Series 1957, No. 9

Issued December 1960

SOIL SURVEY

Erie County Pennsylvania

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
PENNSYLVANIA STATE UNIVERSITY
COLLEGE OF AGRICULTURE AND AGRICULTURAL EXPERIMENT STATION
AND THE
PENNSYLVANIA DEPARTMENT OF AGRICULTURE

HOW TO USE THE SOIL SURVEY REPORT

THIS SOIL SURVEY of Erie County will serve several groups of readers. It will help farmers in planning the kind of management that will protect their soils and provide good yields; assist engineers in selecting sites for roads, buildings, and other structures; and add to the soil scientist's fund of knowledge.

In making this survey soil scientists dug holes and examined surface soils and subsoils; measured slopes with a hand level; noticed differences in the growth of crops, weeds, and grasses; and, in fact, recorded all the things that they thought might affect the suitability of the soils for farming, engineering, and related uses.

The scientists plotted the boundaries of the soils on aerial photographs. Then, cartographers prepared the detailed soil map in the back of this report. Cultivated fields, roads, creeks, and other landmarks are shown on these maps.

Locating soils

Use the index to map sheets to locate areas on the large map. The index is a small map of the survey area on which numbered rectangles have been drawn to show where each sheet of the large map is located. When you find the correct sheet of the large map, note that the boundaries of the soils are outlined and that there is a symbol for each kind of soil. All areas marked with the same symbol are the same kind of soil, wherever they appear on the map. The symbol will be inside the area if there is enough room; otherwise, it will be outside the area and a pointer will show where the symbol belongs. Suppose, for example, you find an area on your farm marked with the symbol AoA. The legend for the detailed map shows that this symbol identifies Allis silt loam, 0 to 3 percent slopes. This soil and all others mapped in the county are described in the section, Descriptions of the Soils.

Finding information

Few readers will be interested in all parts of the soil survey report, for it has special sections for different groups, as well as some sections of value to all. The section, Additional Facts about the County, points out outstanding features of the survey area and will be of interest mainly to those not familiar with Erie County.

Farmers and those who work with farmers will be interested mainly in the sections, General Soil Areas, Descriptions of the Soils, and Use and Management of the Soils. A study of these sections will aid them in identifying soils on a farm, in learning ways the soils can be managed, and in judging what yields can be expected.

Engineers will want to refer to the section, Engineering Applications. The tables in this section show characteristics of the soils that affect engineering.

Soil scientists will find information about how the soils were formed and how they were classified in the section, Formation and Classification of the Soils.

Students, teachers, and other users will find information about soils and their management in various parts of the report, depending on their particular interest.

* * *

This soil survey is part of the technical assistance furnished by the Soil Conservation Service to the Erie County Soil Conservation District. Fieldwork for the survey was finished in 1957. Unless otherwise specified, all statements in the report refer to conditions in the county at the time fieldwork was in progress.

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SOIL SURVEY OF ERIE COUNTY, PENNSYLVANIA

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REPORT BY DAVID C. TAYLOR, SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE IN COOPERATION WITH THE PENNSYLVANIA STATE UNIVERSITY, COLLEGE OF AGRICULTURE AND AGRICULTURAL EXPERIMENT STATION, AND THE PENNSYLVANIA DEPARTMENT OF AGRICULTURE

ERIE COUNTY is the northernmost county in Pennsylvania. It lies along Lake Erie (fig. 1) and is bordered on the east by the State of New York and on the west by the State of Ohio. Its total land area is 812 square miles, or 519,680 acres. Erie County was formed from part of Allegheny County in 1800. It was organized for judicial purposes in 1803. The city of Erie, the industrial and cultural center of the area, is the county seat.

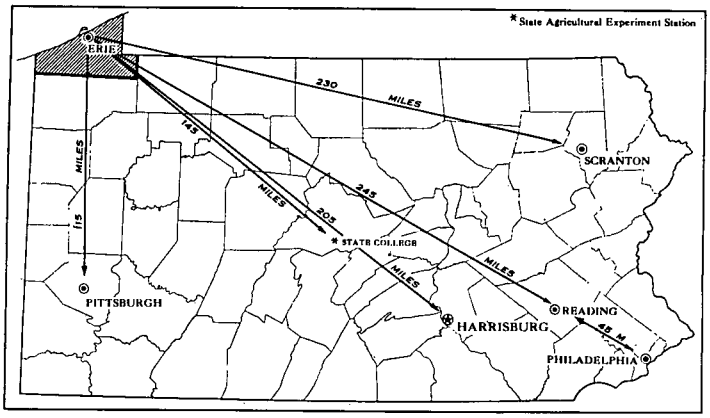

Figure 1.—**Location of Erie County in Pennsylvania.**

In Erie County there are two principal topographic areas—the lake plain and the upland. The lake plain lies parallel to Lake Erie and extends inward 5 to 6 miles. The soils of the lake plain are level to gently sloping. The upland is south of the lake plain. In general, it has gently sloping relief, but, in places, there are valleys formed through stream erosion.

Agriculture is one of the principal industries in Erie County. Nearly all the grapes produced in the State are grown here. The county also ranks high in the production of sour cherries. Grapes, other fruit crops, and early maturing vegetables are grown on the temperate lake plain. Dairy and truck farming predominate in the upland.

General Soil Areas

The general patterns of soils in Erie County can be described with reference to 10 general soil areas. In each general area the soils of two or more soil series are dominant. The most extensive soils in the pattern are shown in the name of the general area. Within each area in Erie County, the soils have formed from similar parent material and, in general, they occupy similar positions on the landscape. A colored map of the general soil areas is in the back part of the report.

A map of general soil areas is useful to those who want to compare different parts of a county; to those who want to locate large areas suitable for some particular kind of agriculture or other broad land use; or to those who need to suggest a program of management for areas of land covering several farms.

Area 1

Silty and clayey soils, chiefly on the lake plain (Wallington-Birdsall-Williamson and Collamer).—This general area is made up of low-lying parts of the lake plain and of former lakebeds in the upland. The soils have formed in deep lacustrine sediments that have settled out of the waters of lagoons; they are separated from the lake by beach ridges. In most of this general area, relief is level or nearly level, but there are some strong, uniform slopes. Escarpments have been cut into the areas as the result of stream and lakeshore erosion. Most of the soils contain either a fragipan or a claypan that is slowly permeable to water and air. These pans begin at depths of 6 to 30 inches.

The Wallington soils make up about 65 percent of this general area. They are nearly level to strongly sloping and are somewhat poorly drained to poorly drained. The Birdsall soils occupy about 20 percent. They occur on flats and in depressions and are very poorly drained to poorly drained. Approximately 10 percent consists of Williamson and Collamer soils. These moderately well drained soils are on the crests of low ridges and in narrow areas that are parallel to the escarpments. Soils on

stream terraces and flood plains make up about 5 percent of this general area.

On the lake plain the temperature is modified by the waters of Lake Erie. The areas are used for vineyards and small fruits and for vegetables planted late in the spring. The old lakebeds in the upland are used for dairy farming. Here, corn, hay, and small grains are grown. Most of the corn is harvested for silage; shallow-rooted grasses and legumes that tolerate retarded drainage are grown for hay. Because of retarded drainage, these soils warm up slowly in spring and become wet early in fall. They are not suited to crops that must be planted early in spring.

In these soils the material above the slowly permeable layer is acid and is deficient in phosphorus and potassium. The supply of available nitrogen is low; this is indicated when the small grains turn yellow in spring. Good yields of suitable crops are obtained in this general area, however, if the soils are limed and fertilized properly.

Area 2

Sandy soils of the lake plain (Rimer-Wauseon-Berrien).—This general area lies along Lake Erie. The soils have formed in deep, sandy lake sediments. Relief is level to steep. The slopes are uniform and are as much as 500 feet long. Escarpments have been cut into the areas as the result of stream and lakeshore erosion. The lake sediments overlie gray, calcareous silty material that is slowly permeable to water and air. The silty material, locally called quicksand, is hard when dry but will flow under pressure when wet. It occurs at depths of 30 to 72 inches. The level of the water table varies greatly; it rises and falls rapidly.

The Rimer soils make up about 70 percent of this general area. They are nearly level to gently sloping and are somewhat poorly drained to poorly drained. The nearly level Wauseon soil occupies about 20 percent of the area. It is very poorly drained and occurs in depressions. Approximately 10 percent consists of the Berrien soils. These moderately well drained soils are on the crests of low ridges and in narrow areas that are parallel to the escarpments.

Most of the soils are used for vineyards, vegetables, and fruit trees. The somewhat poorly drained to very poorly drained soils are not suited to apple trees nor are they desirable for alfalfa and other deep-rooted crops.

The soil material above the calcareous quicksand is acid and is low in phosphorus and potassium. Because the soils are sandier than the soils of Area 1, they warm up earlier in spring. Therefore, their supply of nitrogen is available to plants at the start of the growing season.

Area 3

Gravelly and sandy soils of the beach ridges (Conotton-Ottawa-Fredon).—This general area occupies beach ridges along the lake plain. It extends from the Ohio boundary to the New York State line. The beach ridges, which are a prominent feature of the lake plain, consist of thick deposits of gravel and sand that formed the shoreline when the lake was at higher levels. Near the lake the ridges have short, steep slopes, 100 to 300 feet long. Long, gentle slopes extend inland from the ridge crests. In a few places the gentle slopes have a series of crests and swales that give a washboard appearance to the topography. The first roads were built along the crests of the beach ridges; the main roads that extend from east to west still follow the ridges.

