they are best suited for woodland or wildlife use. Class VIII consists of soils so severely limited that they produce little useful vegetation. They may be attractive as landscapes and may be parts of valuable watersheds. Some have considerable value for wildlife.

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Capability subclasses

Although the soils within a single capability class present use and management problems of about the same difficulty, the kinds of problems may differ greatly. Most of the capability classes include soils that are very different from each other. Class II, for example, includes some well drained soils that are gently sloping and need control of erosion, and also some moderately well drained soils limited chiefly by too much water during part of the year. It is convenient to recognize capability subclasses, based on the dominant kind of limitation. Three subclasses are recognized in Ontario-Yates Counties, according to the following dominant limitations: Risk of erosion (e); excess water (w); shallow, droughty, or stony soil (s). Subclasses are denoted by a small letter following the class number, such as IIe or IIw.

The capability classes and subclasses in Ontario and Yates Counties are as follows:

Class I.—Land that is deep, nearly level, and easily worked. It can be used for tilled crops without special practices to control runoff or erosion and should produce high yields with good soil and crop management.

Class II.—Land suitable for tilled crops that has slight to moderate limitations.

- IIe: Productive gently sloping soils.
- IIs: Nearly level or gently sloping soils that are somewhat droughty.
- IIw: Nearly level soils that are a little late in spring because of drainage restrictions.

Class III.—Land suitable for tilled crops that has limitations that require intensive treatment.

- IIIe: Gently to strongly sloping soils; may be severely eroded.
- IIIs: Nearly level to strongly sloping, droughty soils.
- IIIw: Level or nearly level wet soils.

Class IV.—Land that has severe limitations that prevent its regular use as cropland; suitable for occasional cultivation in long rotations with intensive treatment.

- IVe: Strongly sloping or moderately steep soils; may be severely eroded.
- IVs: Droughty soils; 12 to 20 inches deep over shale bedrock.
- IVw: Wet soils that are difficult to drain.

Class VI.—Land not suited for cultivation; can be used for pasture.

- VIe: Steep or severely eroded soils.
- VIs: Stony or shallow soils.
- VIw: Very wet soils that cannot be drained.

Class VII.—Land that is so severely limited that it should be used for woodland.

- VIIe: Steep to very steep and often severely eroded soils.
- VIIs: Steep, shallow, or droughty soils.

Class VIII.—Land that is unfit for cultivation, grazing, or forestry.

- VIIIs: Soils that are too steep, too stony, or too rocky for timber production.
- VIIIw: Permanently wet marsh areas.

The capability class and subclass in which each soil mapping unit has been placed are shown in the following list. Some of the soil areas shown on the map contain small inclusions of other soils. Wherever these inclusions differ greatly in slope, degree of erosion, or other characteristics from the mapping unit as described, they fall in a different

class or subclass and should be recognized in planning the use and management of the land.

	Capability class and subclass
Alden silty clay loam, 0 to 1 percent slopes (Aa)	VIw
Allendale fine sandy loam, 0 to 2 percent slopes (Ab)	IIIw
Allis channery silt loam, 12 to 20 inches deep, eroded, 15 to 25 percent slopes (Ac)	VIIe
Allis silt loam, 36 inches or more deep, 3 to 8 percent slopes (Ad)	IIIe
Allis silt loam, 12 to 20 inches deep, 3 to 8 percent slopes (Ae)	IVe
Allis silt loam, 12 to 20 inches deep, eroded, 8 to 15 percent slopes (Af)	VIe
Alluvial soils, undifferentiated, 0 to 2 percent slopes (Ag)	VIw
Angola silt loam, 0 to 3 percent slopes (Ah)	IVw
Arkport-Dunkirk fine sandy loams, 6 to 12 percent slopes (Ak)	IVe
Arkport-Dunkirk fine sandy loams, eroded, 12 to 20 percent slopes (Al)	VIe
Arkport fine sandy loam, 0 to 5 percent slopes (Am)	IIe
Arkport fine sandy loam, 6 to 12 percent slopes (An)	IIIe
Arkport fine sandy loam, eroded, 12 to 20 percent slopes (Ao)	VIIe
Arkport loamy fine sand, 0 to 5 percent slopes (Ap)	IIs
Arkport soils, 20 to 45 percent slopes (Ar)	VIIe
Atherton silt loam, 0 to 1 percent slopes (As)	IIIw
Aurora silt loam, 3 to 8 percent slopes (At)	IIIe
Aurora silt loam, eroded, 3 to 8 percent slopes (Au)	IIIe
Aurora silt loam, 8 to 15 percent slopes (Av)	IIIe
Aurora silt loam, eroded, 8 to 15 percent slopes (Aw)	IVe
Aurora silt loam, eroded, 15 to 30 percent slopes (Ax)	VIe
Bath channery silt loam, 5 to 15 percent slopes (Ba)	IIe
Bath channery silt loam, 15 to 25 percent slopes (Bb)	IIIe
Berrien fine sandy loam, 0 to 6 percent slopes (Bc)	IIe
Bono silty clay, 0 to 1 percent slopes (Bd)	IIIw
Braceville gravelly silt loam, 0 to 5 percent slopes (Be)	IIw
Burdett silt loam, 0 to 6 percent slopes (Bf)	IIe
Camillus silt loam, 0 to 8 percent slopes (Ca)	IIs
Camillus silt loam, imperfectly drained variant, 0 to 5 percent slopes (Cb)	IIw
Canandaigua silt loam, 0 to 3 percent slopes (CD)	IIIw
Caneadea silty clay loam, 0 to 6 percent slopes (Cc)	IVw
Caneadea silty clay loam, eroded, 6 to 15 percent slopes (Cd)	IVe
Carlisle muck, 0 to 1 percent slopes (Ce)	IIIw
Carlisle muck, shallow, 0 to 1 percent slopes (Cf)	IIIw
Cayuga silt loam, 3 to 8 percent slopes (Cg)	IIe
Cayuga silt loam, eroded, 3 to 8 percent slopes (Ch)	IIIe
Cayuga silt loam, 8 to 15 percent slopes (Ck)	IIIe
Cayuga silt loam, eroded, 8 to 15 percent slopes (Cl)	IIIe
Cayuga silt loam, eroded, 15 to 25 percent slopes (Cm)	IVe
Cazenovia silt loam, 3 to 10 percent slopes (Cn)	IIe
Cazenovia silt loam, 10 to 20 percent slopes (Co)	IIIe
Chagrin silt loam, 0 to 2 percent slopes (Cp)	IIw
Chagrin silt loam, alluvial fan, 2 to 8 percent slopes (Cr)	IIe
Chagrin shaly silt loam, alluvial fan, 2 to 8 percent slopes (Cs)	IIe
Chenango and Tioga gravelly silt loams, alluvial fan, 2 to 5 percent slopes (Ct)	IIe
Chenango gravelly loam, 0 to 5 percent slopes (Cu)	I
Chenango gravelly loam, 5 to 15 percent slopes (Cv)	IIe
Chenango soils, 15 to 25 percent slopes (Cw)	IIIe
Chenango soils, 25 to 45 percent slopes (Cx)	VIe
Chippewa silt loam, 0 to 1 percent slopes (Cy)	VIw
Chippewa silt loam, 3 to 8 percent slopes (Cz)	VIw
Collamer silt loam, 0 to 6 percent slopes (CA)	IIe
Collamer silt loam, 6 to 12 percent slopes (CB)	IIIe
Colwood silt loam, 0 to 1 percent slopes (CC)	IIIw
Darien silt loam, 0 to 3 percent slopes (Da)	IIw
Darien silt loam, 3 to 8 percent slopes (Db)	IIe
Darien silt loam, 8 to 15 percent slopes (Dc)	IIIe
Darien silt loam, eroded, 8 to 15 percent slopes (Dd)	IVe
Dunkirk fine sandy loam, 0 to 6 percent slopes (De)	IIe
Dunkirk fine sandy loam, 6 to 12 percent slopes (Df)	IIIe
Dunkirk silt loam, 0 to 6 percent slopes (Dg)	IIe
Dunkirk silt loam, 6 to 12 percent slopes (Dh)	IIIe
Dunkirk silt loam, eroded, 12 to 20 percent slopes (Dk)	VIe
Dunkirk silt loam, eroded, 20 to 45 percent slopes (Dl)	VIe
Edwards muck, 0 to 1 percent slopes (Ea)	IIIw
Eel silt loam, 0 to 2 percent slopes (Eb)	IIw
Eel silty clay loam, 0 to 2 percent slopes (Ec)	IIw
Erie gravelly silt loam, 0 to 3 percent slopes (Ed)	IIIw
Erie gravelly silt loam, 3 to 8 percent slopes (Ee)	IIIe
Erie gravelly silt loam, 8 to 15 percent slopes (Ef)	IIIe
Farmington loam, 12 to 30 inches deep, 2 to 8 percent slopes (Fa)	IIs
Farmington loam, 0 to 12 inches deep, 2 to 15 percent slopes (Fb)	VIs
Fremont channery silt loam, 0 to 3 percent slopes (Fc)	IIIw
Fremont channery silt loam, 3 to 8 percent slopes (Fd)	IIIe
Fremont channery silt loam, 8 to 15 percent slopes (Fe)	IIIe
Fresh water marsh, 0 to 1 percent slopes (Ff)	VIIIw
Fulton silt loam, 0 to 3 percent slopes (Fg)	IIIw
Galen fine sandy loam, 0 to 6 percent slopes (Ga)	IIw
Genesee fine sandy loam, 0 to 2 percent slopes (Gb)	IIw
Genesee silt loam, 0 to 2 percent slopes (Gc)	IIw
Genesee silt loam, high bottom, 0 to 2 percent slopes (Gd)	I
Granby fine sandy loam, 0 to 1 percent slopes (Ge)	IIIw
Holly silt loam, 0 to 1 percent slopes (Ha)	IVw
Homer sandy loam, 0 to 3 percent slopes (Hb)	IIIw
Homer silt loam, 0 to 3 percent slopes (Hc)	IIIw
Honeoye fine sandy loam, 0 to 3 percent slopes (Hd)	I
Honeoye fine sandy loam, 3 to 10 percent slopes (He)	IIe
Honeoye fine sandy loam, 10 to 20 percent slopes (Hf)	IIIe
Honeoye fine sandy loam, eroded, 10 to 20 percent slopes (Hg)	IIIe
Honeoye silt loam, 0 to 3 percent slopes (Hh)	I
Honeoye silt loam, 3 to 10 percent slopes (Hk)	IIe
Honeoye silt loam, 10 to 20 percent slopes (Hl)	IIIe
Honeoye silt loam, eroded, 10 to 20 percent slopes (Hm)	IIIe
Honeoye soils, eroded, 20 to 30 percent slopes (Hn)	VIe
Hornell silt loam, 36 inches or more deep, 3 to 8 percent slopes (Ho)	IIe
Hornell silt loam, 12 to 20 inches deep, 3 to 8 percent slopes (Hp)	IIIw
Hornell silt loam, 36 inches or more deep, 8 to 15 percent slopes (Hr)	IIIe
Hornell silt loam, 12 to 20 inches deep, eroded, 8 to 15 percent slopes (Hs)	IVe
Hornell silt loam, 36 inches or more deep, eroded, 8 to 15 percent slopes (Ht)	IVe
Howard gravelly loam, 0 to 5 percent slopes (Hu)	I
Howard gravelly loam, 5 to 15 percent slopes (Hv)	IIe
Howard soils, 15 to 25 percent slopes (Hw)	VIe
Junius fine sandy loam, 0 to 2 percent slopes (Ja)	IIIw
Kendaia loam, 0 to 3 percent slopes (Ka)	IIIw
Kendaia silt loam, 0 to 3 percent slopes (Kb)	IIIw
Kendaia silt loam, 3 to 8 percent slopes (Kc)	IIIe
Lakemont silty clay loam, 0 to 2 percent slopes (La)	IVw
Langford gravelly silt loam, 3 to 8 percent slopes (Lb)	IIe
Langford gravelly silt loam, 8 to 15 percent slopes (Lc)	IIIe
Lansing and Danley silt loams, 12 to 20 inches deep, 3 to 8 percent slopes (Ld)	IVs
Lansing and Danley silt loams, 12 to 20 inches deep, eroded, 8 to 15 percent slopes (Le)	VIs
Lansing and Danley silt loams, 12 to 20 inches deep, eroded, 15 to 25 percent slopes (Lf)	VIIs
Lansing silt loam, 3 to 10 percent slopes (Lg)	IIe
Lansing silt loam, 10 to 20 percent slopes (Lh)	IIIe
Lansing silt loam, eroded, 10 to 20 percent slopes (Lk)	IIIe
Lansing silt loam, 20 to 30 percent slopes (Ll)	IVe
Lansing silt loam, eroded, 20 to 30 percent slopes (Lm)	VIe
Lima fine sandy loam, 0 to 3 percent slopes (Ln)	IIw
Lima fine sandy loam, 3 to 10 percent slopes (Lo)	IIe
Lima silt loam, 12 to 20 inches deep, 0 to 3 percent slopes (Lp)	IIw
Lima silt loam, 0 to 3 percent slopes (Lr)	IIw
Lima silt loam, 3 to 10 percent slopes (Ls)	IIe
Lima silt loam, 10 to 20 percent slopes (Lt)	IIIe
Lobdell silt loam, 0 to 2 percent slopes (Lu)	IIw
Lordstown and Manlius soils, 25 to 45 percent slopes (Lv)	VIIe
Lordstown channery silt loam, 5 to 15 percent slopes (Lw)	IIe
Lordstown channery silt loam, 15 to 25 percent slopes (Lx)	IVe
Lordstown channery silt loam, eroded, 15 to 25 percent slopes (Ly)	VIe
Lordstown soils, 45 to 70 percent slopes (Lz)	VIIe
Lyons silt loam, 0 to 1 percent slopes (LA)	IIIw
Manlius shaly silt loam, 36 inches or more deep, 5 to 15 percent slopes (Ma)	IIe
Manlius shaly silt loam, 36 inches or more deep, eroded, 5 to 15 percent slopes (Mb)	IIIe

	Capability class and subclass
Manlius shaly silt loam, 12 to 20 inches deep, eroded, 15 to 25 percent slopes (Mc)	VIIs
Manlius shaly silt loam, 36 inches or more deep, eroded, 15 to 25 percent slopes (Md)	VIe
Mardin channery silt loam, 3 to 8 percent slopes (Me)	IIe
Mardin channery silt loam, 8 to 15 percent slopes (Mf)	IIIe
Mardin channery silt loam, eroded, 8 to 15 percent slopes (Mg)	IVe
Mardin channery silt loam, eroded, 15 to 25 percent slopes (Mh)	VIe
Mardin silt loam, 12 to 20 inches deep, 3 to 15 percent slopes (Mk)	IIIe
Mardin and Langford soils, 25 to 45 percent slopes (Ml)	VIe
Middlebury silt loam, 0 to 2 percent slopes (Mm)	IIw
Morocco fine sandy loam, 0 to 2 percent slopes (Mn)	IIIw
Muck, acid (unclassified), 0 to 1 percent slopes (Mo)	IIIw
Newton fine sandy loam, 0 to 1 percent slopes (Na)	IIIw
Nunda silt loam, 0 to 6 percent slopes (Nb)	IIe
Nunda silt loam, 6 to 12 percent slopes (Nc)	IVe
Nunda silt loam, eroded, 6 to 12 percent slopes (Nd)	VIe
Nunda silt loam, eroded, 12 to 20 percent slopes (Ne)	VIe
Nunda silt loam, eroded, 20 to 45 percent slopes (Nf)	VIe
Odessa silt loam, 0 to 6 percent slopes (Oa)	IIe
Odessa silty clay loam, eroded, 6 to 12 percent slopes (Ob)	IVe
Ontario fine sandy loam, 3 to 10 percent slopes (Oc)	IIe
Ontario fine sandy loam, 10 to 20 percent slopes (Od)	IIIe
Ontario fine sandy loam, eroded, 10 to 20 percent slopes (Oe)	IIIe
Ontario gravelly loam, 3 to 10 percent slopes (Of)	IIe
Ontario gravelly loam, eroded, 10 to 20 percent slopes (Og)	IIIe
Ontario, Lansing, and Honeoye soils, 30 to 60 percent slopes (Oh)	VIIe
Ontario loam, 3 to 10 percent slopes (Ok)	IIe
Ontario loam, 10 to 20 percent slopes (Ol)	IIIe
Ontario loam, eroded, 10 to 20 percent slopes (Om)	IIIe
Ontario soils, eroded, 20 to 30 percent slopes (On)	VIe
Ottawa loamy fine sand, 0 to 6 percent slopes (Oo)	IIIs
Ottawa loamy fine sand, 6 to 12 percent slopes (Op)	IVe
Ovid silt loam, 0 to 3 percent slopes (Or)	IIw
Ovid silt loam, 3 to 8 percent slopes (Os)	IIe
Ovid silty clay loam, eroded, 3 to 8 percent slopes (Ot)	IIIe
Ovid silty clay loam, eroded, 8 to 15 percent slopes (Ou)	IVe
Palmyra and Howard soils, 25 to 35 percent slopes (Pa)	VIe
Palmyra cobbly loam, 0 to 5 percent slopes (Pb)	IIIs
Palmyra fine sandy loam, 0 to 5 percent slopes (Pc)	I
Palmyra gravelly loam, 0 to 5 percent slopes (Pd)	I
Palmyra gravelly loam, 5 to 15 percent slopes (Pe)	IIe
Palmyra gravelly loam, 15 to 25 percent slopes(Pf)	IIIe
Palmyra gravelly sandy loam, 0 to 5 percent slopes (Pg)	IIIs
Palmyra gravelly sandy loam, 5 to 15 percent slopes (Ph)	IIIs
Phelps gravelly silt loam, 0 to 5 percent slopes (Pk)	IIw
Poygan silty clay loam, 0 to 1 percent slopes (Pl)	VIw
Red Hook gravelly silt loam, 0 to 3 percent slopes (Ra)	IIIw
Romulus silt loam, 0 to 3 percent slopes (Rb)	IIIw
Romulus silt loam, 3 to 8 percent slopes (Rc)	IIIe
Romulus silty clay loam, 0 to 3 percent slopes (Rd)	IVw
Schoharie silt loam, 0 to 6 percent slopes (Sa)	IIe
Schoharie silt loam, 6 to 12 percent slopes (Sb)	IIIe
Schoharie silty clay loam, 0 to 6 percent slopes (Sc)	IIe
Schoharie silty clay loam, 6 to 12 percent slopes (Sd)	IIIe
Schoharie silty clay loam, eroded, 6 to 12 percent slopes (Se)	IIIe
Schoharie silty clay loam, 12 to 20 percent slopes (Sf)	IVe
Schoharie silty clay loam, eroded, 12 to 20 percent slopes (Sg)	IVe
Schoharie silty clay loam, eroded, 20 to 45 percent slopes (Sh)	VIIe
Sloan silt loam, 0 to 1 percent slopes (Sk)	VIw
Steep broken land, 35 to 60 percent slopes (Sl)	VIIIs
Toledo silty clay loam, 0 to 1 percent slopes (Ta)	IVw
Valois gravelly silt loam, 5 to 15 percent slopes (Va)	IIe
Valois gravelly silt loam, eroded, 5 to 15 percent slopes (Vb)	IIIe
Valois gravelly silt loam, 15 to 25 percent slopes (Vc)	IIIe
Valois gravelly silt loam, eroded, 15 to 25 percent slopes (Vd)	VIe
Volusia channery silt loam, 0 to 3 percent slopes (Ve)	IIIw
Volusia channery silt loam, 3 to 8 percent slopes (Vf)	IIIe
Volusia channery silt loam, 8 to 15 percent slopes (Vg)	IIIe
Volusia channery silt loam, eroded, 8 to 15 percent slopes (Vh)	IVe
Volusia channery silt loam, eroded, 15 to 25 percent slopes (Vk)	VIe
Warners loam, 0 to 1 percent slopes (Wa)	IIIw
Wayland silt loam, 0 to 1 percent slopes (Wb)	IVw
Wayland silty clay loam, 0 to 1 percent slopes (Wc)	IVw
Westland silt loam, 0 to 1 percent slopes (Wd)	IIIw
Woostern, Bath, and Valois soils, 25 to 45 percent slopes (We)	VIIe
Woostern gravelly loam, 5 to 15 percent slopes (Wf)	IIe
Woostern gravelly loam, eroded, 5 to 15 percent slopes (Wg)	IIIe
Woostern gravelly loam, 15 to 25 percent slopes (Wh)	VIe
Woostern gravelly loam, eroded, 15 to 25 percent slopes (Wk)	VIe

Estimated Yields

Estimated yields of principal crops are given in table 12 for three levels of liming and fertilization. The estimates are based on the rotations, supporting practices, and need for lime and plant nutrients specified in table 10.