The gravelly and sandy soils in this general area are porous. Drainage varies according to the level of the water table. The steep soils are droughty; the soils in swales or depressions are very poorly drained.

Conotton coarse sandy loams, gravelly loams, and gravelly sandy loams make up approximately 50 percent of this general area. These well-drained soils are on the crests and steep slopes of ridges. The Conotton variants, which are on gentle slopes and in swales, comprise about 25 percent of the area. They are moderately well drained. The Ottawa fine sandy loams, on the crests and on the steep slopes of ridges, make up about 15 percent. They are well drained. Fredon loams make up approximately 10 percent of the area. They are in swales and depressions and are somewhat poorly drained to poorly drained.

The well-drained soils of this general area warm up early in spring. They are used for vineyards, fruit trees, and early maturing vegetables. They are well suited to cherry and peach trees. Asparagus is grown on the Conotton coarse sandy loams and on the Ottawa fine sandy loams.

The soils are rapidly leached of plant nutrients. They are low in potassium and phosphorus. The supply of calcium is low, and the soils are acid in reaction.

Area 4

Gravelly soils of the outwash terraces (Howard-Phelps-Fredon-Halsey).—This general area is on gravelly outwash terraces that were deposited in the larger valleys formed before the area was covered by glaciers. As the glacial ice melted, gravelly and sandy debris was released. The coarser textured gravelly and sandy materials were deposited where the progress of the ice was blocked by the sides of the valleys. In these places the slope pattern is complex; small, steep, round hills, or kames, are separated by depressions or potholes. The finer textured gravelly and sandy materials were carried by glacial streams and deposited on an outwash plain that has a few potholes.

The gravelly and sandy materials are porous. Drainage varies according to the level of the water table. The steep soils are droughty; in contrast, the soils in swales or depressions are very poorly drained. The Howard soils are well drained, and the Phelps are moderately well drained. The Howard and Phelps soils have a hard, porous layer, cemented with lime, at depths of 3½ to 8 feet. This material resembles concrete of poor quality.

Steep to moderately sloping Howard soils occupy approximately 30 percent of this general area. They occur on kames and on parts of the outwash plain. The Phelps soils comprise about 20 percent of the area. They are nearly level to moderately sloping and occur on the outwash plain. Approximately 20 percent of the area is made up of nearly level to gently sloping Fredon soils. The Fredon soils are on the outwash plain and are somewhat poorly drained to poorly drained. The Halsey soil makes up about 10 percent of the area. It is nearly level

and occurs on the outwash plain and in potholes between the kames. It is very poorly drained and is subject to overflow.

The rest of the general area consists of soils on stream terraces and flood plains. Of these, the somewhat poorly drained to poorly drained Wayland and very poorly drained Sloan soils are dominant. These are on flood plains and are frequently overflowed. Moderately well drained Lobdell and well drained Chagrin soils are next most extensive. They occur in areas that are at slightly higher elevations than the streams and are flooded less frequently than the Wayland and Sloan soils. Also included are moderately well drained Scio and well drained Unadilla soils. These inextensive soils are nearly level to gently sloping and occur on stream terraces. Normally, they are not flooded, but, during the spring thaw, ice jams may cause the streams to overflow. There is a small acreage of Muck and Peat; the largest area is northwest of Corry.

The soils of this general area are used for intensive farming. Potatoes are the principal cash crop. Corn, small grains, and alfalfa are grown on the well drained and moderately well drained soils.

Area 5

Deep, medium-textured soils in moderately limy till of the glaciated upland (Erie-Ellery and Alden-Langford).—This general area is on upland that has a mantle of gravelly till. It occurs as hills of medium-textured soils that are surrounded by gravelly material of the outwash terraces. The slopes are long and uniform. Many slopes, one-half mile long, extend from the tops of the ridges to the outwash terraces.

These soils have a fragipan that is slowly permeable to water and air. The depth to the pan ranges from 6 to 30 inches. The till material below the pan is moderately calcareous.

The Erie soils cover approximately 70 percent of this general area. They have long slopes and are somewhat poorly drained. The Ellery and Alden soils make up about 20 percent of the area. They are on nearly level sites and in depressions, and they are poorly drained to very poorly drained. The Langford soils make up about 10 percent of the area. They are moderately well drained and are on the crests of ridges and in other positions that have good drainage. A small acreage of Manlius and Lordstown soils occurs on steep sites. These soils are well drained. They are shallow and have low water-storage capacity; bedrock occurs at depths of 10 to 26 inches. The Manlius and Lordstown soils are on escarpments and along gulfs that have been cut by streams into the upland near the lake plain.

Most of the soils of this general area are used for dairy farming and livestock production. Corn, hay, and small grains are the principal crops. Most of the corn is harvested for silage; shallow-rooted grasses and legumes that tolerate retarded drainage are grown for hay. Late-maturing cabbage is grown as a cash crop.

Because of retarded drainage, most of these soils warm up slowly in spring and become wet early in fall. Frequently, the soils are too wet for the early seeding of small grains. The harvesting of corn is often delayed because the fields are wet.

The extreme northern and northwestern parts of this general area lie close to Lake Erie and are warm enough for vineyards. A common expression is, "If you can see Lake Erie from the site, it is suitable for a vineyard."

In this general area the soil material above the fragipan is acid and is deficient in phosphorus and potassium. The supply of available nitrogen is low; this is indicated when the small grains turn yellow in spring. Suitable crops yield well if the soils are limed and fertilized properly.

Area 6

Deep, medium-textured soils in slightly limy till of the glaciated upland (Volusia-Mardin).—This general area consists of upland that is mantled with gravelly till. The slopes are uniform and long; many of them are as much as one-half mile long. The soils contain fragipans that are slowly permeable to water and air. These pans begin at depths of 6 to 30 inches. The till material below the pans is acid.

The Volusia soils make up about 80 percent of this general area. They have long, gentle slopes and are somewhat poorly drained to poorly drained. The moderately well drained Mardin soils occupy approximately 15 percent of the area. They occur on the crests of ridges and in other positions that have fairly good drainage. About 5 percent consists of the shallow Manlius and Lordstown soils. These soils have steep slopes. They are shallow to bedrock and are well drained.

Where the climate is favorable, these soils are used for vineyards. Fruit trees are grown on the Mardin soils. In the areas south of the fruit belt, the soils are used for dairy farming and livestock production. Because of retarded drainage, most of the soils warm up slowly in spring. When rainfall is greater than normal, the Volusia soils become wet early in fall. The retarded drainage delays the early planting and late harvesting of crops. The soils are acid, and, therefore, they need more careful management than the moderately limy soils of Area 5.

Area 7

Deep, silty and clayey soils of the glaciated upland flats (Trumbull-Mahoning-Miner).—This general area is in the southwestern part of the county. It is on upland that is mantled with glacial till containing almost no gravel. The soils are mainly level to gently sloping. Most of the slopes are short, but some are as much as one-half mile long. At depths of 1 to 2 feet, the soils have compact subsoils that are slowly permeable to air and water. After rains, water remains ponded on level places. The soils warm up slowly in spring and become wet early in fall.

Level to nearly level, poorly drained Trumbull soils occupy more than 80 percent of this general area. They occur in the southern part of the area. Less than 5 percent consists of Mahoning soils. These moderately well drained to somewhat poorly drained soils are on the moderately sloping crests of low ridges. The Miner soil, which is in depressions and is very poorly drained, and other soils on flood plains make up most of the rest of this general area.

Much of the acreage is idle, but some is used for dairy farming and for livestock production. Corn, hay, and small grains are grown. The corn is harvested for silage; shallow-rooted grasses and legumes that tolerate retarded drainage are seeded for hay. When timothy was an important hay crop, these soils were considered the most suitable in the county for hay.

The soils are calcareous at depths of 2 to 5 feet. They are low in phosphorus and potassium and need lime.

Area 8

Deep, silty and clayey soils of the gently or moderately sloping glaciated upland (Platea-Birdsall).—This general area is on upland that is mantled with glacial till. The individual areas are in the western part of the county between areas of lacustrine deposits and areas of coarse-textured glacial till. Relief is mainly gently sloping to moderately sloping, and the slopes are long and uniform. The soils have compact subsoils, which are slowly permeable to air and water at depths of 1 to 2 feet. After rains, water remains ponded on the level spots. The soils warm up slowly in spring and become wet early in fall.

Somewhat poorly drained Platea soils occupy approximately 70 percent of the general area. They are nearly level to moderately sloping. Platea moderately well drained variants are on the crests of ridges and occupy other better drained sites. They make up about 15 percent of the total acreage. Birdsall soils occupy approximately 15 percent of the area. These very poorly drained to poorly drained soils are in depressions in which sediments have been deposited under still, or slack, water.

Most of the soils are used for dairy farming or livestock production. Corn, small grains, and hay are grown. Frequently, the planting and harvesting of crops are delayed because the fields are wet. Mixtures of grasses and legumes that tolerate impeded drainage are seeded for hay. Where the climate is favorable, grapevines are grown on the Platea soils.

Area 9

Shallow, medium-textured soils of the glaciated upland and the lake plain (Allis-Ellery and Alden).—This general area comprises gently sloping parts of the lake plain and moderately sloping to steep parts of the upland. In most places the soil is shallow over the bedrock and acid shale, which is at depths of 12 to 24 inches; the subsoil consists of dense, acid silts and clays.

Allis soils occupy approximately 85 percent of this general area. They are nearly level to steep and are poorly drained. Poorly drained to very poorly drained Ellery and Alden soils make up about 15 percent of the area. They occupy level sites or depressions.

Where the climate is favorable, the soils of this general area are used for vineyards. Yields of grapes are low, but, if they ripen properly, the grapes are of good quality. The grapevines die out soon. Late-maturing tomatoes are also grown. Because these soils warm up slowly in spring, they are not suited to crops that must be planted early in the season. They are low in plant nutrients and need lime.

Area 10

Silty and clayey soils of glacial lakebeds (Canadice-Caneadea-Birdsall).—This general area occupies the sites of former glacial lakes. When the glacial ice melted, these slack-water lakes formed in valleys. The soils formed in deep deposits of silts and clays that were laid down by the slack water. They are mainly level to nearly level and have uniform slopes. Escarpments have been cut into the area by the streams that drained the lakes. The dense silty and clayey materials making up these soils are slowly permeable to air and water. After rains, water remains ponded on the level sites.

Canadice soils occupy approximately 80 percent of this general area. They are level to nearly level and are poorly drained. Caneadea soils make up about 10 percent of the area. They are on the escarpments and are moderately well drained. Birdsall soils occupy almost 10 percent. They are in level areas and in depressions and are very poorly drained to poorly drained. A small acreage of other soils is on the terraces and flood plains along streams.

The soils of this general area are used for dairy farming and livestock production. Corn, hay, and small grains are grown. The corn is usually harvested for silage; shallow-rooted grasses and legumes that tolerate impeded drainage are seeded for hay.

The surface layers of these soils are acid, but the soil material is calcareous at depths of 3 to 4 feet. The soils are low in phosphorus and potassium.

Use and Management of the Soils

This section consists of four parts. In the first the land capability system of classification is described. In the second part the individual soils are placed in capability units and a description of each capability unit is given. The next part gives some general suggestions for the management of soils used for orchards, vineyards, pastures, and woodland. The fourth part gives estimates of the productivity of the soils when used for various crops and suitability ratings for the soils when used for specialized crops, fruit trees, permanent pasture, and woodland.

Capability Grouping

Capability grouping is a system of classification that shows the relative suitability of soils for crops, grazing, forestry, and wildlife. It is a practical grouping based on the needs and limitations of the soils, on the risks of damage to them, and also on their response to management. There are three levels above the soil mapping unit in this grouping. They are the capability unit, the subclass, and the class.

The capability unit, which can also be called a management group of soils, is the lowest level of capability grouping. A capability unit is made up of soils similar in the kind of management they need, in risk of damage, and in general suitability for use.

The next broader grouping, the subclass, is used to indicate the dominant kind of limitation. The letter symbol "e" indicates that the main limiting factor is risk of

erosion if the plant cover is not maintained. The symbol "w" means that excess water retards plant growth or interferes with cultivation. The symbol "s" shows that the soils are shallow, droughty, or unusually low in fertility. Some soils have more than one principal limitation. If a soil is limited by both erosion and wetness, for example, the symbol "e" and "w" can be used. The symbol listed first indicates the dominant limitation.

The broadest grouping, the land capability class, is identified by Roman numerals. All the soils in one class have limitations and hazards of about the same degree, but of different kinds, as shown by the subclass. All the land classes, except class I, may have one or more subclasses.

In classes I, II, and III are soils that are suitable for annual or periodic cultivation of annual or short-lived crops.

Class I soils are those that have the widest range of use and the least risk of damage. They are level or nearly level, productive, well drained, and easy to work. They can be cultivated with almost no risk of erosion and will remain productive if managed with normal care.

Class II soils can be cultivated regularly, but they do not have quite so wide a range of suitability as class I soils. Some class II soils are gently sloping; consequently, they need moderate care to prevent erosion. Other soils in class II may be slightly droughty, slightly wet, or somewhat limited in depth.

Class III soils can be cropped regularly but have a narrower range of use than the soils in class II. They need even more careful management.

In class IV are soils that have greater natural limitations than those in class III but that can be cultivated for some crops under very careful management.

In classes V, VI, and VII are soils that normally should not be cultivated for annual or short-lived crops but that can be used for pasture, as woodland, or as shelter for wildlife.

Class V soils (none in Erie County) have little or no hazard of erosion but have other limitations that are impractical to remove and that limit the use of the soils largely to pasture, woodland, or habitats for wildlife.

Class VI soils are not suitable for crops, because they are steep, droughty, or otherwise limited, but they give fair yields of forage or forest products. Some soils in class VI can, without damage, be cultivated enough so that fruit trees or forest trees can be set out or pasture crops seeded.

Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture, woodland, or wildlife. In class VIII are soils that have practically no agricultural use. Some of them are valuable as parts of watersheds or as shelter for wildlife. Others provide attractive scenery.

The soils of Erie County have been placed in the following capability classes, subclasses, and units:

Class I.—Soils that have few limitations that restrict their use.
- Unit I–1: Level to nearly level, well-drained, gravelly soils.
- Unit I–2: Level to nearly level, well-drained, sandy soils.
- Unit I–3: Level to nearly level, well-drained soils of the bottom land.

Class II.—Soils that have some limitations that reduce the choice of plants or that require moderate conservation practices.
- Subclass IIe: Soils that have a moderate hazard of erosion if not protected.
  - Unit IIe–1: Gently sloping, well-drained, gravelly soils.
  - Unit IIe–2: Mainly gently sloping, well-drained, dominantly sandy soils.
- Subclass IIew: Soils that have moderate hazards of erosion and wetness.
  - Unit IIew–1: Mainly gently sloping, moderately well drained soils on gravel and glacial till.
  - Unit IIew–2: Gently sloping, moderately well drained, sandy soils.
  - Unit IIew–3: Gently sloping, moderately well drained, silty soils.
- Subclass IIw: Soils that have a moderate hazard of wetness.
  - Unit IIw–1: Level to nearly level, moderately well drained to somewhat poorly drained, sandy and silty soils.
  - Unit IIw–2: Level to nearly level, moderately well drained, silty soils on bottom land.

Class III.—Soils that have severe limitations that reduce the choice of plants, that require special conservation practices, or both.
- Subclass IIIe: Soils that have a severe hazard of erosion if they are not protected.
  - Unit IIIe–1: Gently sloping to moderately sloping, well-drained, gravelly soils.
  - Unit IIIe–2: Mainly gently sloping to moderately sloping, well-drained, sandy and gravelly soils.
- Subclass IIIew: Soils that have a severe hazard of erosion and wetness.
  - Unit IIIew–1: Gently sloping to moderately sloping, moderately well drained soils on glacial till and gravel.
  - Unit IIIew–2: Gently sloping to moderately sloping, moderately well drained fine sandy loams.
  - Unit IIIew–3: Moderately sloping, moderately well drained, silty soils.
  - Unit IIIew–4: Gently sloping to moderately sloping, poorly drained, dominantly fine sandy loams.
  - Unit IIIew–5: Gently sloping to moderately sloping, somewhat poorly drained soils on acid glacial till.
  - Unit IIIew–6: Gently sloping to moderately sloping, somewhat poorly drained to poorly drained soils on neutral to calcareous glacial till.
- Subclass IIIw: Soils that have a severe hazard of wetness.
  - Unit IIIw–1: Level to nearly level, poorly drained silt loams.
  - Unit IIIw–2: Level to nearly level, poorly drained fine sandy loams.

Unit IIIw–3: Level to nearly level, very poorly drained loams and fine sandy loams.
Unit IIIw–4: Level to nearly level, poorly drained soils on acid glacial till.
Unit IIIw–5: Level to nearly level, poorly drained silt loams and loams.
Subclass IIIwe: Soils that have a severe hazard of wetness and erosion.
Unit IIIwe–1: Gently sloping, somewhat poorly drained silt loams.
Unit IIIwe–2: Gently sloping to moderately sloping, somewhat poorly drained to poorly drained silt loams.
Subclass IIIs: Soils severely limited by droughtiness.
Unit IIIs–1: Level to moderately sloping, droughty sandy soils.

Class IV.—Soils that have very severe limitations that restrict the choice of plants, that require very careful management, or both.
Subclass IVe: Soils that have a very severe hazard of erosion if they are not protected.
Unit IVe–1: Moderately sloping to strongly sloping, droughty, gravelly and sandy soils.
Subclass IVew: Soils that have very severe hazards of erosion and wetness.
Unit IVew–1: Moderately sloping to strongly sloping, moderately well drained fine sandy loams.
Unit IVew–2: Mainly gently sloping to moderately sloping, moderately well drained soils on glacial till and gravel.
Unit IVew–3: Gently sloping to strongly sloping, moderately well drained to poorly drained silt loams.
Subclass IVw: Soils that have a very severe hazard of wetness.
Unit IVw–1: Level to gently sloping, poorly drained to very poorly drained silt loams.
Unit IVw–2: Level, wet muck and peat.
Subclass IVws: Soils that have very severe limitations of wetness and shallowness.
Unit IVws–1: Gently sloping to moderately sloping, shallow, poorly drained soils.
Unit IVws–2: Level to nearly level, shallow, poorly drained soils.
Subclass IVs: Soils that have a very severe limitation of droughtiness.
Unit IVs–1: Moderately sloping to strongly sloping, shallow soils that have low water-supplying capacity.