Suppose you want to know what yields of corn silage can be expected on Arkport fine sandy loam, 0 to 5 percent slopes. The name of this soil will be found in column 2 of table 12. In column 3 is the rotation group to which the soil belongs, in column 4 are the A, B, and C levels of liming and fertilization, and in column 5 are yields of corn silage to be expected at those levels. Corn silage yields 10.8 tons at level A, 12.0 tons at level B, and 12.6 tons at level C.

If you want to produce 12.0 tons of silage corn per acre (level B) on Arkport fine sandy loam, 0 to 5 percent slopes, turn to rotation group 4 in table 10 and select one of the three rotations that include a row crop. Choose the rotation that best suits your own farm plan. For example, you choose: Row crop for 1 year, close-growing crop for 1 year, and sod for 2 or 3 years. With this rotation, you will need practices to maintain organic matter shown in table 10; that is, use of nitrogen fertilizer if you use a sod crop of grass, or no practices for maintenance if you use a sod crop in which legumes dominate. With the selected rotation and supporting practices to maintain organic matter, you will need to practice across-slope tillage. Finally, you will have to apply lime, nitrogen, phosphorus, and potassium fertilizer in amounts needed at the B level.

At the B level, Arkport fine sandy loam, 0 to 5 percent slopes, has a medium requirement for lime, nitrogen, and phosphorus, and a high requirement for potassium. The next step is to convert these ratings into pounds per acre of lime and fertilizer. You will find the amounts of fertilizer per acre in table 11, and the amounts of lime on p. 94.

Silage corn, at level B, on Arkport fine sandy loam, 0 to 5 percent slopes, will need, each year, 20 to 40 pounds of nitrogen (N), 20 to 30 pounds of phosphate (P_2O_5), and 30+ pounds of potash (K_2O). It will also need 2 to 6 tons of lime an acre to bring initial acidity of the plow layer to pH 6.5, and one-fourth ton of lime per acre each year after the initial acidity has been corrected.

You now have the major practices necessary to get 12.0 tons of silage corn per acre. The soil is well drained, so artificial drainage is not a factor in management. But choice of a variety of corn suitable to the area, timeliness of work, control of weeds and insects, and time and method of applying lime and fertilizer are to be consid-

TABLE 12.—*Estimated acre yields of principal crops under three levels of fertilization and liming*

[A, B, and C levels of fertilization are defined in table 11, and the corresponding levels of liming, on page 94. Yields at the various levels are based on use of a suitable rotation, maintenance of organic matter, and control of runoff, as stated in table 10. Absence of A level indicates that soil needs drainage before crops can be grown, and that the B level would be used after drainage. Absence of C level indicates that soil shows little or no response above that obtained at the B level. Absence of any level indicates soil is so poor for crops or pasture that data on fertilization and liming are not available]

Map symbol	Soil	Rotation group	Levels of liming and fertilization	Corn for silage	Corn for grain	Oats	Wheat	Alfalfa hay	Clover hay	Mixed legumes for hay	Potatoes	Field beans	Sweet corn	Peas for canning	Cabbage	Tomatoes
				Tons	*Bu.*	*Bu.*	*Bu.*	*Ton*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Tons*	*Lbs.*	*Tons*	*Tons*
Aa	Alden silty clay loam, 0 to 1 percent slopes:															
	Undrained	12														
	Drained	1	B	9.0	35	30	14		2.0	2.0						
Ab	Allendale fine sandy loam, 0 to 2 percent slopes:															
	Undrained	12														
	Drained	1	B	10.0	36	27	18		2.4	2.4	225	18	2.7	1,000	10.0	8.0
			C	11.0	40	30	20		3.0	3.0	350	20	3.0	1,200	12.0	11.0
Ac	Allis channery silt loam, 12 to 20 inches deep, eroded, 15 to 25 percent slopes:															
	Undrained	11	A			18	8		1.0	1.0						
			B			20	10		1.1	1.1						
Ad	Allis silt loam, 36 inches or more deep, 3 to 8 percent slopes:															
	Undrained	5	A	6.2	[1] 24	30	12		1.5	1.4						
			B	7.8	[1] 30	33	15		1.7	1.6						
Ae	Allis silt loam, 12 to 20 inches deep, 3 to 8 percent slopes:															
	Undrained	10	A	4.8	18	22	10		1.3	1.3						
			B	6.0	[1] 23	25	13		1.4	1.4						
Af	Allis silt loam, 12 to 20 inches deep, eroded, 8 to 15 percent slopes:															
	Undrained	10	A	4.3	17	20	10		1.2	1.2						
			B	5.4	[1] 21	22	12		1.3	1.3						
Ag	Alluvial soils, undifferentiated, 0 to 2 percent slopes	12														
Ah	Angola silt loam, 0 to 3 percent slopes:															
	Undrained	3	A	5.6	22	22	11		1.6	1.6						
			B	7.2	28	24	14		1.8	1.8						
	Drained	3	A	6.4	25	27	18		1.8	1.6		14	1.5	1,200		
			B	8.0	31	30	23		2.0	1.8		18	1.9	1,500		
Ak	Arkport-Dunkirk fine sandy loams, 6 to 12 percent slopes.	7	A	10.6	48	48	30	2.0	2.0	1.9	[2] 175	18	2.5	1,530	9.1	7.4
			B	11.8	53	53	33	2.6	2.5	2.4	[2] 250	23	2.9	1,800	13.0	10.5
			C	12.4	56	58	36	2.7	2.6	2.5	[2] 312	25	3.6	2,250	16.2	13.1
Al	Arkport-Dunkirk fine sandy loams, eroded, 12 to 20 percent slopes.	9	A	7.7	40	40	23	1.6	1.6	1.6	[2] 126	14	1.9	1,020	6.9	5.6
			B	8.6	45	45	26	2.2	2.0	2.0	[2] 180	18	2.2	1,200	9.8	8.0
			C	9.0	47	50	29	2.3	2.1	2.1	[2] 225	20	2.8	1,500	12.2	10.0
Am	Arkport fine sandy loam, 0 to 5 percent slopes.	4	A	10.8	49	49	32	1.6	1.8	1.8	175	20	2.5	1,615	9.4	7.7
			B	12.0	54	54	35	2.6	2.3	2.2	[2] 250	23	2.9	1,900	13.5	11.0
			C	12.6	57	59	38	2.7	2.4	2.3	[2] 312	25	3.6	2,375	16.9	13.8
An	Arkport fine sandy loam, 6 to 12 percent slopes.	7	A	10.3	46	46	30	1.9	1.9	1.6	[2] 140	17	2.3	1,530	9.0	7.3
			B	11.4	51	51	33	2.5	2.1	2.0	[2] 200	21	2.7	1,800	12.8	10.4
			C	12.0	54	56	35	2.6	2.2	2.1	250	23	3.4	2,250	16.0	13.0
Ao	Arkport fine sandy loam, eroded, 12 to 20 percent slopes.	9	A	7.6	39	39	22	1.6	1.3	1.3	[2] 122	13	1.7	935	6.7	5.4
			B	8.4	43	43	25	2.1	1.6	1.6	[2] 175	16	2.0	1,100	9.6	7.7
			C	8.8	45	47	28	2.2	1.7	1.7	[2] 219	18	2.5	1,375	12.0	9.6
Ap	Arkport loamy fine sand, 0 to 5 percent slopes.	1	A	9.2	41	41	25	1.5	1.3	1.3	[2] 140	14	2.0	1,360	8.0	6.5
			B	10.2	46	46	28	2.0	1.6	1.6	[2] 200	18	2.4	1,600	11.4	9.3
			C	10.7	48	51	31	2.1	1.7	1.7	[2] 250	20	3.0	2,000	14.2	11.6
Ar	Arkport soils, 20 to 45 percent slopes	12														

As	Atherton silt loam, 0 to 1 percent slopes:															
	Undrained	12														
	Drained	1	B	9.5	40	30	20		2.5	2.5	200	18	2.3	750	8.0	9.5
			C	10.4	46	32	20		2.5	2.5	250	20	2.8	1,000	10.0	11.5
At	Aurora silt loam, 3 to 8 percent slopes	4	A	9.0	38	40	24	1.9	2.4	2.3		16	2.0	1,232	7.5	6.1
			B	10.0	42	44	28	1.9	2.4	2.3		19	2.3	1,450	10.0	8.1
Au	Aurora silt loam, eroded, 3 to 8 percent slopes.	7	A	8.6	36	38	22	1.8	2.3	2.2		15	1.8	1,105	6.8	5.5
			B	9.5	40	42	26	1.8	2.3	2.2		18	2.1	1,300	9.0	7.3
Av	Aurora silt loam, 8 to 15 percent slopes	7	A	8.1	34	36	21	1.7	2.2	2.1		14	1.7	1,105	6.8	5.5
			B	9.0	38	40	25	1.7	2.2	2.1		17	2.0	1,300	9.0	7.3
Aw	Aurora silt loam, eroded, 8 to 15 percent slopes.	11	A			33	19	1.6	2.1	2.0						
			B			37	22	1.6	2.1	2.0						
Ax	Aurora silt loam, eroded, 15 to 30 percent slopes.	12	A					1.5	1.9	1.8						
			B					1.5	1.9	1.8						
Ba	Bath channery silt loam, 5 to 15 percent slopes.	4	A	8.8	35	39	22		1.6	1.5	192	14	1.7	1,440		5.1
			B	11.0	[1] 44	46	27	2.2	2.3	2.2	320	18	2.3	1,800	10.0	8.5
			C	13.2	53	48	32	2.3	2.4	2.3	416	20	2.6	2,160	12.5	10.6
Bb	Bath channery silt loam, 15 to 25 percent slopes.	8	A	6.4	26	28	16		1.2	1.1	120	11	1.4	1,200		
			B	8.0	[1] 33	35	20	1.9	1.7	1.6	200	14	1.8	1,500		
			C	9.6	40	37	24	2.0	1.8	1.7	260	15	2.0	1,800		
Bc	Berrien fine sandy loam, 0 to 6 percent slopes.	3	A	9.1	41	39	25		1.0	1.0	140	16	2.0	1,190		6.3
			B	11.4	51	52	33	1.9	2.0	2.0	200	22	2.7	1,700	12.0	10.5
			C	12.5	56	57	36	2.3	2.4	2.4	300	24	3.0	2,125	15.0	13.6
Bd	Bono silty clay, 0 to 1 percent slopes:															
	Undrained	12														
	Partially drained	1	B						2.0	2.0						
Be	Braceville gravelly silt loam, 0 to 5 percent slopes.	1	A	9.4	38	38	22		2.0	1.9	240	17	2.1	1,530		
			B	11.0	45	47	28		2.4	2.2	300	20	2.5	1,800		
			C	12.1	54	49	34		2.9	2.4	390	22	2.9	1,980		
Bf	Burdett silt loam, 0 to 6 percent slopes	4	A	9.9	41	43	27	2.0	2.6	2.5		18	2.1	1,360	8.2	6.8
			B	11.0	46	48	32	2.0	2.6	2.5		21	2.5	1,600	11.0	9.0
Ca	Camillus silt loam, 0 to 8 percent slopes	4	A	9.9	42	43	27	1.6	1.8	1.8	[2] 140	16	2.0	1,360	7.3	5.9
			B	11.0	47	48	30	2.2	2.2	2.2	[2] 200	20	2.4	1,600	10.4	8.4
			C	11.6	49	53	33	2.3	2.3	2.3	[2] 250	22	3.0	2,000	13.0	10.5
Cb	Camillus silt loam, imperfectly drained variant, 0 to 5 percent slopes.	4	A	8.9	38	34	24		1.8	1.8		14	1.9	1,020	6.3	5.2
			B	9.9	42	38	27		2.2	2.3		18	2.2	1,200	9.0	7.5
			C	10.4	44	42	30		2.3	2.4		20	2.8	1,500	11.2	9.4
CD	Canandaigua silt loam, 0 to 3 percent slopes:															
	Undrained	2	A	8.5	34	27	14		2.0	2.0						
			B	9.5	38	30	16		2.0	2.0						
	Drained	2	B	12.0	55	48	32	2.0	3.2	3.2		23	2.7	1,500	12.0	11.5
			C	13.0	60	50	35	2.0	3.2	3.2		25	3.5	1,800	15.0	14.0
Cc	Caneadea silty clay loam, 0 to 6 percent slopes.	4	A	9.0	36	34	21		2.4	2.3						
			B	10.0	40	38	25		2.4	2.3						
Cd	Caneadea silty clay loam, eroded, 6 to 15 percent slopes.	7	A	7.6	31	29	18		2.2	2.1						
			B	8.5	34	32	21		2.2	2.1						
Ce	Carlisle muck, 0 to 1 percent slopes:															
	Undrained	12														
	Drained	1	B	14.5	64					4.0	345	27	3.5		16.0	12.5
			C	16.0	70					4.0	440	30	4.5		20.0	15.5
Cf	Carlisle muck, shallow, 0 to 1 percent slopes:															
	Undrained	12														
	Drained	1	B	12.0	55					3.5	280	27	3.0		13.0	11.0
			C	13.0	60					3.5	350	30	4.0		16.0	14.0
Cg	Cayuga silt loam, 3 to 8 percent slopes	4	A	10.8	45	47	30	2.9	2.7	2.6	[2] 140	20	2.4	1,615	8.4	7.0
			B	12.0	50	52	35	2.9	2.7	2.6	[2] 200	23	2.8	1,900	12.0	10.0
			C	12.6	52	55	38	2.9	2.7	2.6	[2] 240	25	3.1	2,090	14.4	12.0
Ch	Cayuga silt loam, eroded, 3 to 8 percent slopes.	5	A	9.7	40	42	27	2.8	2.6	2.6	[2] 105	17	1.9	1,360	6.7	5.6
			B	10.8	45	47	32	2.8	2.6	2.5	[2] 150	20	2.2	1,600	9.6	8.0
			C	11.3	47	49	35	2.8	2.6	2.5	[2] 180	22	2.4	1,760	11.5	9.6
Ck	Cayuga silt loam, 8 to 15 percent slopes	7	A	9.4	39	40	26	2.8	2.5	2.4		16	1.8	1,275	6.7	5.6
			B	10.5	43	45	30	2.8	2.5	2.4		19	2.1	1,500	9.6	8.0
			C	11.0	45	47	33	2.8	2.5	2.4		21	2.3	1,650	11.5	9.6

See footnotes at end of table.

TABLE 12.—*Estimated acre yields of principal crops under three levels of fertilization and liming*—Continued

Map symbol	Soil	Rotation group	Levels of liming and fertilization	Corn for silage	Corn for grain	Oats	Wheat	Alfalfa hay	Clover hay	Mixed legumes for hay	Potatoes	Field beans	Sweet corn	Peas for canning	Cabbage	Tomatoes
				Tons	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Tons*	*Lbs.*	*Tons*	*Tons*
Cl	Cayuga silt loam, eroded, 8 to 15 percent slopes.	9	A	8. 6	35	37	23	2. 7	2. 4	2. 3		14	1. 6	1, 147	6. 0	5. 0
			B	9. 5	39	41	27	2. 7	2. 4	2. 3		17	1. 9	1, 350	8. 6	7. 2
			C	10. 0	41	43	30	2. 7	2. 4	2. 3		19	2. 1	1, 485	10. 3	8. 6
Cm	Cayuga silt loam, eroded, 15 to 25 percent slopes.	11	A			32	21	2. 5	2. 2	2. 1						
			B			35	25	2. 5	2. 2	2. 1						
Cn	Cazenovia silt loam, 3 to 10 percent slopes.	4	A	10. 8	45	47	30	2. 9	2. 7	2. 6	[2] 140	20	2. 4	1, 615	8. 4	7. 0
			B	12. 0	50	52	35	2. 9	2. 7	2. 6	[2] 200	23	2. 8	1, 900	12. 0	10. 0
			C	12. 6	52	55	38	2. 9	2. 7	2. 6	[2] 240	25	3. 1	2, 090	14. 4	12. 0
Co	Cazenovia silt loam, 10 to 20 percent slopes.	9	A	9. 4	38	40	26	2. 8	2. 5	2. 4		16	1. 8	1, 275	6. 7	5. 6
			B	10. 4	42	44	30	2. 8	2. 5	2. 4		19	2. 1	1, 500	9. 6	8. 0
			C	10. 9	44	46	33	2. 8	2. 5	2. 4		21	2. 3	1, 650	11. 5	9. 6
Cp	Chagrin silt loam, 0 to 2 percent slopes	1	A	12. 6	58	45	27	3. 4	3. 2	3. 0		27	3. 2	1, 980	12. 0	9. 6
			B	14. 0	65	50	30	3. 4	3. 2	3. 0		30	3. 6	2, 200	15. 0	12. 0
			C	14. 0	65	52	32	3. 4	3. 2	3. 0		33	4. 3	2, 640	18. 0	14. 4
Cr	Chagrin silt loam, alluvial fan, 2 to 8 percent slopes.	1	A	12. 2	57	50	30	3. 4	3. 1	2. 9		27	3. 2	2, 070	12. 0	9. 6
			B	13. 5	63	55	33	3. 4	3. 1	2. 9	300	30	3. 5	2, 300	15. 0	12. 0
			C	13. 5	63	58	35	3. 4	3. 1	2. 9		33	4. 2	2, 760	18. 0	14. 4
Cs	Chagrin shaly silt loam, alluvial fan, 2 to 8 percent slopes.	1	A	11. 7	54	48	29	3. 2	3. 0	2. 8		25	3. 0	1, 980	11. 2	8. 8
			B	13. 0	60	53	32	3. 2	3. 0	2. 8	280	28	3. 3	2, 200	14. 0	11. 0
			C	13. 0	60	56	34	3. 2	3. 0	2. 8		31	4. 0	2, 640	16. 8	13. 2
Ct	Chenango and Tioga gravelly silt loams, alluvial fan, 2 to 5 percent slopes.	1	A	10. 6	47	48	31	2. 2	2. 3	2. 2	210	23	2. 4	1, 700	8. 8	7. 0
			B	12. 5	55	56	36	2. 5	2. 6	2. 5	300	27	3. 0	2, 000	12. 5	10. 0
			C	13. 8	60	59	38	2. 5	2. 5	2. 5	390	30	3. 6	2, 600	16. 2	12. 0
Cu	Chenango gravelly loam, 0 to 5 percent slopes.	1	A	10. 6	47	48	31	2. 2	2. 3	2. 2	210	23	2. 4	1, 700	8. 8	7. 0
			B	12. 5	55	56	36	2. 5	2. 6	2. 5	300	27	3. 0	2, 000	12. 5	10. 0
			C	13. 8	60	59	38	2. 5	2. 6	2. 5	390	30	3. 6	2, 600	16. 2	12. 0
Cv	Chenango gravelly loam, 5 to 15 percent slopes.	3	A	9. 0	40	41	26	2. 2	2. 2	2. 1	178	20	2. 0	1, 487	7. 4	6. 0
			B	10. 6	47	48	31	2. 4	2. 4	2. 3	255	23	2. 5	1, 750	10. 6	8. 5
			C	11. 7	52	50	32	2. 4	2. 4	2. 3	332	25	3. 0	2, 275	13. 8	10. 2
Cw	Chenango soils, 15 to 25 percent slopes	6	A	6. 4	28	29	18	1. 7	1. 4	1. 4	126	14	1. 4	1, 020	5. 5	4. 2
			B	7. 5	33	34	21	1. 9	1. 6	1. 5	180	16	1. 8	1, 200	7. 8	6. 0
Cx	Chenango soils, 25 to 45 percent slopes	12	A			17	13	1. 3	1. 1							
			B			20	15	1. 4	1. 2							
Cy	Chippewa silt loam, 0 to 1 percent slopes:															
	Undrained	12														
	Drained	1	A	6. 8	[1] 26	23	10		1. 8	1. 8						
			B	8. 5	[1] 33	25	12		2. 0	2. 0						
Cz	Chippewa silt loam, 3 to 8 percent slopes:															
	Undrained	12														
	Drained	4	A	6. 8	[1] 26	23	10		1. 8	1. 8						
			B	8. 5	[1] 33	25	12		2. 0	2. 0						
CA	Collamer silt loam, 0 to 6 percent slopes.	4	A	11. 5	51	45	31	2. 1	2. 2	2. 2		18	2. 6	1, 445	9. 4	7. 7
			B	12. 8	57	50	34	2. 3	2. 8	2. 7		23	3. 1	1, 700	13. 5	11. 0
			C	13. 4	60	55	37	2. 4	2. 9	2. 8		25	3. 7	1, 955	16. 9	13. 8
CB	Collamer silt loam, 6 to 12 percent slopes.	7	A	11. 0	49	43	29	2. 0	2. 2	2. 1		17	2. 5	1. 360	9. 0	7. 4
			B	12. 2	54	48	32	2. 2	2. 7	2. 6		21	2. 9	1, 600	12. 8	10. 5
			C	12. 8	57	53	35	2. 3	2. 8	2. 7		23	3. 5	1, 840	16. 0	13. 1
CC	Colwood silt loam, 0 to 1 percent slopes:															
	Undrained	12														
	Drained	1	B	11 5	53	31	23		3. 2	3. 2		22	2. 5	1, 175	11. 5	11. 0
			C	12. 5	58	33	25		3. 2	3. 2		24	3. 3	1, 400	14. 5	13. 5
Da	Darien silt loam, 0 to 3 percent slopes	2	A	9. 9	41	43	27	1. 5	2. 5	2. 4		18	2. 1	1, 360	8. 2	6. 8
			B	11. 0	46	48	32	1. 5	2. 5	2. 4		21	2. 5	1, 600	11. 0	9. 0