Class VI.—Soils that have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture, woodland, or wildlife habitats.
Subclass VIe: Soils that are generally unsuitable for cultivation because of the severe hazard of erosion if they are not protected.
Unit VIe–1: Moderately sloping to strongly sloping, well-drained, gravelly and sandy soils.
Unit VIe–2: Level to nearly level, well drained to moderately well drained soils of the bottom land.
Subclass VIew: Soils that are generally unsuitable for cultivation because of the hazards of erosion and wetness.
Unit VIew–1: Level to strongly sloping, moderately well drained to poorly drained dominantly silt loams.
Unit VIew–2: Mainly gently sloping to strongly sloping, poorly drained soils on glacial till.
Unit VIew–3: Moderately sloping to strongly sloping, moderately well drained to poorly drained fine sandy loams.
Unit VIew–4: Level to strongly sloping, shallow, poorly drained silt loams.
Subclass VIw: Soils that are generally unsuitable for cultivation because of wetness.
Unit VIw–1: Level to nearly level, mainly poorly drained to very poorly drained soils on bottom land.
Subclass VIs–1: Soils generally unsuitable for cultivation because of droughtiness.
Unit VIs–1: Moderately sloping to strongly sloping, droughty, erodible loamy fine sands.

Class VII.—Soils that have very severe limitations that make them unsuitable for cultivation and that restrict their use largely to grazing, woodland, and wildlife habitats.
Subclass VIIe: Soils that are unsuited to cultivated crops because of the hazard of erosion.
Unit VIIe–1: Steep, shallow, poorly drained silt loams.
Unit VIIe–2: Strongly sloping to very steep, droughty, sandy soils.
Unit VIIe–3: Strongly sloping to steep, droughty, gravelly soils.
Unit VIIe–4: Strongly sloping to very steep, droughty soils on glacial till.
Unit VIIe–5: Strongly sloping to very steep, moderately well drained to poorly drained soils on glacial till and lacustrine deposits.
Subclass VIIw: Sands that are unsuited to cultivated crops because of wetness.
Unit VIIw–1: Moderately well drained to somewhat poorly drained, coarse-textured, lacustrine sands.

Class VIII.—Soils and miscellaneous land types that have limitations that preclude their use for commercial plant production and restrict their use to recreation, wildlife, water supply, or esthetic purposes.
Subclass VIIIw: Soils that are limited by wetness but that are suitable for recreation and wildlife habitats.
Unit VIIIw–1: Soils that have water at or above the surface.
Subclass VIIIs: Soils that are limited by droughtiness but that are suitable for recreation and for wildlife habitats.
Unit VIIIs–1: Beach and Riverwash, and Dune sand.

Capability Units in Erie County

This section provides a brief description of the soils in each of the capability units, a list of the soils in each

unit, and suggestions for suitable use and management. Additional help in managing the soils can be obtained by consulting the county agricultural agent, a member of the staff of the State Agricultural Experiment Station, or a local representative of the Soil Conservation Service. These technicians can show you how to prepare soil samples for tests that will indicate the needs for lime and fertilizer.

The soils in most of the capability units have many features in common. Distinctive features that affect the use or management of certain individual soils are also given in the descriptions of some of the units.

Many of the soils of Erie County have weak structure, particularly in their subsoils. Developing and maintaining a favorable, stable soil structure is, therefore, a first consideration in the use and management of the soils. Before we get into the descriptions of the individual capability units, the problems involving soil structure are worth special mention.

For a stable structure, the sandy soils need to be compressed and the finer textured soils need to be broken down from a massive or cloddy shape to a granular form. A surface soil that has a moderate, medium, granular structure permits favorable infiltration and retention of moisture and makes for a suitable seedbed. A soil with a strong, medium to coarse, subangular blocky subsoil contains enough pore space to hold an adequate amount of water available to crop roots. Clay helps to promote the development of a well-defined, stable structure.

Although many of the soils of the county have weak structure in their subsoils, most of the soils are high in organic matter and, therefore, have durable structure in the surface layers. In most of the soils formed in lacustrine deposits and glacial till, the subsoil structure is weak and unstable when either wet or dry. Weak structure has helped cause the formation of a pan layer in the subsoil that limits the movement of water and air and results in poor drainage. Worse yet, the weak structure lacks the cracks and lines of weakness needed for the soils to respond to artificial drainage. In soils having weak structure, tile drains soon become coated with silt; this makes the drains impervious to water, and they do not function long. Mole drains are not effective because of the unstable structure of the subsoil.

The following are suggestions for improving and maintaining the structure of the soils:

1. Use long rotations that include 2 or more years of hay crops. The roots of grasses and legumes are especially beneficial to the structure of the soil. Not only do the roots penetrate and bind the soil, but they also furnish a favorable environment for the microscopic life in the soil. One year of a hay crop will improve the structure, but the improvement is short lived, and the structure may soon break down.
2. Till with a moldboard plow to granulate the soil. Plow coarse-textured, single grain soils when they contain plenty of moisture; this will result in the coarse grains being pressed together efficiently. Plow loams at their optimum moisture content, which is indicated if the soil takes the form of a ball when pressed together in the hand and then breaks completely when dropped to the ground. You cannot always plow silty clays and clays at their proper moisture content. Often, you may have to plow these soils when they are too wet. This destroys the structure and makes the soils cloddy after they dry out. If you plow early, alternate freezing and thawing will granulate the clods. When moist soil freezes slowly, there is a favorable effect on structure.
3. Apply lime, manure, and organic matter, not only to improve fertility but also to improve structure by making a good environment for the microscopic life.
4. Mulch the soils with plant residues or other materials. Mulches protect the surface from the force of falling raindrops.

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Capability unit I–1

This capability unit is made up of deep, level to nearly level, well-drained, gravelly soils. The soils have formed on outwash terraces or beach ridges. They are moderately permeable to air and water and have good water-supplying capacity. Their natural fertility is moderate, and they warm up quickly in spring. The following soils are in capability unit I–1:

Conotton gravelly loam, 0 to 3 percent slopes.
Howard gravelly silt loam, 0 to 3 percent slopes.

Use suitability and management needs.—These soils are suited to intensive cultivation of deep-rooted crops commonly grown in the area. Where the climate is favorable, they are suitable for fruits and vegetables.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular crop. The risk of erosion is slight. You can help to maintain good soil structure and the content of organic matter, however, by adding stable manure or by turning under green-manure crops or other cover crops. Keeping tillage to a minimum will also help.

Capability unit I–2

Unadilla fine sandy loam, 0 to 3 percent slopes, is the only soil in this capability unit. This soil is a deep, level to nearly level, well-drained fine sandy loam. It has formed in stream-terrace materials. The soil is permeable to water and air and has moderate water-supplying capacity. Natural fertility is low. This soil warms up quickly in spring.

Use suitability and management needs.—This soil is suited to intensive cultivation of deep-rooted crops. Where the climate is favorable, it is suitable for early maturing vegetables and fruits. During extended dry seasons the soil may be somewhat droughty.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular crop. After the initial application of lime, add small amounts at frequent intervals to maintain the proper content of lime. A dolomitic lime, which contains magnesium, is best. Replenish the supply of organic matter with succulent material that is high in nitrogen, and keep tillage to a minimum. Plow only when the soils contain plenty of moisture and after the danger of freezing has passed in spring.

Capability unit I–3

This capability unit consists of deep, level to nearly level, well-drained fine sandy loams and silt loams of the

bottom land. The soils have high water-supplying capacity and moderate permeability to water and air. Their natural fertility is high. They are flooded occasionally by streams for short periods late in winter and early in spring. The following soils are in capability unit I–3:

Chagrin fine sandy loam, 0 to 3 percent slopes.
Chagrin silt loam, 0 to 3 percent slopes.
Chagrin silt loam, high bottom, 0 to 3 percent slopes.

Use suitability and management needs.—These soils are suitable for general farm crops, truck crops, and pasture. Occasionally, however, a crop is flooded out. Because their seeds are transported by floodwaters, weeds are frequently a problem on these soils. The soils occur adjacent to sources of water that can be used for irrigation.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular crop. During winter and spring, protect the soils against flood damage by maintaining a cover of plants. Keep tillage to a minimum consistent to the needs of the crop to be grown.

Capability unit IIe–1

This capability unit consists of deep, gently sloping, well-drained gravelly loams and gravelly silt loams formed on outwash terraces, beach ridges, and terminal moraines. The soils have good water-supplying capacity and moderately rapid permeability to water and air. Their natural fertility is moderate, and they warm up quickly in spring. The following soils are in capability unit IIe–1:

Conotton gravelly loam, 3 to 8 percent slopes.
Howard gravelly silt loam, 3 to 8 percent slopes.
Wooster gravelly silt loam, 3 to 12 percent slopes.

Use suitability and management needs.—If protected against erosion, these soils are suited to intensive cultivation of deep-rooted crops. Where the climate is favorable, they are well suited to fruits and vegetables.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular crop. Maintain a high content of organic matter, and keep tillage to a minimum. Control erosion by tilling on the contour, practicing stripcropping, planting cover crops, and using sod waterways.

Capability unit IIe–2

This capability unit consists of deep, well-drained soils that are dominantly coarse sandy loams or fine sandy loams formed in terrace materials. The relief is mainly gently sloping. The soils have weak structure. They are permeable to water and air and have moderate to moderately high water-supplying capacity. Their natural fertility is low, and they warm up quickly in spring. The following soils are in capability unit IIe–2:

Chagrin silt loam, high bottom, 3 to 6 percent slopes.
Conotton coarse sandy loam, 0 to 8 percent slopes.
Conotton gravelly sandy loam, 3 to 8 percent slopes.
Unadilla fine sandy loam, 3 to 8 percent slopes.

Use suitability and management needs.—If protected against erosion, these soils are suitable for intensive cultivation of deep-rooted crops. Where the climate is favorable, they are good for early maturing vegetables and fruits. The soils are suited to irrigation where an adequate source of water is available.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular crop. After the initial application of lime has been made, add small amounts of dolomitic lime at frequent intervals to maintain the proper content of lime. Replenish the supply of organic matter with succulent material that is high in nitrogen, and keep tillage to a minimum. Plow only when the soils contain plenty of moisture and after the danger of freezing has passed in spring. Control erosion through stripcropping and the use of sod waterways. During winter, protect the soil with a cover crop.

Capability unit IIew–1

This capability unit consists of moderately well drained silt loams and gravelly silt loams in glacial till and on gravelly outwash terraces. The relief is mainly gently sloping. The depth of the root zone is limited by a firm, slowly permeable layer that generally begins at depths between 26 and 36 inches. Above this layer the soil material is moderately permeable to water and air. These soils have high water-supplying capacity. Their natural fertility is moderate. The following soils are in capability unit IIew–1:

Langford silt loam, 0 to 8 percent slopes.
Langford silt loam, 0 to 8 percent slopes, moderately eroded.
Mardin gravelly silt loam, 3 to 8 percent slopes.
Phelps gravelly silt loam, 3 to 8 percent slopes.

Use suitability and management needs.—These soils are suitable for general farm crops and pasture. Where the climate is favorable, they are suited to vegetables and fruits.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular crop. Keep the content of organic matter high by planting cover crops and green-manure crops. Control excess surface water through diversion terraces or sod waterways.

Capability unit IIew–2

This capability unit consists of gently sloping, moderately well drained fine sandy loams and gravelly sandy loams that have formed in lacustrine and terrace materials. The depth of the root zone is limited by a firm, slowly permeable layer that generally begins at depths between 26 and 36 inches. Above this layer the soil material is rapidly permeable to water and air. The soils have fair water-supplying capacity. Their natural fertility is low. The following soils are in capability unit IIew–2:

Berrien fine sandy loam, 2 to 8 percent slopes.
Conotton gravelly sandy loam, moderately well drained variant, 3 to 8 percent slopes.
Williamson and Collamer fine sandy loams, 2 to 8 percent slopes.

Use suitability and management needs.—Where the climate is favorable, these soils are suitable for fruits and vegetables. In addition they are suited to the crops commonly cultivated in this area.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular crop. After the initial application of lime, add small amounts of dolomitic lime at frequent intervals to maintain the proper content of lime. Replenish the supply of organic matter by turning under cover crops, and keep tillage to a minimum. Plow only when the soils contain plenty

of moisture and after the danger of freezing has passed in spring. Control excess surface water through diversion terraces and sod waterways.

Capability unit IIew–3

This capability unit consists of moderately well drained silt loams formed in lacustrine, terrace, and bottom-land materials. The relief is mainly gently sloping. The depth of the root zone is limited by a firm, slowly permeable layer that generally begins at depths between 20 and 36 inches. Above this layer the soil material is moderately permeable to water and air. These soils have high water-supplying capacity. Their natural fertility is moderate. The following soils are in capability unit IIew–3:

Lobdell silt loam, high bottom, 3 to 6 percent slopes.
Platea silt loam, moderately well drained variant, 2 to 8 percent slopes.
Scio silt loam, 3 to 8 percent slopes.
Williamson and Collamer silt loams, 2 to 8 percent slopes.

Use suitability and management needs.—These soils are suitable for general farm crops and pasture. Where the climate is favorable, they are suited to vegetables and fruits.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular crop. Keep the content of organic matter high, and protect against erosion by planting cover crops. Control excess surface water through diversion terraces and sod waterways.

Capability unit IIw–1

This capability unit consists of level to nearly level soils. The soils are moderately well drained to somewhat poorly drained, and they are dominantly fine sandy loams or silt loams formed in lacustrine and terrace materials. Where they occur in depressions, they are covered by shallow water during wet seasons. The depth of the root zone is limited by a firm, slowly permeable layer that generally begins at depths between 20 and 36 inches. Above the firm layer the soil material is moderately permeable to water and air. The soils have high water-supplying capacity. Their natural fertility is low to moderate. The following soils are in capability unit IIw–1:

Berrien fine sandy loam, 0 to 2 percent slopes.
Conotton gravelly sandy loam, moderately well drained variant, 0 to 3 percent slopes.
Phelps gravelly silt loam, 0 to 3 percent slopes.
Platea silt loam, moderately well drained variant, 0 to 2 percent slopes.
Scio silt loam, 0 to 3 percent slopes.
Williamson and Collamer fine sandy loams, 0 to 2 percent slopes.
Williamson and Collamer silt loams, 0 to 2 percent slopes.

Use suitability and management needs.—These soils are suitable for general farm crops. Where the climate is favorable, they can be used for vegetables and shallow-rooted fruits.

Apply lime and fertilizer in the amounts indicated by soil tests and according to the needs of the particular crop. Replenish the supply of organic matter with manure or a cover crop, and keep tillage to a minimum. Divert surface water from adjacent slopes. Keep the natural drainageways open, and provide outlets for water that has accumulated in the depressions.

Capability unit IIw–2

This capability unit consists of level to nearly level, moderately well drained silt loams of the bottom land. The thickness of the root zone is limited by a seasonally high water table that is at depths of 20 to 36 inches. Above the water table the soil material is moderately permeable to water and air. These soils have high water-supplying capacity, and their natural fertility is high. They are subject to occasional flooding. The following soils are in capability unit IIw–2:

Lobdell silt loam, high bottom, 0 to 3 percent slopes.
Lobdell silt loam, 0 to 3 percent slopes.

Use suitability and management needs.—These soils are flooded occasionally; this restricts their suitability for crops to some extent. Because of the seasonally high water table, they are not especially suitable for deep-rooted crops.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular crop. During winter and spring, protect the soils against damage from flooding by maintaining a cover of plants.

Capability unit IIIe–1

This capability unit consists of deep, gently sloping to moderately sloping, well-drained gravelly loams and gravelly silt loams on beach ridges, terraces, outwash plains, and terminal moraines. The soils are subject to erosion. Their water-supplying capacity is fair to low, and permeability to water and air is moderately rapid. Natural fertility is moderate, and the soils warm up quickly in spring. The following soils are in capability unit IIIe–1:

Conotton gravelly loam, 3 to 8 percent slopes, severely eroded.
Conotton gravelly loam, 8 to 15 percent slopes.
Howard gravelly silt loam, 3 to 8 percent slopes, severely eroded.
Howard gravelly silt loam, 8 to 15 percent slopes.
Wooster gravelly silt loam, 12 to 20 percent slopes.

Use suitability and management needs.—These soils are suited to general farm crops, including deep-rooted crops. They are also suited to pasture. Where the climate is favorable, they are suitable for orchards and vineyards.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular crop. Maintain a high content of organic matter, and keep tillage to a minimum. Control erosion through contour stripcropping, by the use of diversion terraces and sod waterways, and by planting cover crops. The cover crops will help reduce leaching in these soils.

Capability unit IIIe–2

This capability unit consists of deep, well-drained soils that are dominantly coarse sandy loams or gravelly sandy loams formed in stream-terrace materials. The soils are mainly gently sloping to moderately sloping and are subject to erosion. The water-supplying capacity is fair, and permeability to water and air is moderate to moderately rapid. The soils are moderate to low in natural fertility. They warm up quickly in spring. The following soils are in capability unit IIIe–2:

Chagrin very gravelly loam, fan, 0 to 6 percent slopes.
Conotton coarse sandy loam, 0 to 8 percent slopes, severely eroded.

Conotton coarse sandy loam, 8 to 15 percent slopes.
Conotton gravelly sandy loam, 3 to 8 percent slopes, severely eroded.
Conotton gravelly sandy loam, 8 to 15 percent slopes.
Unadilla fine sandy loam, 3 to 8 percent slopes, severely eroded.
Unadilla fine sandy loam, 8 to 15 percent slopes.

Use suitability and management needs.—These soils are suited to deep-rooted general farm crops. Where the climate is favorable, they are suitable for early maturing vegetables and fruits. During dry periods yields of shallow-rooted pasture plants are low.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular crop. After the initial application of lime, add small amounts at frequent intervals to maintain the proper content of lime. Replenish the supply of organic matter, and keep tillage to a minimum. Plow only when the soils contain plenty of moisture and after the danger of freezing has passed in spring. Control erosion through contour stripcropping, by the use of diversion terraces and sod waterways, and by planting cover crops. The cover crops will help reduce leaching in these soils.

Capability unit IIIew–1

This capability unit consists of gently sloping to moderately sloping soils. The soils are moderately well drained and are dominantly silt loams and gravelly silt loams formed in glacial till and on gravelly terraces. The depth of the root zone is limited by a firm, slowly permeable layer that generally begins at depths between 26 and 36 inches. Above this layer the soil material is moderately permeable to air and water. These soils have high water-supplying capacity. Their natural fertility is moderate. The following soils are in capability unit IIIew–1:

Conotton gravelly sandy loam, moderately well drained variant, 3 to 8 percent slopes, severely eroded.
Langford silt loam, 8 to 15 percent slopes.
Langford silt loam, 8 to 15 percent slopes, moderately eroded.
Mardin gravelly silt loam, 3 to 8 percent slopes, severely eroded.
Mardin gravelly silt loam, 8 to 15 percent slopes.
Phelps gravelly silt loam, 3 to 8 percent slopes, severely eroded.
Phelps gravelly silt loam, 8 to 15 percent slopes.