Db	Darien silt loam, 3 to 8 percent slopes	4	A	9.9	41	43	27	1.5	2.5	2.4		18	2.1	1,360	8.2	6.8
			B	11.0	46	48	32	1.5	2.5	2.4		21	2.5	1,600	11.0	9.0
Dc	Darien silt loam, 8 to 15 percent slopes	7	A	9.0	38	40	25	1.4	2.3	2.2		16	1.9	1,232	7.5	6.1
			B	10.0	42	44	29	1.4	2.3	2.2		19	2.2	1,450	10.0	8.1
Dd	Darien silt loam, eroded, 8 to 15 percent slopes.	9	A	8.6	36	38	22	1.3	2.2	2.1		15	1.7	1,105	6.8	5.5
			B	9.5	40	42	26	1.3	2.2	2.1		18	2.0	1,300	9.0	7.3
De	Dunkirk fine sandy loam, 0 to 6 percent slopes.	4	A	11.5	52	52	32	2.0	2.1	2.0	[2] 210	20	2.6	1,700	9.4	7.7
			B	12.8	58	58	36	2.7	2.6	2.5	[2] 300	25	3.1	2,000	13.5	11.0
			C	13.4	61	64	40	2.8	2.7	2.6	[2] 375	28	3.9	2,500	16.9	13.8
Df	Dunkirk fine sandy loam, 6 to 12 percent slopes.	7	A	10.6	48	48	30	2.0	2.0	1.9	[2] 175	18	2.5	1,530	9.1	7.4
			B	11.8	53	53	33	2.6	2.5	2.4	[2] 250	23	2.9	1,800	13.0	10.5
			C	12.4	56	58	36	2.7	2.6	2.5	[2] 312	25	3.6	2,250	16.2	13.1
Dg	Dunkirk silt loam, 0 to 6 percent slopes	4	A	11.2	50	50	33	2.1	2.2	2.1	[2] 175	19	2.6	1,700	9.1	7.4
			B	12.5	55	55	37	2.8	2.7	2.6	[2] 250	24	3.0	2,000	13.0	10.5
			C	13.1	58	60	41	2.9	2.8	2.7	[2] 312	26	3.8	2,500	16.2	13.1
Dh	Dunkirk silt loam, 6 to 12 percent slopes.	7	A	10.2	45	45	30	2.0	2.1	2.0	[2] 154	17	2.3	1,530	8.2	6.6
			B	11.3	50	50	33	2.7	2.6	2.5	[2] 220	21	2.7	1,800	11.7	9.4
			C	11.9	52	55	36	2.8	2.7	2.6	[2] 275	23	3.4	2,250	14.6	11.8
Dk	Dunkirk silt loam, eroded, 12 to 20 percent slopes.	9	A	9.0	40	40	27	2.0	2.0	1.9	[2] 126	15	2.0	1,360	7.3	5.9
			B	10.0	44	44	30	2.6	2.5	2.4	[2] 180	19	2.4	1,600	10.4	8.4
			C	10.5	46	48	33	2.7	2.6	2.5	[2] 225	21	3.0	2,000	13.0	10.5
Dl	Dunkirk silt loam, eroded, 20 to 45 percent slopes.	11	A			22	13	1.3	1.3	1.2						
			B			25	14	1.7	1.6	1.5						
Ea	Edwards muck, 0 to 1 percent slopes: Undrained	12														
	Drained	1	B	11.0	40					2.5	300	20	2.5		11.0	9.0
			C	12.0	45					2.5	425	25	3.2		14.5	12.0
Eb	Eel silt loam, 0 to 2 percent slopes	1	A	11.7	54	36	18	2.5	3.0	2.8		24	3.1	1,620	11.5	9.2
			B	13.0	60	40	20	2.5	3.0	2.8		27	3.4	1,800	14.4	11.5
			C	13.0	60	42	21	2.5	3.0	2.8		30	4.1	2,160	17.3	13.8
Ec	Eel silty clay loam, 0 to 2 percent slopes.	1	A	10.5	49	32	16	2.0	2.8	2.7		22	2.7	1,440	9.6	8.0
			B	11.7	54	36	18	2.0	2.8	2.7		24	3.0	1,600	12.0	10.0
			C	11.7	54	38	19	2.0	2.8	2.7		26	3.6	1,920	14.4	12.0
Ed	Erie gravelly silt loam, 0 to 3 percent slopes.	3	A	7.6	31	31	17		2.0	1.9						
			B	9.5	39	34	21		2.2	2.1						
Ee	Erie gravelly silt loam, 3 to 8 percent slopes.	4	A	8.0	33	40	18		2.1	1.9						
			B	10.0	41	44	22		2.3	2.1						
Ef	Erie gravelly silt loam, 8 to 15 percent slopes.	7	A	7.2	30	36	16		1.9	1.8						
			B	9.0	37	40	20		2.1	2.0						
Fa	Farmington loam, 12 to 30 inches deep, 2 to 8 percent slopes.	3	A	9.2	41	40	27	2.4	2.2	2.2		16	2.0	1,360	7.8	5.9
			B	10.2	46	45	30	2.4	2.2	2.2		20	2.5	1,600	11.2	8.4
Fb	Farmington loam, 0 to 12 inches deep, 2 to 15 percent slopes.	12														
Fc	Fremont channery silt loam, 0 to 3 percent slopes.	2	A	8.0	30	39	16		2.0	1.7						
			B	10.0	[1] 38	43	20		2.2	1.9	200	16	2.0	1,600		
Fd	Fremont channery silt loam, 3 to 8 percent slopes.	4	A	8.0	30	39	16		2.0	1.7						
			B	10.0	[1] 38	43	20		2.2	1.9	200	16	2.0	1,600		
Fe	Fremont channery silt loam, 8 to 15 percent slopes.	7	A	7.2	27	35	14		1.8	1.5						
			B	9.0	[1] 34	39	18		2.0	1.7	180	15	1.8	1,450		
Ff	Fresh water marsh, 0 to 1 percent slopes: Undrained	12														
Fg	Fulton silt loam, 0 to 3 percent slopes: Slightly drained	2	A	8.4	32	23	14		2.0	2.0						
			B	9.3	35	25	16		2.0	2.0						
	Drained	2	B	10.5	44	40	30		2.8	2.8		17	2.3	1,400	10.0	9.0
Ga	Galen fine sandy loam, 0 to 6 percent slopes.	2	A	11.1	50	43	29	2.2	2.7	2.7		17	2.3	1,275	8.8	7.6
			B	12.3	56	48	32	2.2	2.7	2.7		21	2.9	1,500	12.5	10.8
			C	13.5	62	50	35	2.2	2.7	2.7		23	3.8	1,800	15.6	13.5
Gb	Genesee fine sandy loam, 0 to 2 percent slopes.	1	A	12.6	58	45	27	3.5	3.2	3.0		27	3.2	1,980	12.8	9.6
			B	14.0	65	50	30	3.5	3.2	3.0		30	3.6	2,200	16.0	12.0
			C	14.0	65	52	32	3.5	3.2	3.0		33	4.3	2,640	19.2	14.4
Gc	Genesee silt loam, 0 to 2 percent slopes	1	A	13.0	61	45	27	3.6	3.4	3.2		27	3.4	1,980	12.8	9.6
			B	14.5	68	50	30	3.6	3.4	3.2		30	3.8	2,200	16.0	12.0
			C	14.5	68	52	32	3.6	3.4	3.2		33	4.6	2,640	19.2	14.4

See footnotes at end of table.

TABLE 12.—*Estimated acre yields of principal crops under three levels of fertilization and liming*—Continued

Map symbol	Soil	Rotation group	Levels of liming and fertilization	Corn for silage	Corn for grain	Oats	Wheat	Alfalfa hay	Clover hay	Mixed legumes for hay	Potatoes	Field beans	Sweet corn	Peas for canning	Cabbage	Tomatoes
				Tons	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Tons*	*Lbs.*	*Tons*	*Tons*
Gd	Genesee silt loam, high bottom, 0 to 2 percent slopes.	1	A	13.5	63	50	32	3.6	3.4	3.2		29	3.6	3,000	13.6	11.2
			B	15.0	70	55	35	3.6	3.4	3.2		32	4.0	2,500	17.0	14.0
			C	15.0	70	58	37	3.6	3.4	3.2		35	4.8	3,000	20.4	16.8
Ge	Granby fine sandy loam, 0 to 1 percent slopes:															
	Undrained	12														
	Drained	1	B	12.0	54	33	25		3.5	3.5		27	3.0	1,175	13.0	11.5
			C	13.0	60	35	27		3.5	3.5		30	4.0	1,400	16.2	14.4
Ha	Holly silt loam, 0 to 1 percent slopes:															
	Undrained	12														
	Slightly drained	1	B							2.0						
Hb	Homer sandy loam, 0 to 3 percent slopes:															
	Slightly drained	1	B	9.5	38	30	16		2.0	2.0						
	Drained	1	B	13.2	62	48	27	2.0	3.5	3.4		29	3.5	1,500	14.4	12.8
			C	14.5	68	50	30	2.0	3.5	3.4		32	4.5	1,800	18.0	16.0
Hc	Homer silt loam, 0 to 3 percent slopes:															
	Slightly drained	1	B	9.5	38	30	16		2.0	2.0						
	Drained	1	B	13.2	62	48	27	2.0	3.5	3.4		29	3.5	1,500	14.4	12.8
			C	14.5	68	50	30	2.0	3.5	3.4		32	4.5	1,800	18.0	16.0
Hd	Honeoye fine sandy loam, 0 to 3 percent slopes.	1	A	11.5	52	52	33	3.0	2.8	2.7	[2] 210	20	2.5	1,700	9.8	7.4
			B	12.8	58	58	37	3.0	2.8	2.7	[2] 300	25	3.1	2,000	14.0	10.5
			C	14.1	64	61	37	3.0	2.8	2.7	[2] 375	28	4.0	2,500	17.5	13.1
He	Honeoye fine sandy loam, 3 to 10 percent slopes.	4	A	11.5	52	52	33	3.0	2.8	2.7	[2] 210	20	2.5	1,700	9.8	7.4
			B	12.8	58	58	37	3.0	2.8	2.7	[2] 300	25	3.1	2,000	14.0	10.5
			C	14.1	64	61	37	3.0	2.8	2.7	[2] 375	28	4.0	2,500	17.5	13.1
Hf	Honeoye fine sandy loam, 10 to 20 percent slopes.	5	A	9.8	44	44	27	2.6	2.3	2.3	[2] 168	17	2.1	1,445	7.7	5.9
			B	10.9	49	49	30	2.6	2.3	2.3	[2] 240	21	2.6	1,700	11.0	8.4
			C	12.0	54	51	30	2.6	2.3	2.3	[2] 300	23	3.4	2,125	13.8	10.5
Hg	Honeoye fine sandy loam, eroded, 10 to 20 percent slopes.	8	A	8.8	40	40	24	2.5	2.2	2.2	[2] 105	14	1.8	1,190	6.3	5.1
			B	9.8	44	44	27	2.5	2.2	2.2	[2] 150	18	2.3	1,400	9.0	7.3
			C	10.9	48	46	27	2.5	2.2	2.2	[2] 188	20	3.0	1,750	11.2	9.1
Hh	Honeoye silt loam, 0 to 3 percent slopes.	1	A	11.5	52	52	33	3.0	2.8	2.7	[2] 210	20	2.5	1,700	9.8	7.4
			B	12.8	58	58	37	3.0	2.8	2.7	[2] 300	25	3.1	2,000	14.0	10.5
			C	14.1	64	61	37	3.0	2.8	2.7	[2] 375	28	4.0	2,500	17.5	13.1
Hk	Honeoye silt loam, 3 to 10 percent slopes.	4	A	11.5	52	52	33	3.0	2.8	2.7	[2] 210	20	2.5	1,700	9.8	7.4
			B	12.8	58	58	37	3.0	2.8	2.7	[2] 300	25	3.1	2,000	14.0	10.5
			C	14.1	64	61	37	3.0	2.8	2.7	[2] 375	28	4.0	2,500	17.5	13.1
Hl	Honeoye silt loam, 10 to 20 percent slopes.	5	A	9.8	44	44	27	2.6	2.3	2.3	[2] 168	17	2.1	1,445	7.7	5.9
			B	10.9	49	49	30	2.6	2.3	2.3	[2] 240	21	2.6	1,700	11.0	8.4
			C	12.0	54	51	30	2.6	2.3	2.3	[2] 300	23	3.4	2,125	13.8	10.5
Hm	Honeoye silt loam, eroded, 10 to 20 percent slopes.	8	A	8.8	40	40	24	2.5	2.2	2.2	[2] 105	14	1.8	1,190	6.3	5.1
			B	9.8	44	44	27	2.5	2.2	2.2	[2] 150	18	2.3	1,400	9.0	7.3
			C	10.8	48	46	27	2.5	2.2	2.2	[2] 188	20	3.0	1,750	11.2	9.1
Hn	Honeoye soils, eroded, 20 to 30 percent slopes.	11	A			32	19	2.0	1.7	1.7						
			B			35	21	2.0	1.7	1.7						
Ho	Hornell silt loam, 36 inches or more deep, 3 to 8 percent slopes.	4	A	8.5	32	34	18		1.9	1.6		14	1.9			
			B	10.0	[1] 38	42	23		2.2	1.9		16	2.2			
			C	11.0	46	44	28		2.6	2.1		18	2.5			
Hp	Hornell silt loam, 12 to 20 inches deep, 3 to 8 percent slopes.	10	A	6.0	17	20	11		1.3	1.2						
			B	7.0	[1] 20	25	14		1.5	1.4						
Hr	Hornell silt loam, 36 inches or more deep, 8 to 15 percent slopes.	7	A	7.6	29	30	17		1.7	1.4		12	1.7			
			B	9.0	[1] 34	38	21		2.0	1.7		14	2.0			
Hs	Hornell silt loam, 12 to 20 inches deep, eroded, 8 to 15 percent slopes.	11	A			16	10		1.1	1.0						
			B			20	12		1.3	1.2						
Ht	Hornell silt loam, 36 inches or more deep, eroded, 8 to 15 percent slopes.	9	A	7.2	27	29	16		1.6	1.4		10	1.6			
			B	8.5	[1] 32	36	20		1.9	1.6		12	1.9			

Hu	Howard gravelly loam, 0 to 5 percent slopes.	1	A	10.6	47	48	31	2.6	2.3	2.2	210	23	2.4	1,700	9.1	7.0
			B	12.5	55	56	36	2.9	2.6	2.5	300	27	3.0	2,000	13.0	10.0
			C	13.8	60	59	38	2.9	2.6	2.5	390	30	3.6	2,600	16.9	12.0
Hv	Howard gravelly loam, 5 to 15 percent slopes.	3	A	9.0	40	41	26	2.5	2.2	2.1	175	20	2.0	1,445	7.7	6.0
			B	10.6	47	48	31	2.8	2.4	2.3	250	23	2.5	1,700	11.0	8.5
			C	11.7	52	50	32	2.8	2.4	2.3	325	25	3.0	2,210	14.3	10.2
Hw	Howard soils, 15 to 25 percent slopes	6	A	6.5	28	29	18	1.9	1.4	1.4	126	14	1.4	1,020	5.5	4.2
			B	7.5	33	34	21	2.0	1.6	1.5	180	16	1.8	1,200	7.8	6.0
Ja	Junius fine sandy loam, 0 to 2 percent slopes:															
	Slightly drained	1	A	8.6	34	27	9		2.0	2.0						
			B	9.5	38	30	16		2.0	2.0						
	Drained	1	B	13.2	62	48	27	2.0	3.5	3.4		29	3.5	1,500	14.4	12.8
			C	14.5	68	50	30	2.0	3.5	3.4		32	4.5	1,800	18.0	16.0
Ka	Kendaia loam, 0 to 3 percent slopes:															
	Slightly drained	1	A	8.6	34	27	9		2.0	2.0						
			B	9.5	38	30	16		2.0	2.0						
	Drained	1	B	13.2	62	48	27	2.0	3.5	3.4		29	3.5	1,500	14.4	12.8
			C	14.5	68	50	30	2.0	3.5	3.4		32	4.5	1,800	18.0	16.0
Kb	Kendaia silt loam, 0 to 3 percent slopes:															
	Slightly drained	1	A	8.6	34	27	9		2.0	2.0						
			B	9.5	38	30	16		2.0	2.0						
	Drained	1	B	13.2	62	48	27	2.0	3.5	3.4		29	3.5	1,500	14.4	12.8
			C	14.5	68	50	30	2.0	3.5	3.4		32	4.5	1,800	18.0	16.0
Kc	Kendaia silt loam, 3 to 8 percent slopes:															
	Slightly drained	2	A	8.8	36	30	16		2.2	2.0						
			B	9.8	40	33	18		2.2	2.0						
	Drained	2	B	12.0	55	48	34	2.0	3.2	3.0		22	2.9	1,425	12.0	9.6
			C	13.0	60	53	34	2.0	3.2	3.0		24	3.8	1,700	15.0	12.0
La	Lakemont silty clay loam, 0 to 2 percent slopes:															
	Slightly drained	2	A	6.3	23	18	12		1.9	1.9						
			B	7.0	25	20	13		1.9	1.9						
	Drained	2	A	8.1	33	32	23		2.5	2.5						
			B	9.0	37	36	25		2.5	2.5						
Lb	Langford gravelly silt loam, 3 to 8 percent slopes.	2	A	9.4	38	38	22		2.0	1.9	240	17	2.1	1,530		
			B	11.0	45	47	28		2.4	2.2	300	20	2.5	1,800		
			C	12.1	54	49	34		2.9	2.4	390	22	2.9	1,980		
Lc	Langford gravelly silt loam, 8 to 15 percent slopes.	5	A	8.4	34	34	20		1.9	1.7	216	15	2.0	1,360		
			B	9.9	40	42	25		2.2	2.0	270	18	2.3	1,600		
Ld	Lansing and Danley silt loams, 12 to 20 inches deep, 3 to 8 percent slopes.	6	A	6.8	30	30	16	1.6	1.5	1.5						
			B	7.5	33	33	18	1.6	1.5	1.5						
Le	Lansing and Danley silt loams, 12 to 20 inches deep, eroded, 8 to 15 percent slopes.	10	A	5.4	23	23	13	1.2	1.2	1.2						
			B	6.0	26	26	14	1.2	1.2	1.2						
Lf	Lansing and Danley silt loams, 12 to 20 inches deep, eroded, 15 to 25 percent slopes.	11	A			18	9	1.0	1.0	1.0						
			B			20	10	1.0	1.0	1.0						
Lg	Lansing silt loam, 3 to 10 percent slopes.	4	A	11.2	50	50	28	2.8	2.8	2.8	217	18	2.3	1,700	9.4	7.0
			B	12.5	55	55	31	2.8	2.7	2.6	310	23	2.9	2,000	13.5	10.0
			C	13.8	60	58	31	2.8	2.7	2.6	388	25	3.8	2,500	16.9	12.5
Lh	Lansing silt loam, 10 to 20 percent slopes.	7	A	9.5	42	42	22	2.4	2.2	2.2	[2] 175	15	1.9	1,445	7.0	5.6
			B	10.6	47	47	25	2.4	2.2	2.2	[2] 250	19	2.4	1,700	10.0	8.0
			C	11.7	52	49	25	2.4	2.2	2.2	[2] 312	21	3.1	2,125	12.5	10.0
Lk	Lansing silt loam, eroded, 10 to 20 percent slopes.	8	A	8.6	38	38	21	2.3	2.1	2.1	[2] 105	14	1.7	1,190	6.0	4.9
			B	9.5	42	42	23	2.3	2.1	2.1	[2] 150	17	2.1	1,400	8.5	7.0
Ll	Lansing silt loam, 20 to 30 percent slopes.	11	A			33	19	1.9	1.7	1.7						
			B			37	21	1.9	1.7	1.7						
Lm	Lansing silt loam, eroded, 20 to 30 percent slopes.	11	A			30	17	1.9	1.6	1.6						
			B			33	19	1.9	1.6	1.6						
Ln	Lima fine sandy loam, 0 to 3 percent slopes.	1	A	11.7	54	48	31	2.5	2.9	2.8		19	2.6	1,445	10.5	8.4
			B	13.0	60	53	34	2.5	2.9	2.8		24	3.2	1,700	15.0	12.0
			C	14.3	66	56	37	2.5	2.9	2.8		26	4.2	2,040	18.8	15.0
Lo	Lima fine sandy loam, 3 to 10 percent slopes.	4	A	11.7	54	48	31	2.5	2.9	2.8		19	2.6	1,445	10.5	8.4
			B	13.0	60	53	34	2.5	2.9	2.8		24	3.2	1,700	15.0	12.0
			C	14.3	66	56	37	2.5	2.9	2.8		26	4.2	2,040	18.8	15.0

See footnotes at end of table.

413784—58——9

TABLE 12.—*Estimated acre yields of principal crops under three levels of fertilization and liming*—Continued

Map symbol	Soil	Rotation group	Levels of liming and fertilization	Corn for silage	Corn for grain	Oats	Wheat	Alfalfa hay	Clover hay	Mixed legumes for hay	Potatoes	Field beans	Sweet corn	Peas for canning	Cabbage	Tomatoes
				Tons	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Tons*	*Lbs.*	*Tons*	*Tons*
Lp	Lima silt loam, 12 to 20 inches deep, 0 to 3 percent slopes.	1	A	8.1	38	33	21	1.7	1.9	1.8	------	12	1.7	1,020	6.3	5.0
			B	9.0	42	37	23	1.7	1.9	1.8	------	15	2.1	1,200	9.0	7.2
Lr	Lima silt loam, 0 to 3 percent slopes	1	A	11.7	54	48	31	2.5	2.9	2.8	------	19	2.6	1,445	10.5	8.4
			B	13.0	60	53	34	2.5	2.9	2.8	------	24	3.2	1,700	15.0	12.0
			C	14.3	66	56	37	2.5	2.9	2.8	------	26	4.2	2,040	18.8	15.0
Ls	Lima silt loam, 3 to 10 percent slopes	4	A	11.7	54	48	31	2.5	2.9	2.8	------	19	2.6	1,445	10.5	8.4
			B	13.0	60	53	34	2.5	2.9	2.8	------	24	3.2	1,700	15.0	12.0
			C	14.3	66	56	37	2.5	2.9	2.8	------	26	4.2	2,040	18.8	15.0
Lt	Lima silt loam, 10 to 20 percent slopes	8	A	9.9	45	40	26	2.4	2.5	2.4	------	16	2.0	1,190	8.4	6.7
			B	11.0	50	45	29	2.4	2.5	2.4	------	20	2.5	1,400	12.0	9.6
			C	12.1	55	47	32	2.4	2.5	2.4	------	22	3.2	1,680	15.0	12.0
Lu	Lobdell silt loam, 0 to 2 percent slopes	1	A	11.3	52	36	18	2.3	2.9	2.8	------	24	2.9	1,530	11.2	9.2
			B	12.6	58	40	20	2.3	2.9	2.8	------	27	3.2	1,700	14.0	11.5
			C	12.6	58	42	21	2.3	2.9	2.8	------	30	3.8	2,040	16.8	13.8
Lv	Lordstown and Manlius soils, 25 to 45 percent slopes.	12		------	------	------	------	------	------	------	------	------	------	------	------	------
Lw	Lordstown channery silt loam, 5 to 15 percent slopes.	3	A	7.9	30	34	19	------	1.5	1.4	174	14	1.6	1,320	------	------
			B	9.9	[1] 38	43	24	2.0	2.1	2.0	290	17	2.2	1,650	------	------
			C	11.9	46	45	29	2.1	2.2	2.1	377	19	2.5	1,980	------	------
Lx	Lordstown channery silt loam, 15 to 25 percent slopes.	6	A	5.6	22	24	14	------	1.0	1.0	108	10	1.1	960	------	------
			B	7.0	[1] 27	30	18	1.4	1.4	1.4	180	12	1.5	1,200	------	------
			C	8.4	32	32	22	1.5	1.5	1.5	234	13	1.7	1,440	------	------
Ly	Lordstown channery silt loam, eroded, 15 to 25 percent slopes.	10	A	5.0	19	22	13	------	0.9	0.9	------	------	------	------	------	------
			B	6.3	[1] 24	27	16	1.2	1.3	1.3	------	------	------	------	------	------
Lz	Lordstown soils, 45 to 70 percent slopes	12		------	------	------	------	------	------	------	------	------	------	------	------	------
LA	Lyons silt loam, 0 to 1 percent slopes:															
	Undrained	12		------	------	------	------	------	------	------	------	------	------	------	------	------
	Drained	1	B	12.0	55	33	25	------	3.5	3.5	------	27	3.0	1,175	13.0	11.5
			C	13.0	60	35	27	------	3.5	3.5	------	30	4.0	1,400	16.2	14.4
Ma	Manlius shaly silt loam, 36 inches or more deep, 5 to 15 percent slopes.	7	A	8.4	32	36	21	------	1.5	1.5	180	14	1.7	1,360	------	4.9
			B	10.5	[1] 40	45	26	2.1	2.2	2.1	300	18	2.3	1,700	9.5	8.2
			C	12.6	48	47	31	2.2	2.3	2.2	390	20	2.6	2,040	11.9	10.2
Mb	Manlius shaly silt loam, 36 inches or more deep, eroded, 5 to 15 percent slopes.	9	A	8.0	30	34	19	------	1.5	1.4	168	14	1.6	1,280	------	4.7
			B	10.0	[1] 38	43	24	2.0	2.1	2.0	280	17	2.1	1,600	9.0	7.8
			C	12.0	46	45	29	2.1	2.2	2.1	364	19	2.4	1,920	11.2	9.8
Mc	Manlius shaly silt loam, 12 to 20 inches deep, eroded, 15 to 25 percent slopes.	11	A	------	------	15	10	------	0.7	0.7	------	------	------	------	------	------
			B	------	------	19	12	------	1.0	1.0	------	------	------	------	------	------
Md	Manlius shaly silt loam, 36 inches or more deep, eroded, 15 to 25 percent slopes.	9	A	6.2	23	26	16	------	1.1	1.0	108	10	1.3	1,040	------	------
			B	7.8	[1] 29	32	20	1.8	1.6	1.5	180	13	1.7	1,300	------	------
Me	Mardin channery silt loam, 3 to 8 percent slopes.	2	A	8.8	34	35	20	------	2.0	1.7	240	15	2.0	1,445	------	------
			B	10.4	[1] 40	44	25	------	2.3	2.0	300	18	2.4	1,700	------	------
			C	11.4	48	46	30	------	2.8	2.2	390	20	2.8	1,870	------	------
Mf	Mardin channery silt loam, 8 to 15 percent slopes.	5	A	8.0	31	32	18	------	1.8	1.5	216	14	1.8	1,275	------	------
			B	9.4	[1] 36	40	23	------	2.1	1.8	270	16	2.1	1,500	------	------
			C	10.3	43	42	28	------	2.5	2.0	351	18	2.4	1,650	------	------
Mg	Mardin channery silt loam, eroded, 8 to 15 percent slopes.	7	A	7.2	27	29	17	------	1.6	1.4	192	12	1.5	1,190	------	------
			B	8.5	[1] 32	36	21	------	1.9	1.7	240	14	1.8	1,400	------	------
			C	9.4	38	38	25	------	2.3	1.9	312	15	2.1	1,540	------	------
Mh	Mardin channery silt loam, eroded, 15 to 25 percent slopes.	9	A	6.6	25	26	16	------	1.4	1.4	------	------	------	------	------	------
			B	7.8	[1] 29	32	20	------	1.7	1.6	------	------	------	------	------	------
Mk	Mardin silt loam, 12 to 20 inches deep, 3 to 15 percent slopes.	10	A	6.2	24	24	14	------	1.3	1.2	------	------	------	------	------	------
			B	7.3	[1] 28	30	18	------	1.5	1.4	------	------	------	------	------	------
Ml	Mardin and Langford soils, 25 to 45 percent slopes.	12		------	------	------	------	------	------	------	------	------	------	------	------	------
Mm	Middlebury silt loam, 0 to 2 percent slopes.	1	A	11.2	50	36	18	2.0	2.8	2.7	------	22	2.7	1,620	9.6	9.2
			B	12.4	56	40	20	2.0	2.8	2.7	------	25	3.0	1,800	12.0	11.5
			C	12.4	56	42	21	2.0	2.8	2.7	------	28	3.6	2,160	14.4	13.8

Mn	Morocco fine sandy loam, 0 to 2 percent slopes:														
	Undrained	12													
	Slightly drained	1	A	6.4	24		9		1.0	1.0					
			B	8.0	30		12		1.9	1.9					
	Drained	1	B	12.0	53	36	23		2.5	2.5	265	25	3.4	1,200	11.5	12.0
			C	13.0	58	40	25		3.0	3.0	400	27	3.8	1,500	14.4	15.5
Mo	Muck, acid (unclassified), 0 to 1 percent slopes:														
	Undrained	12													
	Drained	1	B	14.5	64					4.0	345	27	3.5		16.0	12.5
			C	16.0	70					4.0	440	30	4.5		20.0	15.5
Na	Newton fine sandy loam, 0 to 1 percent slopes:														
	Undrained	12													
	Drained	1	C	10.4	46	32	20		2.5	2.5	300	20	3.0	1,200	11.0	12.4
Nb	Nunda silt loam, 0 to 6 percent slopes	4	A	10.8	45	47	30	2.9	2.7	2.6	175	20	2.4	1,615	8.4	7.0
			B	12.0	50	52	35	2.9	2.7	2.6	250	23	2.8	1,900	12.0	10.0
			C	12.6	52	55	38	2.9	2.7	2.6	300	25	3.1	2,090	14.4	12.0
Nc	Nunda silt loam, 6 to 12 percent slopes	7	A	9.4	39	40	26	2.8	2.5	2.4	140	16	1.8	1,275	6.7	5.6
			B	10.5	43	45	30	2.8	2.5	2.4	200	19	2.1	1,500	9.6	8.0
			C	11.0	45	47	33	2.8	2.5	2.4	240	21	2.3	1,650	11.5	9.6
Nd	Nunda silt loam, eroded, 6 to 12 percent slopes.	8	A	8.6	35	37	23	2.7	2.4	2.3	126	14	1.6	1,148	6.0	5.0
			B	9.5	39	41	27	2.7	2.4	2.3	180	17	1.9	1,350	8.6	7.2
			C	10.0	41	43	30	2.7	2.4	2.3	216	19	2.1	1,485	10.3	8.6
Ne	Nunda silt loam, eroded, 12 to 20 percent slopes.	9	A	7.6	32	32	21	2.5	2.2	2.1		13	1.4	1,020		
			B	8.4	35	36	25	2.5	2.2	2.1		15	1.7	1,200		
Nf	Nunda silt loam, eroded, 20 to 45 percent slopes.	12														
Oa	Odessa silt loam, 0 to 6 percent slopes	4	A	9.4	40	40	27	2.0	2.6	2.5		16	2.0	1,350	7.5	7.5
			B	10.5	44	45	32	2.0	2.6	2.5		18	2.3	1,500	10.0	9.0
			C	11.0	46	47	35	2.0	2.6	2.5		19	2.5	1,650	12.0	11.5
Ob	Odessa silty clay loam, eroded, 6 to 12 percent slopes.	8	A	8.3	34	35	25	1.8	2.4	2.3		14	1.7	1,170	6.0	5.8
			B	9.2	38	39	29	1.8	2.4	2.3		15	2.0	1,300	8.0	7.7
Oc	Ontario fine sandy loam, 3 to 10 percent slopes.	2	A	11.2	50	50	30	2.8	2.7	2.6	[2] 210	18	2.3	1,700	9.4	7.0
			B	12.5	55	55	31	2.8	2.7	2.6	[2] 300	23	2.9	2,000	13.5	10.0
			C	13.8	60	58	31	2.8	2.7	2.6	[2] 375	25	3.8	2,500	16.9	12.5
Od	Ontario fine sandy loam, 10 to 20 percent slopes.	5	A	9.5	42	42	22	2.4	2.2	2.2	[2] 168	15	1.9	1,445	7.0	5.6
			B	10.6	47	47	25	2.4	2.2	2.2	[2] 240	19	2.4	1,700	10.0	8.0
			C	11.7	52	49	25	2.4	2.2	2.2	[2] 300	21	3.1	2,125	12.5	10.0
Oe	Ontario fine sandy loam, eroded, 10 to 20 percent slopes.	8	A	8.6	38	38	21	2.3	2.1	2.1	[2] 105	14	1.7	1,190	6.0	4.9
			B	9.5	42	42	23	2.3	2.1	2.1	[2] 150	17	2.1	1,400	8.5	7.0
Of	Ontario gravelly loam, 3 to 10 percent slopes.	2	A	11.2	50	50	30	2.8	2.7	2.6	[2] 210	18	2.3	1,700	9.4	7.0
			B	12.5	55	55	31	2.8	2.7	2.6	[2] 300	23	2.9	2,000	13.5	10.0
			C	13.8	60	58	31	2.8	2.7	2.6	[2] 375	25	3.8	2,500	16.9	12.5
Og	Ontario gravelly loam, eroded, 10 to 20 percent slopes.	8	A	8.6	38	38	21	2.3	2.1	2.1	[2] 105	14	1.7	1,190	6.0	4.9
			B	9.5	42	42	23	2.3	2.1	2.1	[2] 150	17	2.1	1,400	8.5	7.0
Oh	Ontario, Lansing, and Honeoye soils, 30 to 60 percent slopes.	12														
Ok	Ontario loam, 3 to 10 percent slopes	2	A	11.2	50	50	28	2.8	2.7	2.6	[2] 210	18	2.3	1,700	9.4	7.0
			B	12.5	55	55	31	2.8	2.7	2.6	[2] 300	23	2.9	2,000	13.5	10.0
			C	13.8	60	58	31	2.8	2.7	2.6	[2] 375	25	3.8	2,500	16.9	12.5
Ol	Ontario loam, 10 to 20 percent slopes	5	A	9.5	42	42	22	2.4	2.2	2.2	[2] 168	15	1.9	1,445	7.0	5.6
			B	10.6	47	47	25	2.4	2.2	2.2	[2] 240	19	2.4	1,700	10.0	8.0
			C	11.7	52	49	25	2.4	2.2	2.2	[2] 300	21	3.1	2,125	12.5	10.0
Om	Ontario loam, eroded, 10 to 20 percent slopes.	8	A	8.6	38	38	21	2.3	2.1	2.1	[2] 105	14	1.7	1,190	6.0	4.9
			B	9.5	42	42	23	2.3	2.1	2.1	[2] 150	17	2.1	1,400	8.5	7.0
On	Ontario soils, eroded, 20 to 30 percent slopes.	11	A			30	17	1.9	1.6	1.6						
			B			33	19	1.9	1.6	1.6						
Oo	Ottawa loamy fine sand, 0 to 6 percent slopes.	3	A	6.4	28	27	14		0.6	0.6	98	11	1.4	840		4.4
			B	8.0	35	36	19	1.3	1.2	1.2	140	15	1.9	1,200	7.0	7.3
			C	8.8	38	40	21	1.6	1.4	1.4	210	16	2.1	1,500	8.8	9.5
Op	Ottawa loamy fine sand, 6 to 12 percent slopes.	6	A	5.8	24	22	11		0.5	0.5	77	9	1.1	700		
			B	7.2	30	30	15	1.2	1.0	1.0	110	12	1.5	1,000		
			C	7.9	33	33	16	1.4	1.2	1.2	165	13	1.6	1,250		

See footnotes at end of table.

TABLE 12.—*Estimated acre yields of principal crops under three levels of fertilization and liming*—Continued

Map symbol	Soil	Rotation group	Levels of liming and fertilization	Corn for silage	Corn for grain	Oats	Wheat	Alfalfa hay	Clover hay	Mixed legumes for hay	Potatoes	Field beans	Sweet corn	Peas for canning	Cabbage	Tomatoes
				Tons	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Tons*	*Lbs.*	*Tons*	*Tons*
Or	Ovid silt loam, 0 to 3 percent slopes	2	A	9.9	41	43	27	2.0	2.6	2.5		18	2.1	1,360	8.2	6.8
			B	11.0	46	48	32	2.0	2.6	2.5		21	2.5	1,600	11.0	9.0
			C	11.6	48	50	35	2.0	2.6	2.5		23	2.8	1,760	13.2	10.8
Os	Ovid silt loam, 3 to 8 percent slopes	4	A	9.9	41	43	27	2.0	2.6	2.5		18	2.1	1,360	8.2	6.8
			B	11.0	46	48	32	2.0	2.6	2.5		21	2.5	1,600	11.0	9.0
Ot	Ovid silty clay loam, eroded, 3 to 8 percent slopes.	7	A	9.0	38	40	25	1.9	2.4	2.3		15	1.9	1,232	7.5	6.1
			B	10.0	42	44	29	1.9	2.4	2.3		18	2.2	1,450	10.0	8.1
Ou	Ovid silty clay loam, eroded, 8 to 15 percent slopes.	8	A	8.6	36	38	22	1.7	2.3	2.2		15	1.7	1,105	6.8	5.5
			B	9.5	40	42	26	1.7	2.3	2.2		18	2.0	1,300	9.0	7.3
Pa	Palmyra and Howard soils, 25 to 35 percent slopes.	11	A			24	15	1.5	1.1	1.1						
			B			28	18	1.7	1.2	1.2						
Pb	Palmyra cobbly loam, 0 to 5 percent slopes.	1	A	10.6	47	48	31	2.6	2.3	2.2	[2] 210	23	2.4	1,700	9.1	7.0
			B	12.5	55	56	36	2.9	2.6	2.5	[2] 300	27	3.0	2,000	13.0	10.0
			C	13.8	60	57	38	2.9	2.6	2.5	[2] 390	30	3.6	2,600	16.9	12.0
Pc	Palmyra fine sandy loam, 0 to 5 percent slopes.	1	A	10.6	47	48	31	2.6	2.3	2.2	[2] 210	23	2.4	1,700	9.1	7.0
			B	12.5	55	56	36	2.9	2.6	2.5	[2] 300	27	3.0	2,000	13.0	10.0
			C	13.8	60	57	38	2.9	2.6	2.5	[2] 390	30	3.6	2,600	16.9	12.0
Pd	Palmyra gravelly loam, 0 to 5 percent slopes.	1	A	10.6	47	48	31	2.6	2.3	2.2	[2] 210	23	2.4	1,700	9.1	7.0
			B	12.5	55	56	36	2.9	2.6	2.5	[2] 300	27	3.0	2,000	13.0	10.0
			C	13.8	60	57	38	2.9	2.6	2.5	[2] 390	30	3.6	2,600	16.9	12.0
Pe	Palmyra gravelly loam, 5 to 15 percent slopes.	3	A	9.0	40	41	26	2.5	2.2	2.1	[2] 175	20	2.0	1,488	7.7	6.0
			B	10.6	47	48	31	2.8	2.4	2.3	[2] 250	23	2.5	1,750	11.0	8.5
			C	11.7	52	50	32	2.8	2.4	2.3	[2] 325	25	3.0	2,275	14.3	10.2
Pf	Palmyra gravelly loam, 15 to 25 percent slopes.	6	A	6.4	28	29	18	1.8	1.4	1.4	[2] 126	14	1.4	1,020	5.5	4.2
			B	7.5	33	34	21	2.0	1.6	1.5	[2] 180	16	1.8	1,200	7.8	6.0
Pg	Palmyra gravelly sandy loam, 0 to 5 percent slopes.	1	A	10.2	45	46	29	2.6	2.2	2.2	196	21	2.2	1,700	8.6	6.6
			B	12.0	53	54	34	2.9	2.5	2.4	280	25	2.8	2,000	12.3	9.5
			C	13.2	58	57	36	2.9	2.5	2.4	364	28	3.4	2,600	16.0	11.4
Ph	Palmyra gravelly sandy loam, 5 to 15 percent slopes.	3	A	8.7	38	39	26	2.4	2.1	2.0	161	18	1.8	1,445	7.2	5.8
			B	10.2	45	46	30	2.7	2.3	2.2	230	21	2.3	1,700	10.3	8.3
			C	11.2	50	48	32	2.7	2.3	2.2	299	23	2.8	2,210	13.4	10.0
Pk	Phelps gravelly silt loam, 0 to 5 percent slopes.	1	A	10.5	49	43	27	2.2	2.9	2.8		17	2.3	1,275	9.4	7.6
			B	11.7	54	48	30	2.2	2.9	2.8		21	2.9	1,500	13.5	10.8
			C	12.9	59	50	33	2.2	2.9	2.8		23	3.8	1,800	16.9	13.5
Pl	Poygan silty clay loam, 0 to 1 percent slopes:															
	Undrained	12														
	Partially drained	1	B						2.0	2.0						
Ra	Red Hook gravelly silt loam, 0 to 3 percent slopes:															
	Slightly drained	1	A	6.4	24	27	11		1.7	1.6						
			B	8.0	30	30	14		1.9	1.8						
Rb	Romulus silt loam, 0 to 3 percent slopes:															
	Slightly drained	2	A	8.0	32	27	13		2.0	2.0						
			B	9.0	35	30	14		2.0	2.0						
	Drained	2	B	11.0	46	45	32	1.5	3.0	3.0		21	2.5	1,600	11.0	9.0
			C	12.0	51	47	35	1.5	3.0	3.0		23	3.3	1,920	13.8	11.3
Rc	Romulus silt loam, 3 to 8 percent slopes:															
	Slightly drained	4	A	8.5	34	29	14		2.0	2.0						
			B	9.5	38	32	16		2.0	2.0						
	Drained	4	B	11.0	46	45	32	1.5	3.0	3.0		21	2.5	1,600	11.0	9.0
			C	12.9	51	47	35	1.5	3.0	3.0		23	3.3	1,920	13.8	11.3