Use suitability and management needs.—These soils are suited to general farm crops and pasture. Where the climate is favorable, they are suitable for fruits and vegetables.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular crop. Maintain a high content of organic matter. Protect against erosion by controlling excess surface water through contour tillage and the use of diversion terraces and sod waterways. Also, plant a cover crop to protect the soils in cultivated fields during the winter.

Capability unit IIIew–2

This capability unit consists of gently sloping to moderately sloping, moderately well drained fine sandy loams formed in lacustrine materials. The soils have weak to moderate structure. The depth of the root zone is limited by a firm, slowly permeable layer that generally begins at depths between 18 and 36 inches. Above this layer the soil material is moderately permeable to water and air. These soils have fair to moderate water-supplying capacity. Their natural fertility is low. The following soils are in capability unit IIIew–2:

Berrien fine sandy loam, 2 to 8 percent slopes, severely eroded.
Berrien fine sandy loam, 8 to 15 percent slopes.
Williamson and Collamer fine sandy loams, 2 to 8 percent slopes, severely eroded.
Williamson and Collamer fine sandy loams, 8 to 15 percent slopes.

Use suitability and management needs.—These soils are suitable for fruits and vegetables. In addition they are suited to general farm crops.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular crop. After the initial application of lime, add small amounts of dolomitic lime at frequent intervals to maintain the proper content of lime. Replenish the supply of organic matter with succulent material that is high in nitrogen, and keep tillage to a minimum. Plow only when the soils contain plenty of moisture and after the danger of freezing has passed in spring. Protect against erosion by controlling excess surface water through contour tillage and by the use of diversion terraces and sod waterways.

Capability unit IIIew–3

This capability unit consists of moderately sloping, moderately well drained silt loams formed in lacustrine silts, glacial till, and stream terrace deposits. The depth of the root zone is limited by a firm, very slowly permeable layer that generally begins at depths between 18 and 30 inches. Above the firm layer the soil material is slowly permeable to water and air. These soils have high water-supplying capacity. They warm up slowly in spring. Their natural fertility is moderate. The following soils are in capability unit IIIew–3:

Mahoning silt loam, 8 to 15 percent slopes.
Mahoning silt loam, 8 to 15 percent slopes, moderately eroded.
Platea silt loam, moderately well drained variant, 8 to 15 percent slopes.
Scio silt loam, 8 to 15 percent slopes.
Williamson and Collamer silt loams, 8 to 15 percent slopes.

Use suitability and management needs.—These soils are suitable for general farm crops and pasture. Where the climate is favorable, they can be used to grow shallow-rooted fruits and vegetables.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular crop. Maintain a high content of organic matter. Protect against erosion by controlling excess surface water through contour tillage and the use of diversion terraces and sod waterways and by growing cover crops.

Capability unit IIIew–4

This capability unit consists of gently sloping to moderately sloping, poorly drained loams and fine sandy loams formed in lacustrine and terrace materials. The depth of the root zone is limited by a firm, slowly permeable layer that generally begins at depths between 12 and 18 inches. Above this layer the soil material is moderately permeable to water and air. The soils have good water-supplying capacity. They warm up slowly in spring. Their natural fertility is moderate. The following soils are in capability unit IIIew–4:

Fredon loam, 3 to 8 percent slopes.
Rimer fine sandy loam, 2 to 8 percent slopes.

Rimer fine sandy loam, 2 to 8 percent slopes, severely eroded.
Wallington fine sandy loam, 2 to 8 percent slopes.
Wallington fine sandy loam, 2 to 8 percent slopes, severely eroded.
Wallington fine sandy loam, 8 to 15 percent slopes.

Use suitability and management needs.—These soils are suitable for general farm crops that have shallow roots. Where the climate is favorable, they are suited to vegetables and grapevines.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular crop. Maintain a good supply of organic matter. Plow after the danger of freezing has passed in spring. Keep tillage to a minimum. Protect against erosion by controlling excess surface water through the use of diversion terraces and sod waterways and by planting cover crops. Because of the unstable subsoil, closed, or underground, drains are difficult to install in these soils; open drains are used more commonly.

Capability unit IIIew–5

This capability unit consists of gently sloping to moderately sloping, somewhat poorly drained silt loams and gravelly silt loams of the upland. The soils have formed in acid glacial till. The depth of the root zone is limited by a firm, very slowly permeable layer that generally begins at depths between 12 and 18 inches. Above the firm layer the soil material is slowly permeable to water and air. These soils have fair water-supplying capacity. They warm up slowly in spring. Their natural fertility is low. The following soils are in capability unit IIIew–5:

Volusia gravelly silt loam, 3 to 8 percent slopes.
Volusia gravelly silt loam, 8 to 15 percent slopes.
Volusia silt loam, 3 to 8 percent slopes.
Volusia silt loam, 8 to 15 percent slopes.

Use suitability and management needs.—These soils are suited to general farm crops and pasture. Where the climate is favorable, they are suitable for vineyards.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular crop. Maintain a high content of organic matter. In vineyards, increase the supply of organic matter and prevent soil losses by turning under green-manure and cover crops. Protect against erosion by controlling excess surface water through contour tillage and through the use of diversion terraces and sod waterways.

Capability unit IIIew–6

This capability unit consists of gently sloping to moderately sloping, somewhat poorly drained to poorly drained silt loams. The soils have formed in neutral to calcareous glacial till of the upland. On the gently sloping soils, shallow surface water remains in the depressions during wet seasons. The depth of the root zone is limited by a firm, very slowly permeable layer that generally begins at depths between 12 and 18 inches. Above this layer the soil material is slowly permeable to water and air. The soils have good water-supplying capacity. They warm up slowly in spring. Their natural fertility is high to moderate. The following soils are in capability unit IIIew–6:

Dalton silt loam, 2 to 8 percent slopes.
Dalton silt loam, 2 to 8 percent slopes, moderately eroded.
Erie silt loam, 3 to 8 percent slopes.
Erie silt loam, 3 to 8 percent slopes, moderately eroded.
Erie silt loam, 8 to 15 percent slopes.
Erie silt loam, 8 to 15 percent slopes, moderately eroded.

Use suitability and management needs.—If not drained, these soils are suited primarily to small grains, grasses, and shallow-rooted legumes grown for hay or pasture. They can be used for row crops if drainage is improved and erosion is controlled.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular crop. Maintain a high content of organic matter by growing grasses and legumes; the organic matter will, in turn, help maintain a favorable soil structure. Provide drainage outlets for the water in depressions, and keep the natural drainageways open. Use a random system of tile drainage in wet spots; in general, a complete system of tile drainage is not needed. Protect against erosion by controlling excess surface water on long slopes through graded stripcropping and the use of diversion terraces and sod waterways.

Capability unit IIIw–1

This capability unit consists of level to nearly level, poorly drained silt loams formed in neutral to calcareous lacustrine deposits and glacial till. Where they occur in depressions, the soils are covered by shallow water during wet seasons. The depth of the root zone for most crops is limited by a firm, very slowly permeable layer that generally begins at depths between 10 and 15 inches. The soils have good water-supplying capacity. They warm up slowly in spring. Their natural fertility is high to moderate. The following soils are in capability unit IIIw–1:

Dalton silt loam, 0 to 2 percent slopes.
Erie silt loam, 0 to 3 percent slopes.
Platea silt loam, 0 to 2 percent slopes.
Wallington silt loam, 0 to 2 percent slopes.

Use suitability and management needs.—If not drained, these soils are suitable for general farm crops that have shallow roots. Where they have been drained effectively, the soils can be used for row crops.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular crop. Maintain a high content of organic matter. Keep the natural drainageways open, and provide drainage outlets for the water in depressions. Divert surface water from adjacent higher lying areas. Use a random system of tile drainage in wet spots; in general, a complete system of tile drainage is not needed.

Capability unit IIIw–2

This capability unit consists of level to nearly level, poorly drained fine sandy loams formed in lacustrine materials. Where they occur in depressions, the soils are covered by shallow water during wet seasons. They have weak structure. The depth of the root zone is limited by a firm, slowly permeable layer that generally begins at depths between 10 and 18 inches. Above this layer the soil material is moderately permeable to water and air. The soils have good water-supplying capacity. They warm up slowly in spring. Their natural fertility is low. The following soils are in capability unit IIIw–2:

Rimer fine sandy loam, 0 to 2 percent slopes.
Wallington fine sandy loam, 0 to 2 percent slopes.

Use suitability and management needs.—These soils are suitable for general farm crops that have very shallow roots. If artificially drained, they are suited to all general farm crops grown in the area. Where the climate is favorable, the soils are suited to vineyards.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular crop. Maintain a high content of organic matter. Plow after the danger of freezing has passed in spring, and keep tillage to a minimum. Keep the natural drainageways open, and provide drainage outlets for water in depressions. Divert surface water from adjacent higher lying areas. The subsoil is unstable when wet; consequently, closed, or underground, drains are difficult to install in these soils. Open ditches are used more commonly than underground drains.