Rd	Romulus silty clay loam, 0 to 3 percent slopes:														
	Slightly drained	2	A	7.8	29	25	12		1.9	1.9					
			B	8.7	32	28	13		1.9	1.9					
	Drained	2	B	10.4	38	34	28		2.8	2.8		18	2.2	1,400	10.0	8.5
Sa	Schoharie silt loam, 0 to 6 percent slopes.	4	A	10.0	41	42	29	2.9	2.7	2.5		17	2.1	1,440	7.8	7.1
			B	11.2	46	47	34	2.9	2.7	2.5		19	2.5	1,600	10.4	9.5
Sb	Schoharie silt loam, 6 to 12 percent slopes.	7	A	9.1	39	40	27	2.8	2.6	2.4		15	1.9	1,065	7.2	6.4
			B	10.1	43	45	32	2.8	2.6	2.4		17	2.2	1,450	9.6	8.5
Sc	Schoharie silty clay loam, 0 to 6 percent slopes.	4	A	9.7	40	41	28	2.8	2.6	2.4		16	2.0	1,485	7.5	6.9
			B	10.8	45	46	33	2.8	2.6	2.4		18	2.4	1,650	10.2	9.2
Sd	Schoharie silty clay loam, 6 to 12 percent slopes.	7	A	8.7	37	39	27	2.7	2.5	2.3		14	1.7	1,260	6.8	6.2
			B	9.7	41	43	32	2.7	2.5	2.3		16	2.1	1,400	9.0	8.2
Se	Schoharie silty clay loam, eroded, 6 to 12 percent slopes.	8	A	8.5	36	37	26	2.5	2.4	2.2		14	1.7	1,170	6.4	6.0
			B	9.4	40	41	30	2.5	2.4	2.2		15	2.0	1,300	8.5	8.0
Sf	Schoharie silty clay loam, 12 to 20 percent slopes.	9	A	7.2	32	33	21	2.3	2.1	2.0						
			B	8.0	36	37	25	2.3	2.1	2.0						
Sg	Schoharie silty clay loam, eroded, 12 to 20 percent slopes.	11	A			30	19	2.2	2.0	1.9						
			B			33	22	2.2	2.0	1.9						
Sh	Schoharie silty clay loam, eroded, 20 to 45 percent slopes.	12														
Sk	Sloan silt loam, 0 to 1 percent slopes:															
	Undrained	12														
	Partially drained	12	B						2.0	2.0						
Sl	Steep broken land, 35 to 60 percent slopes.	12														
Ta	Toledo silty clay loam, 0 to 1 percent slopes:															
	Undrained	12														
	Drained	1	A	8.0	32	27	13		2.0	2.0						
			B	9.0	35	30	15		2.0	2.0						
Va	Valois gravelly silt loam, 5 to 15 percent slopes.	5	A	9.4	40	40	24		1.8	1.7	186	16	2.0	1,440		5.6
			B	11.7	50	50	30	2.6	2.5	2.4	310	20	2.6	1,800	11.0	9.3
			C	14.0	60	52	36	2.7	2.6	2.5	403	22	3.0	2,160	13.8	11.6
Vb	Valois gravelly silt loam, eroded, 5 to 15 percent slopes.	7	A	8.9	38	38	22		1.7	1.6	162	15	1.9	1,360		5.3
			B	11.1	47	47	28	2.5	2.4	2.3	270	19	2.5	1,700	10.5	8.8
			C	13.3	56	49	34	2.6	2.5	2.4	351	21	2.9	2,040	13.1	11.0
Vc	Valois gravelly silt loam, 15 to 25 percent slopes.	8	A	7.0	30	30	18		1.3	1.2	120	12	1.5	1,200		
			B	8.7	38	38	23	2.2	1.8	1.7	200	15	2.0	1,500		
Vd	Valois gravelly silt loam, eroded, 15 to 25 percent slopes.	10	A	6.6	28	28	18		1.2	1.1	108	11	1.4	1,620		
			B	8.3	35	35	22	2.1	1.7	1.6	180	14	1.8	1,350		
Ve	Volusia channery silt loam, 0 to 3 percent slopes.	3	A	7.2	26	27	13		1.8	1.6						
			B	9.0	[1]33	30	16		2.0	1.8						
Vf	Volusia channery silt loam, 3 to 8 percent slopes.	4	A	7.8	30	38	14		2.0	1.7						
			B	9.8	[1]37	42	18		2.2	1.9						
			C	11.5	43	50	22		2.3	2.1						
Vg	Volusia channery silt loam, 8 to 15 percent slopes.	7	A	7.0	26	34	13		1.8	1.5						
			B	8.8	[1]33	38	16		2.0	1.7						
Vh	Volusia channery silt loam, eroded, 8 to 15 percent slopes.	8	A	6.4	24	31	11		1.6	1.4						
			B	8.0	[1]30	34	14		1.8	1.6						
Vk	Volusia channery silt loam, eroded, 15 to 25 percent slopes.	11	A	5.8	22	27	10		1.4	1.4						
			B	7.3	[1]27	30	12		1.6	1.5						
Wa	Warners loam, 0 to 1 percent slopes:															
	Undrained	12														
	Drained	1	B	10.4	48	32	16		2.3	2.8		22	2.7		11.6	9.2
			C	11.4	53	34	18		2.3	2.8		24	3.5		14.5	11.5
Wb	Wayland silt loam, 0 to 1 percent slopes:															
	Undrained	12														
	Partially drained	1	B						2.5	2.5						

See footnotes at end of table.

TABLE 12.—*Estimated acre yields of principal crops under three levels of fertilization and liming*—Continued

Map symbol	Soil	Rotation group	Levels of liming and fertilization	Corn for silage	Corn for grain	Oats	Wheat	Alfalfa hay	Clover hay	Mixed legumes for hay	Potatoes	Field beans	Sweet corn	Peas for canning	Cabbage	Tomatoes
				Tons	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Tons*	*Lbs.*	*Tons*	*Tons*
Wc	Wayland silty clay loam, 0 to 1 percent slopes:															
	Undrained	12														
	Partially drained	1	B						2.0	2.0						
Wd	Westland silt loam, 0 to 1 percent slopes:															
	Undrained	12														
	Drained	1	B	12.8	55	33	26		3.5	3.5		27	3.3	1,075	12.5	12.0
			C	13.0	60	35	27		3.5	3.5		30	4.0	1,400	16.2	14.4
We	Woostern, Bath, and Valois soils, 25 to 45 percent slopes.	12														
Wf	Woostern gravelly loam, 5 to 15 percent slopes.	3	A	9.1	38	38	22		1.7	1.6	186	15	1.9	1,440		5.4
			B	11.4	[1] 47	47	28	2.4	2.4	2.3	310	19	2.5	1,800	10.8	9.0
			C	13.7	56	49	34	2.5	2.5	2.4	403	21	2.9	2,160	13.5	11.2
Wg	Woostern gravelly loam, eroded, 5 to 15 percent slopes.	6	A	8.6	35	35	22		1.6	1.5	162	14	1.8	1,360		5.1
			B	10.8	[1] 44	44	27	2.3	2.3	2.2	270	18	2.4	1,700	10.3	8.5
			C	13.0	53	46	32	2.4	2.4	2.3	351	20	2.8	2,040	12.9	10.6
Wh	Woostern gravelly loam, 15 to 25 percent slopes.	6	A	6.7	28	28	17		1.2	1.1	120	11	1.4	1,200		
			B	8.4	[1] 35	35	21	2.0	1.7	1.6	200	14	1.9	1,500		
Wk	Woostern gravelly loam, eroded, 15 to 25 percent slopes.	10	A	6.4	26	26	16		1.1	1.0	108	10	1.3	1,080		
			B	8.0	[1] 33	33	20	1.9	1.6	1.5	180	13	1.7	1,350		

[1] Yields of corn for grain in terms of dry corn equivalent, but immature soft corn is common.
[2] Potato scab is a problem on this soil.

ered. The yield estimate of 12 tons takes into account all these normal practices of good farming.

The yield estimates in table 12 are based on (1) yields in long-term experiments; (2) yields reported by farmers for specific soils; and (3) yields reported by farmers who cooperated in farm management studies made on soils that were not identified. Tables 6, 7, 8, and 9 provided much of the data on which the estimates in table 12 are based. These basic yields were adjusted according to additional information on the effects of slope, weather, and management on yields. Data were not available for some of the soils; for these, yields were estimated by comparing them with similar soils for which yield data were available.

The yield estimates in table 12 are not based on a large amount of data for specific soils and crops, but they are believed to be fairly accurate. No estimates for pasture yields are given in the table because the kinds of pasture vary widely, and little reliable information on yields is available. The total yield of pasture for a year is deceiving, because the seasonality of pasture production is very important.

General Information About the Area

Ontario and Yates Counties lie in west-central New York about midway between Lake Ontario and the Pennsylvania State line (fig. 7). The combined counties extend north and south for a distance of 40 miles and east and west for 34 miles. Ontario County has a land area of 649 square miles, or 415,360 acres. Yates County has 344 square miles, or 220,160 acres.

Canandaigua is the county seat of Ontario County and is near its geographical center. It is 25 miles south of Rochester, 80 miles east of Buffalo, and 230 miles northwest of New York City. Penn Yan, the county seat of Yates County, is 20 miles southeast of Canandaigua.

This part of New York State is known as the Central Lakes or Finger Lakes region because of the series of narrow parallel north-and-south lakes. From west to east the lakes in these counties are: Hemlock Lake, on the border between Ontario and Livingston Counties; Canadice, Honeoye, and Canandaigua Lakes, which lie within the two counties; Keuka Lake, mostly in Yates County but extending southward into Steuben County; and Seneca Lake, which forms all the eastern boundary of Yates County and part of that of Ontario County. A detailed description of the geography and drainage of the two counties is contained in the section on Factors That Influenced Soil Formation. The total water area of Ontario and Yates Counties is about 36 square miles.

Climate

The climate of Ontario and Yates Counties is generally of the continental type. It is modified locally by varia-

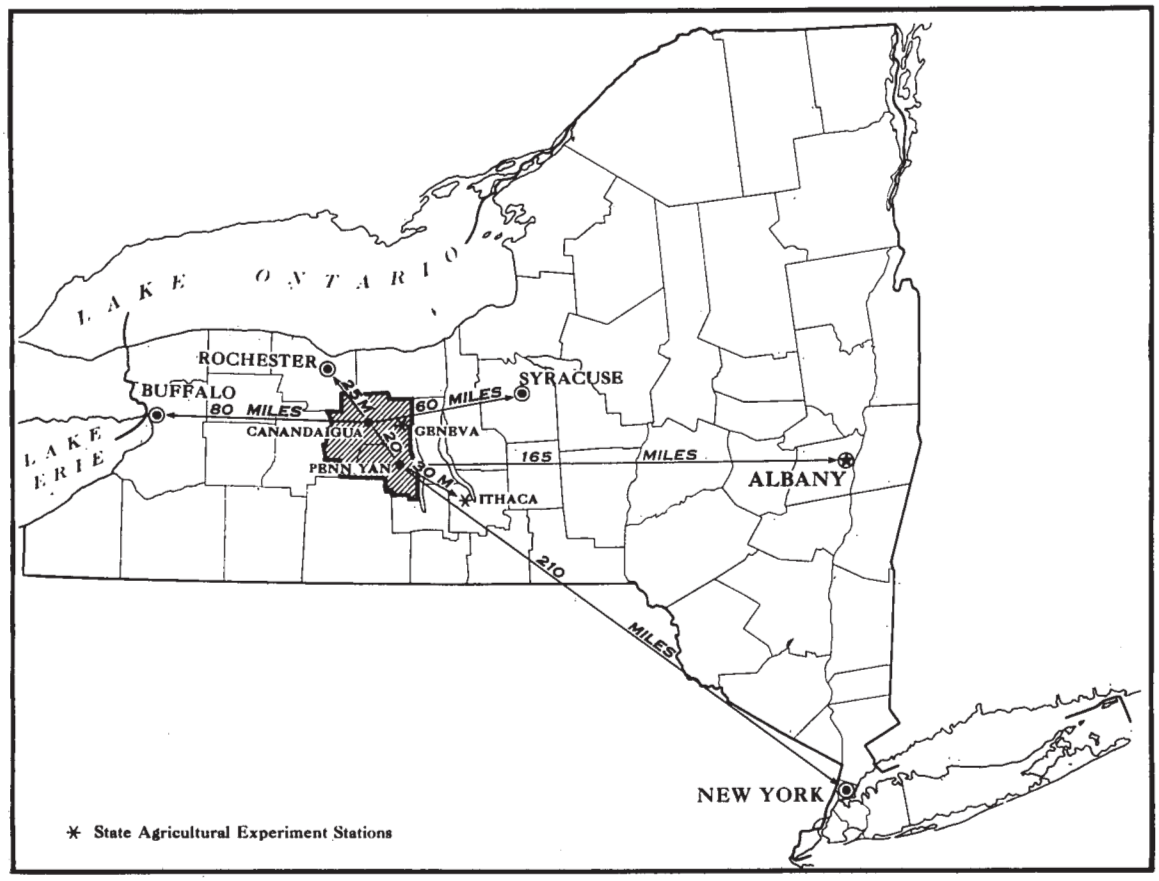

Figure 7.—Location of Ontario and Yates Counties in New York.

tions in elevation and by the large bodies of water of the several Finger Lakes. The general climate of the region is not changed by these lakes, but the larger lakes noticeably affect temperatures and wind currents near them. The slightly longer growing season and good air drainage on the slopes next to these lakes have allowed the growing of wine grapes to develop into an important farm enterprise in both counties. The most important effect of the lakes is to retard development of fruit buds in the spring until danger from frost is over and to extend the frost-free season in the fall for 2 to 3 weeks.

Climatic data for the two principal cities of this area are summarized in table 13. One of the driest regions of New York State is in this area. The average yearly precipitation at Geneva is 33.38 inches. At Penn Yan, 8 miles south, it is less than 30 inches. Both of these stations are at relatively low elevations, however, and the precipitation at higher elevations in the counties is probably several inches more than at the stations listed. This rainfall is fairly evenly distributed throughout the growing season, but short periods dry enough to damage crops are likely during nearly every summer. Long droughts that result in crop failure are very rare. The prevailing wind direction is from the northwest from December to July and from the southwest from August to November.

The average length of the frost-free season at Geneva is 162 days. This is about 10 days longer than is usual in the northern part of the survey area because the influence of Seneca Lake tempers the climate near it. Penn Yan has a frost-free season of about 153 days. This season is about 1 to 2 weeks longer than the other areas in the southern part of the area because the climate at this station is also tempered by its position between Keuka and Seneca Lakes. No figures are available from stations located in the parts of these counties where the climate is more typical of the area in general. At Geneva and Penn Yan, frosts have occurred as late in spring as June 6 and as early in fall as September 11.

It is usually possible to plow as late as the middle of November. Plowing may be started in March on some of the gravelly or sandy soils, but it may be delayed until May on the fine-textured and the poorly drained soils. In general, spring work starts 1 to 3 weeks earlier in the northern part of the survey area than it does on the hills in the southern part. At the lower elevations in the northern part of the area, the grazing season lasts for 180 days. The grazing season is only 150 days on South Hill, Worden Hill, and other high hills in the southern part of the area.

Vegetation

Before this area was settled, it was heavily forested. The only openings were the swamps at the ends of the lakes and the patches burned over or cleared by the Indians for their villages and gardens. The original forests were principally hard maple, beech, hickory, red and white oaks, yellow-poplar, and black walnut. On the higher hills, white pine was common. Chestnut, ash, butternut, and basswood often grew on the dry sites. On the alluvial soils in the valleys, elm, black ash, willow, poplar, and soft maple were important.

No virgin timber is left in the two counties. The present forests consist of second- and third-growth stands of the original species. Most of these are on steep or wet areas. Cutting has been heavy since 1940. Few woodlots now have sound trees of valuable species that are more than 10 inches in diameter.

In Ontario County in 1949, there were 38,326 acres of woodland on farms; this was 12.6 percent of the land in farms. About two-fifths of this was in small woodlots, and the rest was on the steep slopes of the narrow valleys in the southwestern part of the county. In Yates County there were 22,384 acres of woodland, amounting to 14.3 percent of the total land in farms. The proportion in small woodlots is about the same as in Ontario County. The largest areas of forest are in the towns of Middlesex and Italy.

Much of the idle land is slowly reforesting. The present vegetation is brush and brambles. Hawthorn and pincherry come in first but are gradually superseded by better species. When seed trees of white pine are left they reseed nearby areas rapidly. These seedlings usually do not develop into good timber because they are badly infested with blister rust and weevil.

Water Supply

In the rural sections the principal source of water for domestic use is dug wells. Water for livestock comes from wells and small streams. Occasionally, dry periods lasting more than three weeks in midsummer cause many of the shallower wells to go dry and stop the flow of small streams. Most wells are shallow dug wells. Drilled wells generally provide a good water supply in any part of Ontario or Yates Counties.

The driest part of the survey area is on the slopes above Seneca Lake. On these slopes getting water is a problem. In the high uplands of the plateau sections and on gravelly or shallow areas elsewhere, it is sometimes hard to get a good supply of water. Farms in the valleys of the southern part of the area, or next to the lakes and larger streams in the northern part, have a constant supply of readily accessible water.

Early History and Population

Before settlement by white men, this region was the home of the Seneca Indians, one of the six tribes of the Iroquois Confederation. These Indians cleared the native forests next to their many villages and grew fruit, corn, beans, and squash. The first white men visited this region before 1700, but the land was not settled until after the Revolutionary War and General Sullivan's punitive expedition in 1779. The first permanent settlement came in 1787, when six men from Massachusetts settled in Naples town. In 1788 a permanent settlement was made in Yates County near Dresden. Settlement proceeded rapidly after this beginning. The original Ontario County included part or all of Yates, Seneca, Wayne, Livingston, and Monroe Counties. The present boundaries were established in 1823.

Ontario and Yates Counties were originally heavily forested with hardwoods, pine, and hemlock. The first crops grown were wheat, corn, and barley. Sheep and cattle were raised. Milk was processed into cheese and butter.

Before canals were developed in the area, the wheat, corn, cheese, and butter were transported overland to markets. The Erie Canal, completed in 1825, furnished

TABLE 13.—*Normal monthly, seasonal, and annual temperature and precipitation at Geneva, Ontario County, and Penn Yan, Yates County, N. Y.*

GENEVA
[Elevation, 615 feet]

Month	Temperature [1]			Precipitation [2]			
	Average	Absolute maximum	Absolute minimum	Average	Driest year	Wettest year	Average snowfall
	° *F.*	° *F.*	° *F.*	*Inches*	*Inches*	*Inches*	*Inches*
December	28. 9	68	−21	2. 35	0. 70	2. 55	11. 9
January	25. 1	70	−16	2. 26	1. 30	3. 20	14. 5
February	24. 6	66	−31	2. 07	1. 04	2. 45	14. 8
Winter	26. 2	70	−31	6. 68	3. 04	8. 20	41. 2
March	33. 3	85	−10	2. 47	. 66	3. 05	12. 3
April	45. 1	89	6	2. 92	3. 91	2. 43	4. 1
May	56. 8	94	27	3. 28	6. 59	6. 04	. 2
Spring	45. 1	94	−10	8. 67	11. 16	11. 52	16. 6
June	67. 4	102	34	3. 58	2. 05	5. 43	0
July	72. 4	106	44	3. 08	2. 64	1. 54	0
August	69. 4	101	33	3. 10	. 96	4. 35	0
Summer	69. 7	106	33	9. 76	5. 65	11. 32	0
September	62. 7	101	28	2. 71	. 09	6. 11	0
October	51. 3	92	18	2. 87	1. 50	4. 66	. 2
November	39. 7	85	6	2. 69	. 33	2. 46	6. 0
Fall	51. 2	101	6	8. 27	1. 92	13. 23	6. 2
Year	48. 1	106	−31	33. 38	[3] 21. 77	[4] 44. 27	64. 0

PENN YAN
[Elevation, 730 feet]

December	28. 3	66	−17	1. 88	1. 33	2. 12	10. 0
January	24. 9	67	−18	1. 82	1. 06	. 79	11. 9
February	24. 8	68	−25	1. 65	1. 25	1. 07	10. 2
Winter	26. 0	68	−25	5. 35	3. 64	3. 98	32. 1
March	33. 7	83	−12	2. 13	1. 89	1. 09	10. 1
April	44. 9	88	7	2. 44	4. 11	4. 79	3. 3
May	55. 7	92	24	2. 97	1. 47	3. 37	. 2
Spring	44. 7	92	−12	7. 54	7. 47	9. 25	13. 6
June	66. 3	100	30	3. 36	1. 69	11. 03	0
July	71. 6	106	38	3. 40	. 60	2. 81	0
August	69. 1	100	36	2. 82	1. 89	4. 87	0
Summer	69. 0	106	30	9. 58	4. 18	18. 71	0
September	62. 7	99	25	2. 51	1. 51	1. 63	0
October	51. 1	93	15	2. 62	1. 50	6. 56	. 2
November	40. 0	80	−1	2. 24	1. 36	4. 23	3. 2
Fall	51. 2	99	−1	7. 37	4. 37	12. 42	3. 4
Year	47. 7	106	−25	29. 84	[5] 19. 66	[6] 44. 36	49. 1

[1] *Geneva*: Average temperature based on an 86-year record through 1955; highest temperature on a 43-year record through 1952; lowest temperature on a 44-year record through 1952. *Penn Yan:* Average temperature based on a 50-year record through 1955; highest temperature on a 44-year record through 1952; lowest temperature on a 43-year record through 1952.

[2] *Geneva:* Average precipitation based on a 67-year record between 1855 and 1955; wettest and driest years based on a 57-year record between 1855 and 1955; snowfall based on a 42-year record through 1952. *Penn Yan:* Average precipitation based on a 104-year record between 1829 and 1955; wettest and driest years based on a 90-year record between 1829 and 1955; snowfall based on a 33-year record through 1952.

[3] In 1867. [5] In 1854. [4] In 1890. [6] In 1857.

the first efficient transportation for agricultural products. Keuka Lake was connected to Seneca Lake by canal, and Seneca Lake was linked with the original Erie Canal. After completion of the canal system, grain and other field crops, dairy products, vegetables, and fruits became the important farm products, and they still are the main sources of farm income.

The population of Ontario County was 55,307 in 1940, and 60,172 in 1950. Of the 1950 population, 20 percent was rural farm, 38 percent was rural nonfarm, and 42 percent was urban. Geneva had 17,144 inhabitants in 1950 and was the largest city in either county. The 1950 populations of other important villages in Ontario County were: Canandaigua, 8,332; Phelps, 1,650; and Naples, 1,141.

Yates County had a population of 16,381 in 1940, and of 17,615 in 1950. In 1950, rural farm population was 33 percent of the total; rural nonfarm, 36 percent; and urban, 31 percent. Penn Yan, which had 5,481 inhabitants in 1950, is the largest village in Yates County. Other villages are Dundee, Middlesex, and Dresden.

In Ontario County the rural population is greatest through the central, northern, and eastern parts. In these areas there are about 60 persons per square mile. In the southern and southwestern parts of the county, where the topography is rougher and the soils are less productive, there are only about 42 persons per square mile. Most of the abandoned farmland is in the southern and southwestern parts of the county.

In Yates County the population is greatest in the northern part of the county, where the best soils occur and where markets are closer. These better agricultural sections have a density of about 60 persons per square mile, but the rougher southern parts of the county have about 42 persons per square mile.

Industries, Transportation, and Marketing Facilities

These counties have never been important centers of industry. The outlets of Keuka Lake are the best source of waterpower in either county, and here gristmills and sawmills were built at an early date. Waterpower is still used at Penn Yan, but the amount developed is too small to allow much industrial development.

Geneva, the only city in either county, grew up because it is located on the canal system and is centrally located in a large area of very productive soils.

Both of the counties are located in an area ideal for summer resorts. The six Finger Lakes are sites for summer cottages and tourist accommodations. Fishing, boating, and camping are attractions for tourists and resort trade. The three small lakes in the west, Hemlock, Canadice, and Honeoye, are part of the water supply for the city of Rochester, and their use for recreation is discouraged. The shores of Canandaigua, Keuka, and Seneca Lakes have many cottages and summer homes.

The transportation systems are mainly in the northern part of the area because the Finger Lakes prevent building railroads or highways from east to west at places further south. Two railroad lines cross northern Ontario County. The Lehigh Valley Railroad crosses from Geneva to Rochester in Monroe County. A branch line leaves Geneva and ends in Naples in the southwestern part of Ontario County. The New York Central Railroad connects the city of Rochester with Canandaigua and Geneva. This railroad system also runs south from Geneva along the west side of Seneca Lake toward Corning in Steuben County. The Pennsylvania Railroad comes north from Elmira in Chemung County and branches at Stanley. One branch goes to Penn Yan and Canandaigua, and the other leaves Ontario County near the northeastern corner. Many of the smaller villages of Ontario and Yates Counties have no railroad connections.

The principal highways in these counties are: U. S. Highway No. 20, which crosses Ontario County from east to west, going through Geneva and Canandaigua; State Highway No. 14, which runs along the western edge of Seneca Lake and connects Geneva with southern points; and the New York State Thruway,[10] which crosses the extreme northern part of Ontario County and does not go through any large villages. Paved roads connect most of the principal villages with the main highways.

Agriculture

Agriculture is very diversified in these two counties. The good soils are suited to a wide range of crops. Much of the rougher land and the land along the lake shores is used for recreational purposes and for forests.

Types of Farming and Land Use

Dairying is the most common type of farming in both counties. The next most important type of farm enterprise in both counties is the general farm that produces both crops and livestock. Several hundred farms on the smoother northern part of Ontario County produce mostly cash-grain crops. Yates County, although smaller than Ontario County, has more farms specializing in production of fruits and nuts. Poultry raising is important in both counties. Fruit-and-nut farms in Ontario County and cash-grain farms in Yates County are next most important, respectively. Vegetable farms and livestock farms other than dairy farms are also important in both counties. About one-fourth of the farms in both counties were not classified by source of income in the 1950 census.

According to 1950 census data, 303,255 acres, or 73.0 percent of the area of Ontario County, was land in farms. These farms averaged 121.0 acres in size. During the 1949 season, 154,063 acres, or 50.8 percent of the farmland, was used for crops, and 62,206 acres, or 20.5 percent, was used for pasture, including pasture grown in rotation with other crops. Woods covered 38,326 acres, or 12.6 percent of the farmland, and 48,660 acres, or 16.1 percent, was idle or was used for roads, house lots, and other nonagricultural uses. Most of the nonfarm rural land in Ontario County is along the lake shores and in the high hills of the southern part of the county. The lake shores are used for summer homes and cottages or have been purchased by the State Conservation Department and reforested to protect watersheds. Some abandoned farmland in the towns of Canadice, South Bristol, and Bristol has also been reforested by the State.

[10] This road does not appear on the soil map; it was built after the mapping for the survey was completed.

In Yates County in 1950, the land in farms totaled 156,772 acres, or 71.2 percent of the land area of the county. The average was 132.5 acres in size. Crops were grown on 73,816 acres, or 47.1 percent of the farmland, and another 34,100 acres, or 21.7 percent, was used for permanent and rotation pastures. Woods were on 22,384 acres, or 14.3 percent of the land in farms in Yates County. Roads, house lots, other uses, and land left idle accounted for the remaining 26,472 acres, or 16.9 percent of the farmland. The more productive northern half of Yates County is almost all in farms. Most of the idle land is on the higher and rougher parts of Middlesex, Italy, Jerusalem, and Barrington towns. The shores of Seneca, Keuka, and Canandaigua lakes are used for recreation. The State also purchases and reforests abandoned farmland in this county.

Crops and Rotations

The crops most commonly grown in Ontario and Yates Counties are listed in table 14, and the acreage of each is given for stated years. Acreage figures are from the census reports of crops grown during the previous year. Fruit crops are stated in number of trees or vines of bearing age at the time of the census.

The usual rotation on dairy farms is corn, oats, and 2 or 3 years of hay. Where the soil will grow alfalfa, timothy-alfalfa mixtures are grown. Some farmers add wheat or dry field beans to this rotation. On poorly drained soils in the southern part of the area, buckwheat may take the place of oats if the spring season is wet.

Dairy farmers on the more productive high-lime soils in the central and northern parts of Ontario County and in northern Yates County use a more intensive rotation. This rotation may have 3 years of intensive row crops, such as cabbage, beets or carrots, and sweet corn, and then meadow for only 1 or 2 years. Normally the same crop is grown only 1 year on the same field, though beans may follow beans if the crop is harvested too late to sow winter wheat. A typical rotation on these farms would be alfalfa and timothy 2 years, cabbage 1 year, beets 1 year, and wheat 1 year. Another such rotation would be timothy and clover 2 years, sweet corn 1 year, beans 1 year, wheat 1 year, and oats 1 year.

On the finer textured soils like the Odessa, Schoharie, or Darien, wheat and beans are the main cash crops. Canning peas are frequently grown, but not always as part of the regular rotation. A common rotation on these soils is timothy and clover 2 years, beans 1 year, and wheat 1 year. Also common is timothy and clover 2 years, corn 1 year, beans 1 year, wheat 1 year, and oats 1 year.

In the southern part of Ontario County and the southwestern part of Yates County, potatoes are grown in commercial quantities on the Mardin, Bath, Woostern, and Langford soils. On these farms the rotation may be timothy and clover 2 years, potatoes 1 or 2 years, and oats 1 year. Dairy farms on these same soils use a rotation of timothy and clover 2 or 3 years, corn 1 year, oats 1 year, and wheat 1 year.

TABLE 14.—*Acreage of principal crops and number of fruit trees and grapevines of bearing age in stated years*

Crop	Ontario County		Yates County	
	1939	1949	1939	1949
Corn:	*Acres*	*Acres*	*Acres*	*Acres*
For all purposes	15, 316	15, 962	8, 278	7, 030
Harvested for grain	9, 129	8, 112	5, 265	3, 726
Cut for silage, fodder, hogged, or grazed	6, 187	7, 850	3, 013	3, 304
Small grains threshed:				
Wheat	24, 934	34, 073	11, 892	15, 018
Oats	17, 184	19, 476	6, 780	8, 615
Barley	7, 217	2, 819	1, 655	682
Buckwheat	1, 334	1, 076	2, 641	1, 836
Rye	756	297	1, 068	258
Mixed small grains	5, 854	2, 867	4, 358	1, 417
Hay, total	54, 220	39, 680	28, 145	19, 936
Alfalfa	23, 181	15, 775	6, 988	4, 195
Clover and timothy, alone or mixed	26, 139	22, 651	17, 320	14, 371
Small grains cut for hay	97	238	241	35
Other hay	4, 803	1, 016	3, 596	1, 035
Crops harvested for seed:				
Clover	1, 462	1, 917	322	1, 026
Alfalfa	575	265	184	90
Timothy	(1)	48	(1)	I8
Other field crops	183	59	23	44
Dry field and seed beans harvested for beans	14, 712	19, 597	7, 363	8, 359
Potatoes [2]	5, 095	1, 272	1, 084	301
Vegetables for sale	10, 726	9, 079	3, 057	3, 322
Beets (table)	1, 138	2, 060	112	378
Cabbage	4, 937	2, 009	483	409
Carrots	421	396	46	17
Green beans	209	334	267	161
Peas, green	497	954	768	875
Squash	55	108	4	64
Sweet corn	2, 040	2, 557	1, 297	1, 173
Tomatoes	688	306	42	51
Other vegetables	741	355	38	194
Raspberries	759	501	553	648
Strawberries	48	42	21	31
Blackberries and dewberries	20	25	14	20
Land in bearing and non-bearing fruit orchards, vineyards, and nut trees	7, 735	4, 995	9, 358	6, 166
	Number [3]	*Number* [3]	*Number* [3]	*Number* [3]
Apple trees	98, 194	47, 852	73, 769	28, 869
Cherry trees	50, 149	46, 771	4, 918	3, 702
Peach trees	12, 725	18, 296	18, 519	9, 002
Pear trees	39, 557	13, 568	14, 383	4, 348
Plum and prune trees	4, 266	5, 326	1, 192	412
Maple trees tapped for sirup	1, 788	436	1, 318	1, 179
Grapevines	1,204,757	1,072,261	3,476,023	3,045,539

[1] Not reported.

[2] Does not include acreage for farms harvesting less than 15 bushels.

[3] Number in the census year, which is 1 year after the crop year given at the head of the column.

Fertilizers

Commercial fertilizers are used quite generally over both counties. Vegetable farms usually have less manure than other farms, but they use more mineral fertilizers. Potatoes grown for sale receive heavier applications of complete fertilizer than any other crop. Cabbage and carrots are heavily fertilized, although they get about half as much fertilizer as potatoes do. Beets get about the same amount of fertilizer as cabbage, but salt and boron are usually added to improve the quality and yield. Dry field beans may be fertilized with manure or with commercial fertilizer. Wheat also may get complete commercial fertilizer.

When oats follow a heavily fertilized crop, they get no additional fertilizer, but when oats follow a sod crop, superphosphate may be added. Corn may be manured and receive superphosphate in addition. For corn, commercial fertilizer may be substituted for the manure.

Meadows of timothy mixed with clover or alfalfa are frequently topdressed with manure the second year. Soils in the northern part of the area need little lime, but the acid soils in the southern parts of both counties usually get 1 ton of ground limestone per acre before seeding to pasture or meadow. Dairy farms use more manure and less commercial fertilizer than vegetable and field-crop farms. They use mostly manure and superphosphate. On the dairy farms only cash crops of wheat and dry field beans get complete commercial fertilizers.

Livestock

Table 15 shows the number of livestock and beehives on farms in these two counties during the census years of 1940 and 1950. The number of cattle has been increasing for many years, but the numbers of horses, sheep, and hogs have been decreasing.

Dairy cattle are the most important livestock in both counties. They are fairly evenly distributed in all parts of the area. The average number of milk cows per farm in 1950 was 6.3 in Ontario County and 5.8 in Yates County. Many dairy farms, however, have herds of 30 or more. Farms in the rougher southern part of these counties depend more on income from dairy products because they can grow fewer of the other cash crops.

TABLE 15.—*Number of livestock and beehives on farms in stated years*

Livestock	Ontario County		Yates County	
	1940	1950	1940	1950
	Number	*Number*	*Number*	*Number*
Horses and colts	[1] 6, 574	2, 299	[1] 2, 863	908
Cattle and calves	[1] 23, 746	32, 259	[1] 10, 069	13, 513
Milk cows	13, 744	15, 807	5, 741	6, 920
Hogs and pigs [2]	6, 607	2, 931	2, 321	2, 349
Sheep and lambs [3]	26, 152	9, 028	19, 190	9, 449
Chickens [2]	243, 404	217, 381	154, 125	118, 615
Other poultry	2, 263	4, 295	455	951
Beehives	6, 092	2, 990	1, 332	883

[1] Over 3 months old. [2] Over 4 months old. [3] Over 6 months old.

Literature Cited

(1) BIZZELL, J. A.
1930. THE CHEMICAL COMPOSITION OF NEW YORK SOILS. Cornell Univ. Agr. Expt. Sta. Bul. 513, 25 pp., illus.

(2) CLINE, M. G.
1949. PROFILE STUDIES OF NORMAL SOILS OF NEW YORK: I. SOIL PROFILE SEQUENCES INVOLVING BROWN FOREST, GRAY-BROWN PODZOLIC, AND BROWN PODZOLIC SOILS. Soil Sci. 68: 259–272, illus.

(3) FAIRCHILD, H. L.
1909. GLACIAL WATERS IN CENTRAL NEW YORK. New York State Mus. Bul. 127, 66 pp., illus.

(4) FENNEMAN, N. M.
1938. PHYSIOGRAPHY OF EASTERN UNITED STATES. 714 pp., illus. New York and London.

(5) FREI, ERWIN, AND CLINE, M. G.
1949. PROFILE STUDIES OF NORMAL SOILS OF NEW YORK: II. MICROMORPHOLOGICAL STUDIES OF THE GRAY-BROWN PODZOLIC—BROWN PODZOLIC SOIL SEQUENCE. Soil Sci. 68: 333–344, illus.

(6) GARDNER, D. R., AND WHITESIDE, E. P.
1952. ZONAL SOILS IN THE TRANSITION REGION BETWEEN THE PODZOLIC AND GRAY-BROWN PODZOLIC REGIONS IN MICHIGAN. Soil Sci. Soc. Proc. 16: 137–141, illus.

(7) MCCALEB, S. B., AND CLINE, M. G.
1950. PROFILE STUDIES OF NORMAL SOILS OF NEW YORK: III. PHYSICAL AND CHEMICAL PROPERTIES OF BROWN FOREST AND GRAY-BROWN PODZOLIC SOILS. Soil Sci. 70: 315–328, illus.

(8) MILLER, W. J.
1924. THE GEOLOGICAL HISTORY OF NEW YORK STATE. New York State Bul. 168 (rev. ed.), 129 pp., illus.

(9) MORDOFF, R. A.
1949. THE CLIMATE OF NEW YORK STATE. Cornell Univ. Agr. Expt. Sta. Bul. 764, 72 pp., illus.

(10) SAYRE, C. B.
1933. EFFECTS OF FERTILIZERS AND ROTATION ON EARLINESS AND TOTAL YIELDS OF TOMATOES. New York State Agr. Expt. Sta. Bul. 619; 50 pp., illus.