Capability unit IIIw–3

This capability unit consists of level to nearly level, very poorly drained loams and fine sandy loams formed in lacustrine and terrace materials. Where they occur in depressions, the soils are covered by shallow water for long periods during and following wet seasons. The depth of the root zone is limited by a seasonally high water table that, at times, is at the surface or may be at depths of as much as 12 inches. Above the water table the soil material is slowly to moderately permeable to water and air. These soils have good water-supplying capacity. They warm up very slowly in spring. Their natural fertility is moderate to low. The following soils are in capability unit IIIw–3:

Halsey loam, 0 to 3 percent slopes.
Wauseon fine sandy loam, 0 to 2 percent slopes.

Use suitability and management needs.—These soils are suitable for general farm crops that have shallow roots. With effective artificial drainage, they are suited to all of the general farm crops and to pasture.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular crop. Maintain a high content of organic matter. Keep the natural drainageways open, and divert surface water from adjacent higher lying areas. Underground drains are effective in these soils.

Capability unit IIIw–4

This capability unit consists of level to nearly level, poorly drained gravelly silt loams and silt loams formed in acid glacial till of the upland. Where they occur in depressions, the soils are covered by shallow water during wet seasons. The depth of the root zone is limited by a firm, slowly permeable layer that generally begins at depths between 10 and 18 inches. Above this layer the soil material is moderately permeable to water and air. The soils have fair water-supplying capacity. They warm up slowly in spring. Their natural fertility is low. The following soils are in capability unit IIIw–4:

Volusia gravelly silt loam, 0 to 3 percent slopes.
Volusia silt loam, 0 to 3 percent slopes.

Use suitability and management needs.—These soils are suitable for general farm crops that have shallow roots. They are also suitable for pasture. If drained effectively, they can be used for all general farm crops. Where the climate is favorable, the soils are suited to vineyards.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular crop. Maintain a high content of organic matter. Keep the natural drainageways open, and provide drainage outlets for the water in depressions. Divert surface water from adjacent, higher lying areas.

Capability unit IIIw–5

This capability unit consists of level to nearly level, predominantly poorly drained silt loams and loams formed in lacustrine deposits, glacial till, and terrace materials. Where they occur in depressions, the soils are covered by shallow water for long periods during wet seasons. The depth of the root zone is limited by a seasonally high water table that generally begins at depths between 10 and 18 inches. Above the water table the soil material is slowly to moderately permeable to water and air. The soils have high water-supplying capacity. They warm up slowly in spring. Their natural fertility is high. The following soils are in capability unit IIIw–5:

Caneadea silt loam, 0 to 2 percent slopes.
Fredon loam, 0 to 3 percent slopes.

Use suitability and management needs.—These soils are suitable for general farm crops that have shallow roots. They are also suitable for pasture. If drained effectively, the soils can be used for row crops common to the area. Where the climate is favorable, the Fredon soil is suited to grapevines.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular crop. Maintain a high content of organic matter. Keep the natural drainageways open, and provide drainage outlets for the water in depressions. Divert surface water from adjacent higher lying areas. Plow early in fall to permit freezing of the plow layer.

Capability unit IIIwe–1

This capability unit consists of gently sloping, somewhat poorly drained silt loams formed in lacustrine deposits and glacial till. Where they occur in depressions, the soils are covered with shallow water during wet seasons. The depth of the root zone is limited by a compact, very slowly permeable layer that generally begins at depths between 18 and 26 inches. Above this layer the soil material is slowly permeable to water and air. The soils have high water-supplying capacity. They warm up slowly in spring. Their natural fertility is high. The following soils are in capability unit IIIwe–1:

Caneadea silt loam, 2 to 8 percent slopes.
Mahoning silt loam, 3 to 8 percent slopes.
Mahoning silt loam, 3 to 8 percent slopes, moderately eroded.

Use suitability and management needs.—These soils are suitable for general farm crops that have shallow roots. They are also suitable for pasture. If drained effectively, the soils are suited to other general crops.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular crop. Maintain a high content of organic matter. Keep the natural drainageways open, and provide drainage outlets for the water in depressions. Control excess surface water and protect the soils against erosion by using diversion terraces and sod waterways.

Capability unit IIIwe-2

This capability unit consists of gently sloping to moderately sloping, somewhat poorly drained to poorly drained silt loams. The soils have formed in lacustrine deposits and glacial till. During wet seasons shallow water remains in depressions in the gently sloping soils. The depth of the root zone is limited by a compact, very slowly permeable layer that generally begins at depths between 12 and 26 inches. Above this layer the soil material is slowly permeable to water and air. These soils have high water-supplying capacity. They warm up slowly in spring. The natural fertility is high. The following soils are in capability unit IIIwe–2:

Platea silt loam, 2 to 8 percent slopes.
Platea silt loam, 8 to 15 percent slopes.
Wallington silt loam, 2 to 8 percent slopes.
Wallington silt loam, 8 to 15 percent slopes.

Use suitability and management needs.—These soils are suited to general farm crops that have shallow roots. They are also suited to pasture. Artificial drainage will make them more suitable for cultivated crops. Where the climate is favorable, the soils are suitable for vineyards.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular crop. Maintain a high content of organic matter, preferably by adding mature, coarse organic material. Keep the natural drainageways open, and provide drainage outlets for the water in depressions. Control excess surface water and protect the soils against erosion by graded stripcropping and the use of diversion terraces and sod waterways.

Capability unit IIIs–1

This capability unit consists of deep, level to moderately sloping, droughty, sandy soils formed in lacustrine materials. The soils are rapidly permeable to water and air and have low water-supplying capacity. Their natural fertility is low. The soils warm up quickly in spring. The following soils are in capability unit IIIs–1:

Ottawa fine sandy loam, 0 to 2 percent slopes.
Ottawa fine sandy loam, 2 to 8 percent slopes.
Ottawa fine sandy loam, 2 to 8 percent slopes, severely eroded.
Ottawa fine sandy loam, 8 to 15 percent slopes.
Ottawa loamy fine sand, 0 to 2 percent slopes.
Ottawa loamy fine sand, 2 to 8 percent slopes.
Ottawa loamy fine sand, 2 to 8 percent slopes, severely eroded.
Ottawa loamy fine sand, 8 to 15 percent slopes.

Use suitability and management needs.—These soils are suitable for early maturing vegetables and fruits. They are too droughty for high yields of small grains and permanent pasture. The soils can be irrigated, but they require frequent applications of small amounts of water.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular crop. Add small amounts of lime, preferably dolomitic lime, at frequent intervals, because lime and soluble plant nutrients leach rapidly from the root zones of these soils. Replenish the supply of organic matter, and keep tillage to a minimum. Plow only when the soils contain plenty of moisture and after the danger of freezing has passed in spring. Conserve water through contour stripcropping and the use of sod waterways.

Capability unit IVe–1

This capability unit consists of deep, well-drained, moderately sloping to strongly sloping, gravelly and sandy soils formed in lacustrine, terrace, and morainic deposits. The soils are droughty and are subject to erosion. They have weak to moderate structure. They are moderately permeable to water and air and have moderate to fair water-supplying capacity. The soils warm up quickly in spring. Their natural fertility is moderate to low. The following soils are in capability unit IVe–1:

Conotton coarse sandy loam, 15 to 25 percent slopes.
Conotton gravelly loam, 8 to 15 percent slopes, severely eroded.
Conotton gravelly sandy loam, 15 to 25 percent slopes.
Howard gravelly silt loam, 15 to 25 percent slopes.
Wooster gravelly silt loam, 20 to 30 percent slopes.

Use suitability and management needs.—Because of the risk of erosion, these soils are best restricted to limited cultivation. Shallow-rooted pasture plants produce low yields during dry seasons.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular crop. Choose seeding mixtures or planting stock that will tolerate a somewhat droughty soil. Reseed the pastures in contour strips. Divert surface water away from gullies.

Capability unit IVew–1

This capability unit consists of moderately sloping to strongly sloping, moderately well drained fine sandy loams formed in lacustrine materials. The soils are subject to erosion. The depth of the root zone is limited by a firm, slowly permeable layer that generally begins at depths between 18 and 36 inches. Above this layer the soil material is rapidly permeable to water and air. The soils have fair to moderate water-supplying capacity. Their natural fertility is low. The following soils are in capability unit IVew–1:

Berrien fine sandy loam, 8 to 15 percent slopes, severely eroded.
Berrien fine sandy loam, 15 to 25 percent slopes.
Williamson and Collamer fine sandy loams, 8 to 15 percent slopes, severely eroded.
Williamson and Collamer fine sandy loams, 15 to 25 percent slopes.

Use suitability and management needs.—Because of the risk of erosion, these soils are best used for permanent hay crops or as woodland. Cultivated crops may be grown occasionally. In midseason the soils are somewhat droughty for high yields of permanent pasture.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular crop. After the initial application of lime, add small amounts at frequent intervals to maintain the proper content of lime. Reseed pastures in contour strips. Divert surface water away from gullies.

Capability unit IVew–2

This capability unit consists mainly of gently sloping to moderately sloping, moderately well drained silt loams and gravelly silt loams formed in glacial till and gravelly terrace materials. The soils are subject to erosion. The depth of the root zone is limited by a firm, slowly permeable layer that generally begins at depths between 20 and 30 inches. Above this layer the soil material is

moderately permeable to water and air. The soils have good water-supplying capacity. Their natural fertility is moderate. The following soils are in capability unit IVew–2:

Langford silt loam, 0 to 8 percent slopes, severely eroded.
Langford silt loam, 8 to 15 percent slopes, severely eroded.
Langford silt loam, 15 to 25 percent slopes.
Langford silt loam, 15 to 25 percent slopes, moderately eroded.
Mardin gravelly silt loam, 8 to 15 percent slopes, severely eroded.
Mardin gravelly silt loam, 15 to 25 percent slopes.
Phelps gravelly silt loam, 8 to 15 percent slopes, severely eroded.
Platea silt loam, moderately well drained variant, 15 to 25 percent slopes.