(11) ——— AND VITTUM, M. T.
1952. EFFECT OF DIFFERENT SOURCES OF FERTILIZER NUTRIENTS AND DIFFERENT RATES OF FERTILIZER APPLICATIONS ON YIELDS OF VEGETABLE CANNING CROPS: BEETS, CABBAGE, PEAS, SWEET CORN, AND TOMATOES. New York State Agr. Expt. Sta. Bul. 749, 30 pp., illus.

(12) UNITED STATES DEPARTMENT OF AGRICULTURE.
1951. SOIL SURVEY MANUAL. U. S. Dept. Agr. Handbook 18, 503 pp., illus.

Important characteristics of the soils

The kind of profile of each soil is shown in figures 4, 5, and 6, on pages 31, 45, and 54. The kind of profile varies according to the parent material and the drainage of the soil. A4=well-drained Alluvial soil; A3=moderately well drained Alluvial soil; A2=imperfectly drained Alluvial soil; G4=well-drained Gray-Brown Podzolic soil; G3=moderately well drained Gray-Brown Podzolic soil; G2=imperfectly drained Gray-Brown Podzolic soil; H=very poorly drained Humic Gley soil; L=poorly drained Low-Humic Gley soil; P4=well-drained Podzolic soil; P3=moderately well drained Podzolic soil; and P2=imperfectly drained Podzolic soil]

Map symbol	Soil and dominant slope range	Kind of profile	Texture of profile	Parent material	Lime content	Topography [1]	Permeability [2]	Erodibility	Capability
Aa	Alden silty clay loam, 0 to 1 percent slopes.	H	Medium	Shale and sandstone till.	Low	Simple	Slow	Low	VIw
Ab	Allendale fine sandy loam, 0 to 2 percent slopes.	L	Coarse	Lacustrine sands	Very low	Simple	Slow	Low	IIIw
Ac	Allis channery silt loam, 12 to 20 inches deep, eroded, 15 to 25 percent slopes.	L	Moderately fine.	Shaly till and residuum	Very low	Simple	Slow	Very high	VIIe
Ad	Allis silt loam, 36 inches or more deep, 3 to 8 percent slopes.	L	Moderately fine.	Shaly till	Very low	Simple	Slow	Medium	IIIe
Ae	Allis silt loam, 12 to 20 inches deep, 3 to 8 percent slopes.	L	Moderately fine.	Shaly till and residuum	Very low	Simple	Slow	Medium	IVe
Af	Allis silt loam, 12 to 20 inches deep, eroded, 8 to 15 percent slopes.	L	Moderately fine.	Shaly till and residuum	Very low	Simple	Slow	High	VIe
Ag	Alluvial soils, undifferentiated, 0 to 2 percent slopes.	A4, A3, A2, L	Medium	Alluvial sediments	Low to high.	Complex	Moderate	Low	VIw
Ah	Angola silt loam, 0 to 3 percent slopes	L	Moderately fine.	Shaly till and residuum	Low	Simple	Slow	Low	IVw
Ak	Arkport-Dunkirk fine sandy loams, 6 to 12 percent slopes.	G4	Coarse to medium.	Lacustrine silts and sands.	Medium	Complex	Moderate	High	IVe
Al	Arkport-Dunkirk fine sandy loams, eroded, 12 to 20 percent slopes.	G4	Coarse to medium.	Lacustrine silts and sands.	Medium	Complex	Moderate	Very high	VIe
Am	Arkport fine sandy loam, 0 to 5 percent slopes.	G4	Coarse	Lacustrine fine sands	Medium	Complex	Rapid	Medium	IIe
An	Arkport fine sandy loam, 6 to 12 percent slopes.	G4	Coarse	Lacustrine fine sands	Medium	Complex	Moderate	Medium	IIIe
Ao	Arkport fine sandy loam, eroded, 12 to 20 percent slopes.	G4	Coarse	Lacustrine fine sands	Medium	Complex	Moderate	Very high	VIIe
Ap	Arkport loamy fine sand, 0 to 5 percent slopes.	G4	Coarse	Lacustrine fine sands	Medium	Complex	Rapid	Medium	IIs
Ar	Arkport soils, 20 to 45 percent slopes	G4	Coarse	Lacustrine fine sands	Medium	Complex	Moderate	Very high	VIIe
As	Atherton silt loam, 0 to 1 percent slopes	H	Moderately coarse.	Glacial outwash	Very low	Simple	Slow	Low	IIIw
At	Aurora silt loam, 3 to 8 percent slopes	P2	Moderately fine.	Shaly till and residuum	Low	Simple	Slow	Medium	IIIe
Au	Aurora silt loam, eroded, 3 to 8 percent slopes.	P2	Moderately fine.	Shaly till and residuum	Low	Simple	Slow	Medium	IIIe

See footnotes at end of table.

Important characteristics of the soils—Continued

Map symbol	Soil and dominant slope range	Kind of profile	Texture of profile	Parent material	Lime content	Topography [1]	Permeability [2]	Erodibility	Capability
Av	Aurora silt loam, 8 to 15 percent slopes	P2	Moderately fine.	Shaly till and residuum	Low	Simple	Slow	High	IIIe
Aw	Aurora silt loam, eroded, 8 to 15 percent slopes.	P2	Moderately fine.	Shaly till and residuum	Low	Simple	Slow	High	IVe
Ax	Aurora silt loam, eroded, 15 to 30 percent slopes.	P2	Moderately fine.	Shaly till and residuum	Low	Simple	Slow	Very high	VIe
Ba	Bath channery silt loam, 5 to 15 percent slopes.	P4	Medium	Shale and sandstone till	Very low	Simple	Moderate	Medium	IIe
Bb	Bath channery silt loam, 15 to 25 percent slopes.	P4	Medium	Shale and sandstone till	Very low	Simple	Moderate	High	IIIe
Bc	Berrien fine sandy loam, 0 to 6 percent slopes.	P3	Coarse	Lacustrine fine sands	Very low	Complex	Moderate	Medium	IIe
Bd	Bono silty clay, 0 to 1 percent slopes	H	Fine	Lacustrine silt and clay	High	Simple	Slow	Low	IIIw
Be	Braceville gravelly silt loam, 0 to 5 percent slopes.	P3	Moderately coarse.	Glacial outwash	Very low	Simple	Moderate	Low	IIw
Bf	Burdett silt loam, 0 to 6 percent slopes	G2	Moderately fine.	Reworked till with silts and sands.	Medium	Simple	Slow	Medium	IIe
Ca	Camillus silt loam, 0 to 8 percent slopes	G4	Medium	Shaly till and residuum	Medium	Simple	Moderate	Medium	IIs
Cb	Camillus silt loam, imperfectly drained variant, 0 to 5 percent slopes.	G2	Medium	Shaly till and residuum	Medium	Simple	Moderate	Medium	IIw
CD	Canandaigua silt loam, 0 to 3 percent slopes.	L	Medium	Lacustrine silts and sands.	Medium	Simple	Slow	Low	IIIw
Cc	Caneadea silty clay loam, 0 to 6 percent slopes.	G2	Fine	Lacustrine silts and clays.	Medium	Simple	Slow	Medium	IVw
Cd	Caneadea silty clay loam, eroded, 6 to 15 percent slopes.	G2	Fine	Lacustrine silts and clays.	Medium	Simple	Slow	High	IVe
Ce	Carlisle muck, 0 to 1 percent slopes			Organic material	High	Simple	Slow	Low	IIIw
Cf	Carlisle muck, shallow, 0 to 1 percent slopes.			Organic material	High	Simple	Slow	Low	IIIw
Cg	Cayuga silt loam, 3 to 8 percent slopes	G4	Moderately fine.	Lacustrine silt and clay over high-lime till.	High	Simple	Moderate	Medium	IIe
Ch	Cayuga silt loam, eroded, 3 to 8 percent slopes.	G4	Moderately fine.	Same	High	Simple	Slow	Medium	IIIe
Ck	Cayuga silt loam, 8 to 15 percent slopes	G4	Moderately fine.	Same	High	Simple	Moderate	High	IIIe
Cl	Cayuga silt loam, eroded, 8 to 15 percent slopes.	G4	Moderately fine.	Same	High	Simple	Slow	High	IIIe
Cm	Cayuga silt loam, eroded, 15 to 25 percent slopes.	G4	Moderately fine.	Same	High	Simple	Slow	Very high	IVe

Cn	Cazenovia silt loam, 3 to 10 percent slopes.	G4	Moderately fine.	Reworked high-lime till.	High	Simple	Moderate	Medium	IIe
Co	Cazenovia silt loam, 10 to 20 percent slopes.	G4	Moderately fine.	Reworked high-lime till.	High	Simple	Moderate	High	IIIe
Cp	Chagrin silt loam, 0 to 2 percent slopes	A4	Medium	Alluvial sediments	Low	Simple	Moderate	Low	IIw
Cr	Chagrin silt loam, alluvial fan, 2 to 8 percent slopes.	A4	Medium	Alluvial sediments	Low	Simple	Moderate	Low	IIe
Cs	Chagrin shaly silt loam, alluvial fan, 2 to 8 percent slopes.	A4	Medium	Alluvial sediments	Low	Simple	Moderate	Low	IIe
Ct	Chenango and Tioga gravelly silt loams, alluvial fan, 2 to 5 percent slopes.	P4	Moderately coarse.	Local outwash	Very low	Simple	Moderate	Low	IIe
Cu	Chenango gravelly loam, 0 to 5 percent slopes.	P4	Moderately coarse.	Glacial outwash	Very low	Simple	Rapid	Low	I
Cv	Chenango gravelly loam, 5 to 15 percent slopes.	P4	Moderately coarse.	Glacial outwash	Very low	Complex	Rapid	Low	IIe
Cw	Chenango soils, 15 to 25 percent slopes	P4	Moderately coarse.	Glacial outwash	Very low	Complex	Very rapid	High	IIIe
Cx	Chenango soils, 25 to 45 percent slopes	P4	Moderarely coarse.	Glacial outwash	Very low	Complex	Very rapid	Very high	VIe
Cy	Chippewa silt loam, 0 to 1 percent slopes	H	Medium	Shale and sandstone till.	Very low	Simple	Slow	Low	VIw
Cz	Chippewa silt loam, 3 to 8 percent slopes.	H	Medium	Shale and sandstone till.	Very low	Simple	Slow	Low	VIw
CA	Collamer silt loam, 0 to 6 percent slopes	G2	Medium	Lacustrine silts and sands.	Medium	Simple	Slow	Medium	IIe
CB	Collamer silt loam, 6 to 12 percent slopes	G2	Medium	Lacustrine silts and sands.	Medium	Simple	Slow	High	IIIe
CC	Colwood silt loam, 0 to 1 percent slopes	H	Medium	Lacustrine silts and sands.	High	Simple	Slow	Low	IIIw
Da	Darien silt loam, 0 to 3 percent slopes	G2	Moderately fine.	Shaly till	Medium	Simple	Slow	Low	IIw
Db	Darien silt loam, 3 to 8 percent slopes	G2	Moderately fine.	Shaly till	Medium	Simple	Slow	Medium	IIe
Dc	Darien silt loam, 8 to 15 percent slopes	G2	Moderately fine.	Shaly till	Medium	Simple	Slow	High	IIIe
Dd	Darien silt loam, eroded, 8 to 15 percent slopes.	G2	Moderately fine.	Shaly till	Medium	Simple	Slow	High	IVe
De	Dunkirk fine sandy loam, 0 to 6 percent slopes.	G4	Medium	Lacustrine silts and sands.	Medium	Simple	Moderate	Medium	IIe
Df	Dunkirk fine sandy loam, 6 to 12 percent slopes.	G4	Medium	Lacustrine silts and sands.	Medium	Complex	Moderate	High	IIIe
Dg	Dunkirk silt loam, 0 to 6 percent slopes	G4	Medium	Lacustrine silts and sands.	Medium	Simple	Moderate	Medium	IIe

See footnotes at end of table.

Important characteristics of the soils—Continued

Map symbol	Soil and dominant slope range	Kind of profile	Texture of profile	Parent material	Lime content	Topography [1]	Permeability [2]	Erodibility	Capability
Dh	Dunkirk silt loam, 6 to 12 percent slopes	G4	Medium	Lacustrine silts and sands.	Medium	Complex	Moderate	High	IIIe
Dk	Dunkirk silt loam, eroded, 12 to 20 percent slopes.	G4	Medium	Lacustrine silts and sands.	Medium	Complex	Slow	Very high	VIe
Dl	Dunkirk silt loam, eroded, 20 to 45 percent slopes.	G4	Medium	Lacustrine silts and sands.	Medium	Complex	Slow	Very high	VIe
Ea	Edwards muck, 0 to 1 percent slopes	-------	-------	Organic material	High	Simple	Slow	Low	IIIw
Eb	Eel silt loam, 0 to 2 percent slopes	A3	Medium	Alluvial sediments	Medium	Simple	Moderate	Low	IIw
Ec	Eel silty clay loam, 0 to 2 percent slopes	A3	Medium	Alluvial sediments	Medium	Simple	Slow	Low	IIw
Ed	Erie gravelly silt loam, 0 to 3 percent slopes.	L	Medium	Shale and sandstone till.	Low	Simple	Slow	Low	IIIw
Ee	Erie gravelly silt loam, 3 to 8 percent slopes.	L	Medium	Shale and sandstone till.	Low	Simple	Slow	Medium	IIIe
Ef	Erie gravelly silt loam, 8 to 15 percent slopes.	L	Medium	Shale and sandstone till.	Low	Simple	Slow	High	IIIe
Fa	Farmington loam, 12 to 30 inches deep, 2 to 8 percent slopes.	G4	Medium	Thin high-lime till	High	Simple	Moderate	Medium	IIs
Fb	Farmington loam, 0 to 12 inches deep, 2 to 15 percent slopes.	G4	Medium	Thin high-lime till	High	Simple	Rapid	Medium	VIs
Fc	Fremont channery silt loam, 0 to 3 percent slopes.	P2	Medium	Shale and sandstone till.	Very low	Simple	Slow	Low	IIIw
Fd	Fremont channery silt loam, 3 to 8 percent slopes.	P2	Medium	Shale and sandstone till.	Very low	Simple	Slow	Medium	IIIe
Fe	Fremont channery silt loam, 8 to 15 percent slopes.	P2	Medium	Shale and sandstone till.	Very low	Simple	Slow	High	IIIe
Ff	Fresh water marsh, 0 to 1 percent slopes	-------	-------	Organic material and alluvium.	Low	Simple	Slow	Low	VIIIw
Fg	Fulton silt loam, 0 to 3 percent slopes	G2	Fine	Lacustrine silts and clays.	High	Simple	Slow	Low	IIIw
Ga	Galen fine sandy loam, 0 to 6 percent slopes.	G3	Coarse	Lacustrine sands	Medium	Simple	Moderate	Medium	IIw
Gb	Genesee fine sandy loam, 0 to 2 percent slopes.	A4	Medium	Alluvial sediments	Medium	Simple	Moderate	Low	IIw
Gc	Genesee silt loam, 0 to 2 percent slopes	A4	Medium	Alluvial sediments	Medium	Simple	Moderate	Low	IIw
Gd	Genesee silt loam, high bottom, 0 to 2 percent slopes.	A4	Medium	Alluvial sediments	Medium	Simple	Moderate	Low	I
Ge	Granby fine sandy loam, 0 to 1 percent slopes.	H	Coarse	Lacustrine silts and sands.	High	Simple	Slow	Low	IIIw

Ha	Holly silt loam, 0 to 1 percent slopes	L	Medium	Alluvial sediments	Very low	Simple	Slow	Low	IVw
Hb	Homer sandy loam, 0 to 3 percent slopes	L	Moderately coarse.	Glacial outwash	High	Simple	Slow	Low	IIIw
Hc	Homer silt loam, 0 to 3 percent slopes	L	Moderately coarse.	Glacial outwash	High	Simple	Slow	Low	IIIw
Hd	Honeoye fine sandy loam, 0 to 3 percent slopes.	G4	Medium	High-lime till	High	Simple	Moderate	Low	I
He	Honeoye fine sandy loam, 3 to 10 percent slopes.	G4	Medium	High-lime till	High	Simple	Moderate	Medium	IIe
Hf	Honeoye fine sandy loam, 10 to 20 percent slopes.	G4	Medium	High-lime till	High	Simple	Moderate	High	IIIe
Hg	Honeoye fine sandy loam, eroded, 10 to 20 percent slopes.	G4	Medium	High-lime till	High	Simple	Slow	High	IIIe
Hh	Honeoye silt loam, 0 to 3 percent slopes	G4	Medium	High-lime till	High	Simple	Moderate	Medium	I
Hk	Honeoye silt loam, 3 to 10 percent slopes.	G4	Medium	High-lime till	High	Simple	Moderate	Low	IIe
Hl	Honeoye silt loam, 10 to 20 percent slopes.	G4	Medium	High-lime till	High	Simple	Moderate	High	IIIe
Hm	Honeoye silt loam, eroded, 10 to 20 percent slopes.	G4	Medium	High-lime till	High	Simple	Slow	High	IIIe
Hn	Honeoye soils, eroded, 20 to 30 percent slopes.	G4	Medium	High-lime till	High	Simple	Slow	Very high	VIe
Ho	Hornell silt loam, 36 inches or more deep, 3 to 8 percent slopes.	P2	Moderately fine.	Shaly till	Very low	Simple	Slow	Medium	IIe
Hp	Hornell silt loam, 12 to 20 inches deep, 3 to 8 percent slopes.	P2	Moderately fine.	Shaly till and residuum	Very low	Simple	Slow	Medium	IIIw
Hr	Hornell silt loam, 36 inches or more deep, 8 to 15 percent slopes.	P2	Moderately fine.	Shaly till	Very low	Simple	Slow	High	IIIe
Hs	Hornell silt loam, 12 to 20 inches deep, eroded, 8 to 15 percent slopes.	P2	Moderately fine.	Shaly till and residuum	Very low	Simple	Slow	High	IVe
Ht	Hornell silt loam, 36 inches or more deep, eroded, 8 to 15 percent slopes.	P2	Moderately fine.	Shaly till	Very low	Simple	Slow	High	IVe
Hu	Howard gravelly loam, 0 to 5 percent slopes.	G4	Moderately coarse.	Glacial outwash	Medium	Simple	Rapid	Low	I
Hv	Howard gravelly loam, 5 to 15 percent slopes.	G4	Moderately coarse.	Glacial outwash	Medium	Complex	Rapid	Medium	IIe
Hw	Howard soils, 15 to 25 percent slopes	G4	Moderately coarse.	Glacial outwash	Medium	Complex	Very rapid	High	VIe
Ja	Junius fine sandy loam, 0 to 2 percent slopes.	L	Coarse	Lacustrine fine sands	Medium	Simple	Slow	Low	IIIw
Ka	Kendaia loam, 0 to 3 percent slopes	L	Medium	High-lime till	High	Simple	Slow	Low	IIIw
Kb	Kendaia silt loam, 0 to 3 percent slopes	L	Medium	High-lime till	High	Simple	Slow	Low	IIIw
Kc	Kendaia silt loam, 3 to 8 percent slopes	L	Medium	High-lime till	High	Simple	Slow	Low	IIIe

See footnotes at end of table.

Important characteristics of the soils—Continued

Map symbol	Soil and dominant slope range	Kind of profile	Texture of profile	Parent material	Lime content	Topography [1]	Permeability [2]	Erodibility	Capability
La	Lakemont silty clay loam, 0 to 2 percent slopes.	L	Fine	Lacustrine silts and clays.	High	Simple	Slow	Low	IVw
Lb	Langford gravelly silt loam, 3 to 8 percent slopes.	P3	Medium	Shale and sandstone till.	Low	Simple	Moderate	Medium	IIe
Lc	Langford gravelly silt loam, 8 to 15 percent slopes.	P3	Medium	Shale and sandstone till.	Low	Simple	Moderate	High	IIIe
Ld	Lansing and Danley silt loams, 12 to 20 inches deep, 3 to 8 percent slopes.	G4	Medium	Thin till and residuum	Medium	Simple	Moderate	Medium	IVs
Le	Lansing and Danley silt loams, 12 to 20 inches deep, eroded, 8 to 15 percent slopes.	G4	Medium	Thin till and residuum	Medium	Simple	Slow	High	VIs
Lf	Lansing and Danley silt loams, 12 to 20 inches deep, eroded, 15 to 25 percent slopes.	G4	Medium	Thin till and residuum	Medium	Simple	Slow	Very high	VIIs
Lg	Lansing silt loam, 3 to 10 percent slopes	G4	Medium	Mixed till	Medium	Simple	Moderate	Medium	IIe
Lh	Lansing silt loam, 10 to 20 percent slopes.	G4	Medium	Mixed till	Medium	Simple	Moderate	High	IIIe
Lk	Lansing silt loam, eroded, 10 to 20 percent slopes.	G4	Medium	Mixed till	Medium	Simple	Slow	High	IIIe
Ll	Lansing silt loam, 20 to 30 percent slopes.	G4	Medium	Mixed till	Medium	Simple	Moderate	Very high	IVe
Lm	Lansing silt loam, eroded, 20 to 30 percent slopes.	G4	Medium	Mixed till	Medium	Simple	Slow	Very high	VIe
Ln	Lima fine sandy loam, 0 to 3 percent slopes.	G3	Medium	High-lime till	High	Simple	Moderate	Low	IIw
Lo	Lima fine sandy loam, 3 to 10 percent slopes.	G3	Medium	High-lime till	High	Simple	Moderate	Medium	IIe
Lp	Lima silt loam, 12 to 20 inches deep, 0 to 3 percent slopes.	G3	Medium	Thin high-lime till	High	Simple	Moderate	Low	IIw
Lr	Lima silt loam, 0 to 3 percent slopes	G3	Medium	High-lime till	High	Simple	Moderate	Low	IIw
Ls	Lima silt loam, 3 to 10 percent slopes	G3	Medium	High-lime till	High	Simple	Moderate	Medium	IIe
Lt	Lima silt loam, 10 to 20 percent slopes	G3	Medium	High-lime till	High	Simple	Moderate	High	IIIe
Lu	Lobdell silt loam, 0 to 2 percent slopes	A3	Medium	Alluvial sediments	Low	Simple	Moderate	Low	IIw
Lv	Lordstown and Manlius soils, 25 to 45 percent slopes.	P4	Medium	Shale and sandstone till.	Very low	Simple	Moderate	Very high	VIIe
Lw	Lordstown channery silt loam, 5 to 15 percent slopes.	P4	Medium	Shale and sandstone till.	Very low	Simple	Moderate	Medium	IIe
Lx	Lordstown channery silt loam, 15 to 25 percent slopes.	P4	Medium	Shale and sandstone till.	Very low	Simple	Moderate	High	IVe

Ly	Lordstown channery silt loam, eroded, 15 to 25 percent slopes.	P4	Medium	Shale and sandstone till.	Very low	Simple	Moderate	High	VIe
Lz	Lordstown soils, 45 to 70 percent slopes	P4	Medium	Shale and sandstone till.	Very low	Simple	Moderate	Very high	VIIe
LA	Lyons silt loam, 0 to 1 percent slopes	H	Medium	High-lime till	High	Simple	Slow	Low	IIIw
Ma	Manlius shaly silt loam, 36 inches or more deep, 5 to 15 percent slopes.	P4	Moderately fine.	Shaly till	Very low	Simple	Moderate	High	IIe
Mb	Manlius shaly silt loam, 36 inches or more deep, eroded, 5 to 15 percent slopes.	P4	Moderately fine.	Shaly till	Very low	Simple	Moderate	High	IIIe
Mc	Manlius shaly silt loam, 12 to 20 inches deep, eroded, 15 to 25 percent slopes.	P4	Moderately fine.	Shaly till and residuum	Very low	Simple	Slow	Very high	VIIs
Md	Manlius shaly silt loam, 36 inches or more deep, eroded, 15 to 25 percent slopes.	P4	Moderately fine.	Shaly till	Very low	Simple	Slow	Very high	VIe
Me	Mardin channery silt loam, 3 to 8 percent slopes.	P3	Medium	Shale and sandstone till	Very low	Simple	Moderate	Medium	IIe
Mf	Mardin channery silt loam, 8 to 15 percent slopes.	P3	Medium	Shale and sandstone till	Very low	Simple	Moderate	High	IIIe
Mg	Mardin channery silt loam, eroded, 8 to 15 percent slopes.	P3	Medium	Shale and sandstone till	Very low	Simple	Slow	High	IVe
Mh	Mardin channery silt loam, eroded, 15 to 25 percent slopes.	P3	Medium	Shale and sandstone till	Very low	Simple	Slow	Very high	VIe
Mk	Mardin silt loam, 12 to 20 inches deep, 3 to 15 percent slopes.	P3	Medium	Shale and sandstone till	Very low	Simple	Moderate	Medium	IIIe
Ml	Mardin and Langford soils, 25 to 45 percent slopes.	P3	Medium	Shale and sandstone till	Very low	Simple	Moderate	Very high	VIe
Mm	Middlebury silt loam, 0 to 2 percent slopes.	A3	Medium	Alluvial sediments	Very low	Simple	Moderate	Low	IIw
Mn	Morocco fine sandy loam, 0 to 2 percent slopes.	L	Coarse	Lacustrine sands	Very low	Simple	Slow	Low	IIIw
Mo	Muck, acid (unclassified), 0 to 1 percent slopes.			Organic material	Very low	Simple	Slow	Low	IIIw
Na	Newton fine sandy loam, 0 to 1 percent slopes.	H	Coarse	Lacustrine sands	Very low	Simple	Slow	Low	IIIw
Nb	Nunda silt loam, 0 to 6 percent slopes	G4	Moderately fine.	Reworked glacial till	Medium	Complex	Moderate	Medium	IIe
Nc	Nunda silt loam, 6 to 12 percent slopes	G4	Moderately fine.	Reworked glacial till	Medium	Complex	Moderate	High	IVe
Nd	Nunda silt loam, eroded, 6 to 12 percent slopes.	G4	Moderately fine.	Reworked glacial till	Medium	Complex	Slow	High	VIe
Ne	Nunda silt loam, eroded, 12 to 20 percent slopes.	G4	Moderately fine.	Reworked glacial till	Medium	Complex	Slow	Very high	VIe
Nf	Nunda silt loam, eroded, 20 to 45 percent slopes.	G4	Moderately fine.	Reworked glacial till	Medium	Complex	Slow	Very high	VIe

See footnotes at end of table.

Important characteristics of the soils—Continued

Map symbol	range	Kind of profile	Texture of profile	Parent material	Lime content	Topography [1]	Permeability [2]	Erodibility	Capability
Oa	Odessa silt loam, 0 to 6 percent slopes	G2	Fine	Lacustrine silts and clays.	High	Simple	Slow	Medium	IIe
Ob	Odessa silty clay loam, eroded, 6 to 12 percent slopes.	G2	Fine	Lacustrine silts and clays.	High	Simple	Slow	High	IVe
Oc	Ontario fine sandy loam, 3 to 10 percent slopes.	G4	Medium	High-lime till	High	Simple	Moderate	Medium	IIe
Od	Ontario fine sandy loam, 10 to 20 percent slopes.	G4	Medium	High-lime till	High	Simple	Moderate	High	IIIe
Oe	Ontario fine sandy loam, eroded, 10 to 20 percent slopes.	G4	Medium	High-lime till	High	Simple	Slow	Very high	IIIe
Of	Ontario gravelly loam, 3 to 10 percent slopes.	G4	Medium	High-lime till	High	Simple	Moderate	Medium	IIe
Og	Ontario gravelly loam, eroded, 10 to 20 percent slopes.	G4	Medium	High-lime till	High	Simple	Slow	High	IIIe
Oh	Ontario, Lansing, and Honeoye soils, 30 to 60 percent slopes.	G4	Medium	High-lime till	High	Simple	Moderate	Very high	VIIe
Ok	Ontario loam, 3 to 10 percent slopes	G4	Medium	High-lime till	High	Simple	Moderate	Medium	IIe
Ol	Ontario loam, 10 to 20 percent slopes	G4	Medium	High-lime till	High	Simple	Moderate	High	IIIe
Om	Ontario loam, eroded, 10 to 20 percent slopes.	G4	Medium	High-lime till	High	Simple	Slow	High	IIIe
On	Ontario soils, eroded, 20 to 30 percent slopes.	G4	Medium	High-lime till	High	Simple	Slow	Very high	VIe
Oo	Ottawa loamy fine sand, 0 to 6 percent slopes.	P4	Coarse	Lacustrine fine sands	Very low	Complex	Rapid	Medium	IIIs
Op	Ottawa loamy fine sand, 6 to 12 percent slopes.	P4	Coarse	Lacustrine fine sands	Very low	Complex	Rapid	High	IVe
Or	Ovid silt loam, 0 to 3 percent slopes	G2	Moderately fine.	High-lime till	High	Simple	Slow	Low	IIw
Os	Ovid silt loam, 3 to 8 percent slopes	G2	Moderately fine.	High-lime till	High	Simple	Slow	Medium	IIe
Ot	Ovid silty clay loam, eroded, 3 to 8 percent slopes.	G2	Moderately fine.	High-lime till	High	Simple	Slow	Medium	IIIe
Ou	Ovid silty clay loam, eroded, 8 to 15 percent slopes.	G2	Moderately fine.	High-lime till	High	Simple	Slow	High	IVe
Pa	Palmyra and Howard soils, 25 to 35 percent slopes.	G4	Moderately coarse.	Glacial outwash	High and medium.	Complex	Very rapid	Very high	VIe
Pb	Palmyra cobbly loam, 0 to 5 percent slopes.	G4	Moderately coarse.	Glacial outwash	High	Simple	Very rapid	Low	IIIs
Pc	Palmyra fine sandy loam, 0 to 5 percent slopes.	G4	Moderately coarse.	Glacial outwash	High	Simple	Rapid	Low	I

Pd	Palmyra gravelly loam, 0 to 5 percent slopes.	G4	Moderately coarse.	Glacial outwash	High	Simple	Rapid	Low	I
Pe	Palmyra gravelly loam, 5 to 15 percent slopes.	G4	Moderately coarse.	Glacial outwash	High	Complex	Rapid	Medium	IIe
Pf	Palmyra gravelly loam, 15 to 25 percent slopes.	G4	Moderately coarse.	Glacial outwash	High	Complex	Very rapid	High	IIIe
Pg	Palmyra gravelly sandy loam, 0 to 5 percent slopes.	G4	Moderately coarse.	Glacial outwash	High	Simple	Rapid	Low	IIIs
Ph	Palmyra gravelly sandy loam, 5 to 15 percent slopes.	G4	Moderately coarse.	Glacial outwash	High	Complex	Rapid	Medium	IIIs
Pk	Phelps gravelly silt loam, 0 to 5 percent slopes.	G3	Moderately coarse.	Glacial outwash	High	Simple	Moderate	Low	IIw
Pl	Poygan silty clay loam, 0 to 1 percent slopes.	H	Fine	Lacustrine silts and clays.	High	Simple	Slow	Low	VIw
Ra	Red Hook gravelly silt loam, 0 to 3 percent slopes.	L	Moderately coarse.	Glacial outwash	Very low	Simple	Slow	Low	IIIw
Rb	Romulus silt loam, 0 to 3 percent slopes	L	Moderately fine.	Shaly till	Medium	Simple	Slow	Low	IIIw
Rc	Romulus silt loam, 3 to 8 percent slopes	L	Moderately fine.	Shaly till	Medium	Simple	Slow	Medium	IIIe
Rd	Romulus silty clay loam, 0 to 3 percent slopes.	L	Moderately fine.	Shaly till and residuum	Medium	Simple	Slow	Low	IVw
Sa	Schoharie silt loam, 0 to 6 percent slopes	G4	Fine	Lacustrine silts and clays.	High	Simple	Slow	Medium	IIe
Sb	Schoharie silt loam, 6 to 12 percent slopes.	G4	Fine	Lacustrine silts and clays.	High	Simple	Slow	High	IIIe
Sc	Schoharie silty clay loam, 0 to 6 percent slopes.	G4	Fine	Lacustrine silts and clays.	High	Simple	Slow	Medium	IIe
Sd	Schoharie silty clay loam, 6 to 12 percent slopes.	G4	Fine	Lacustrine silts and clays.	High	Simple	Slow	High	IIIe
Se	Schoharie silty clay loam, eroded, 6 to 12 percent slopes.	G4	Fine	Lacustrine silts and clays.	High	Simple	Slow	High	IIIe
Sf	Schoharie silty clay loam, 12 to 20 percent slopes.	G4	Fine	Lacustrine silts and clays.	High	Complex	Slow	Very high	IVe
Sg	Schoharie silty clay loam, eroded, 12 to 20 percent slopes.	G4	Fine	Lacustrine silts and clays.	High	Complex	Slow	Very high	IVe
Sh	Schoharie silty clay loam, eroded, 20 to 45 percent slopes.	G4	Fine	Lacustrine silts and clays.	High	Complex	Slow	Very high	VIIe
Sk	Sloan silt loam, 0 to 1 percent slopes	H	Medium	Alluvial sediments	High	Simple	Slow	Low	VIw
Sl	Steep broken land, 35 to 60 percent slopes.			Shale and sandstone till.		Simple	Moderate	Very high	VIIIs
Ta	Toledo silty clay loam, 0 to 1 percent slopes.	H	Fine	Lacustrine silts and clays.	High	Simple	Slow	Low	IVw

See footnotes at end of table.

Important characteristics of the soils—Continued

Map symbol	Soil and dominant slope range	Kind of profile	Texture of profile	Parent material	Lime content	Topography [1]	Permeability [2]	Erodibility	Capability
Va	Valois gravelly silt loam, 5 to 15 percent slopes.	P4	Medium	Shale and sandstone till.	Low	Complex	Moderate	Medium	IIe
Vb	Valois gravelly silt loam, eroded, 5 to 15 percent slopes.	P4	Medium	Shale and sandstone till.	Low	Complex	Moderate	Medium	IIIe
Vc	Valois gravelly silt loam, 15 to 25 percent slopes.	P4	Medium	Shale and sandstone till.	Low	Complex	Moderate	High	IIIe
Vd	Valois gravelly silt loam, eroded, 15 to 25 percent slopes.	P4	Medium	Shale and sandstone till.	Low	Complex	Moderate	High	VIe
Ve	Volusia channery silt loam, 0 to 3 percent slopes.	L	Medium	Shale and sandstone till.	Very low	Simple	Slow	Low	IIIw
Vf	Volusia channery silt loam, 3 to 8 percent slopes.	L	Medium	Shale and sandstone till.	Very low	Simple	Slow	Medium	IIIe
Vg	Volusia channery silt loam, 8 to 15 percent slopes.	L	Medium	Shale and sandstone till.	Very low	Simple	Slow	High	IIIe
Vh	Volusia channery silt loam, eroded, 8 to 15 percent slopes.	L	Medium	Shale and sandstone till.	Very low	Simple	Slow	High	IVe
Vk	Volusia channery silt loam, eroded, 15 to 25 percent slopes.	L	Medium	Shale and sandstone till.	Very low	Simple	Slow	Very high	VIe
Wa	Warners loam, 0 to 1 percent slopes	L	Medium	Alluvium over marl	High	Simple	Slow	Low	IIIw
Wb	Wayland silt loam, 0 to 1 percent slopes	L	Medium	Alluvial sediments	Medium	Simple	Slow	Low	IVw
Wc	Wayland silty clay loam, 0 to 1 percent slopes.	L	Moderately fine.	Alluvial sediments	Medium	Simple	Slow	Low	IVw
Wd	Westland silt loam, 0 to 1 percent slopes	H	Medium	Glacial outwash	High	Simple	Slow	Low	IIIw
We	Woostern, Bath, and Valois soils, 25 to 45 percent slopes.	P4	Medium	Shale and sandstone till.	Very low	Complex	Moderate	Very high	VIIe
Wf	Woostern gravelly loam, 5 to 15 percent slopes.	P4	Medium	Shale and sandstone till.	Very low	Complex	Moderate	Medium	IIe
Wg	Woostern gravelly loam, eroded, 5 to 15 percent slopes.	P4	Medium	Shale and sandstone till.	Very low	Complex	Moderate	Medium	IIIe
Wh	Woostern gravelly loam, 15 to 25 percent slopes.	P4	Medium	Shale and sandstone till.	Very low	Complex	Moderate	High	VIe
Wk	Woostern gravelly loam, eroded, 15 to 25 percent slopes.	P4	Medium	Shale and sandstone till.	Very low	Complex	Low	High	VIe

[1] Simple topography: single slopes upon which contour cultivation and strip-cropping can be used. Complex topography: compound or irregular slopes that are difficult to cultivate and plant on the contour.

[2] The relative ease with which the soil transmits water and air.

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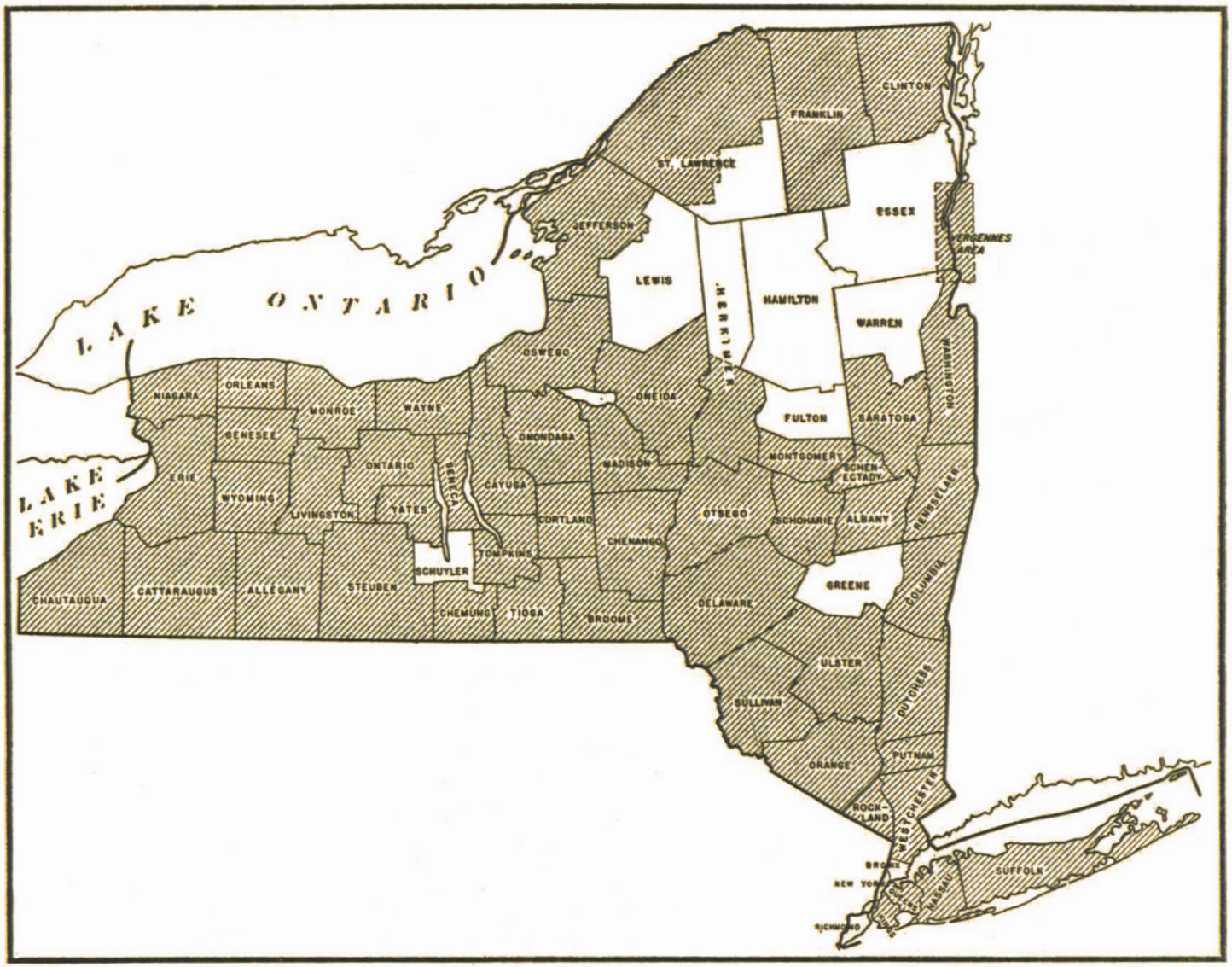

Areas surveyed in New York shown by shading.

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