Use suitability and management needs.—Because of the risk of erosion, these soils are best used for hay crops, pasture, or woodland. They can be used for cultivated crops grown in long rotations.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular crop. Replenish the supply of organic matter by turning under cover crops and crop residues. Reseed pastures in contour strips. Divert surface water to suitable outlets.

Capability unit IVew–3

This capability unit consists of gently sloping to strongly sloping, moderately well drained to poorly drained silt loams. The soils have formed in lacustrine deposits, glacial till, and terrace materials. They are subject to erosion. The depth of the root zone is limited by a firm, very slowly permeable layer that generally begins at depths between 18 and 26 inches. Above this layer the soil material is slowly permeable to water and air. The soils have high water-supplying capacity. They warm up slowly in spring. Their natural fertility is high to moderate. The following soils are in capability unit IVew–3:

Caneadea silt loam, 8 to 15 percent slopes.
Caneadea silt loam, 15 to 25 percent slopes.
Mahoning silt loam, 8 to 15 percent slopes, severely eroded.
Platea silt loam, 15 to 25 percent slopes.
Platea silt loam, moderately well drained variant, 2 to 8 percent slopes, severely eroded.
Platea silt loam, moderately well drained variant, 8 to 15 percent slopes, severely eroded.
Scio silt loam, 8 to 15 percent slopes, severely eroded.
Trumbull silt loam, 8 to 15 percent slopes.
Trumbull silt loam, 8 to 15 percent slopes, moderately eroded.

Use suitability and management needs.—Because of the risk of erosion, these soils are best suited to permanent hay crops, pasture, or woodland. They can be used for cultivated crops grown in a long rotation.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular crop. Choose a seeding mixture or planting stock that will tolerate somewhat poor drainage. Control surface water through diversion terraces. Reseed pastures in contour strips.

Capability unit IVw–1

This capability unit consists of level to gently sloping, poorly drained to very poorly drained silt loams. The soils are neutral to slightly acid and have formed in glacial till and lacustrine materials. They are in depressions and seep spots of the upland and are covered with water for long periods during and following wet seasons. The depth of the root zone is limited by a seasonally high water table that is at depths between 6 and 10 inches. Above the water table the soil material is slowly permeable to water and air. The soils have high water-supplying capacity. They warm up slowly in spring. Their natural fertility is high. The following soils are in capability unit IVw–1:

Birdsall silt loam, 0 to 2 percent slopes.
Birdsall silt loam, 2 to 4 percent slopes.
Canadice silt loam, 0 to 2 percent slopes.
Canadice silt loam, 2 to 8 percent slopes.
Ellery and Alden silt loams, 0 to 4 percent slopes.
Miner silt loam, 0 to 3 percent slopes.
Trumbull silt loam, 0 to 3 percent slopes.
Trumbull silt loam, 3 to 8 percent slopes.
Trumbull silt loam, 3 to 8 percent slopes, moderately eroded.

Use suitability and management needs.—Because of very poor surface drainage, these soils are best suited to permanent hay crops, pasture, or woodland. With adequate artificial drainage, they can be used in a rotation that includes row crops.

Apply lime and fertilizer in amounts indicated by soil tests and according to the requirements of the particular crop. Keep the natural drainageways open, and provide drainage outlets for water in depressions. Divert the surface water in adjacent areas away from depressions in these soils. Choose a seeding mixture or planting stock that tolerates ponding of surface water.

Capability unit IVw–2

This capability unit consists of level, very poorly drained, fine-textured, organic soils that are at least 18 inches thick. Only one mapping unit, Muck and Peat, is in the unit. During wet seasons the soils are covered with water. The depth of the root zone is limited by a seasonally high water table that occurs at the surface or at depths of as much as 12 inches. Above the water table the soil material is rapidly permeable to water and air. The soils have high water-supplying capacity. Their natural fertility is high.

Use suitability and management needs.—Very poor surface drainage and a high water table restrict the use of these organic soils. The soils are not extensive in this county, and it is expensive to develop them for agriculture. Individual areas should be studied to determine whether reclaiming these soils would be practical. If improved through artificial drainage, the soils are suitable for the intensive growing of vegetables and small fruits. If too much water is drained off, however, the surface soil will shrink and the land will become lower.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the crop to be grown. To prevent the shrinking of the organic materials, control the level of the water table through proper drainage and keep tillage to a minimum. Divert the surface water in adjacent areas away from these soils or into adequate channels.

Capability unit IVws–1

This capability unit consists of shallow, gently sloping to moderately sloping, poorly drained silt loams formed in glacial till. Where they occur in depressions, the gently sloping soils are covered by shallow water during wet seasons. The depth of the root zone is limited by a seasonally high water table that generally occurs at depths between 6 and 10 inches. It is also limited by the

weathered shale that begins between depths of about 10 and 18 inches. Above the water table the soil material is slowly permeable to water and air. The soils have fair water-supplying capacity. They warm up slowly in spring. Their natural fertility is moderate. The following soils are in capability unit IVws–1:

Allis silt loam, 3 to 8 percent slopes.
Allis silt loam, 8 to 15 percent slopes.

Use suitability and management needs.—These soils are suitable for general farm crops that have shallow roots. They are also suitable for pasture. Where the climate is especially favorable, they are moderately suited to vineyards.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular crop. Maintain a high content of organic matter. Keep the natural drainageways open, and provide drainage outlets for water in depressions. Divert excess water through sod waterways.

Capability unit IVws–2

Allis silt loam, 0 to 3 percent slopes, is the only soil in this capability unit. This is a level to nearly level, shallow, poorly drained soil formed in glacial till. Where it occurs in depressions, it is covered by shallow water for several days during and following wet seasons. The depth of the root zone is limited by a seasonally high water table that occurs at depths of 6 to 10 inches. It is also limited by weathered shale that begins between depths of 10 and 18 inches. Above the water table the soil material is slowly permeable to water and air. The soil has fair water-supplying capacity. It warms up very slowly in spring. Natural fertility is moderate to low.

Use suitability and management needs.—This soil is suited to general farm crops that have very shallow roots. It is also suited to pasture. Where the climate is favorable, the soil is suitable for vineyards.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular crop. Maintain a high content of organic matter, preferably by adding a mature, coarse organic material. Keep the natural drainageways open, and provide drainage outlets for the water in depressions. Divert surface water from higher lying adjacent areas away from this soil.

Capability unit IVs–1

Only one mapping unit, Manlius and Lordstown soils, shallow, 8 to 25 percent slopes, is in this capability unit. These soils are shallow, moderately sloping to strongly sloping, and well drained. They are medium textured and are shallow over bedrock. The depth of the root zone is limited by shale bedrock that generally begins at depths of 12 to 18 inches. The soil material above the shale is moderately permeable to water and air. The soils have low water-supplying capacity. Their natural fertility is low.

Use suitability and management needs.—Because of the risk of erosion, these shallow soils are best used for permanent hay crops, pasture, or woodland. They can be cultivated occasionally when used in a long rotation. Shallow-rooted pasture plants produce low yields during dry seasons.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular crop. Choose a seeding mixture or planting stock that will tolerate droughty soil. Keep tillage to a minimum, and cultivate only on the contour for reseeding. Divert surface water from higher lying areas away from these soils.

Capability unit VIe–1

This capability unit consists of moderately sloping to strongly sloping, well-drained, severely eroded coarse sandy loams, gravelly silt loams, and fine sandy loams. The soils are low in organic matter and have fair to moderate water-supplying capacity. They are rapidly permeable to water and air. Gullies are common in most of these soils. The following soils are in capability unit VIe–1:

Conotton gravelly sandy loam, 8 to 15 percent slopes, severely eroded.
Conotton coarse sandy loam, 8 to 15 percent slopes, severely eroded.
Conotton coarse sandy loam, 15 to 25 percent slopes, severely eroded.
Howard gravelly silt loam, 8 to 15 percent slopes, severely eroded.
Howard gravelly silt loam, 15 to 25 percent slopes, severely eroded.
Unadilla fine sandy loam, 8 to 15 percent slopes, severely eroded.

Use suitability and management needs.—These severely eroded soils are best kept in permanent vegetation, but they are too droughty for high yields of pasture.

Apply lime and fertilizer as indicated by soil tests. Increase and maintain the supply of organic matter. Choose a seeding mixture or planting stock that will tolerate a droughty soil. Plow only when the hayfields or pastures need to be reseeded. Divert surface water into protected channels, and control gully erosion. Some gullies may need to be filled in to permit the use of farm machinery.

Capability unit VIe–2

This capability unit consists of level to nearly level, well drained to moderately well drained fine sandy loams and silt loams of the flood plains. The soils are subject to overflow by streams and have been severely damaged through erosion. The depth of the root zone is limited by a water table that occurs at depths of 26 inches or more. The soils are moderately permeable to water and air, and they have good water-supplying capacity. Their natural fertility is high. The following soils are in capability unit VIe–2:

Chagrin fine sandy loam, 0 to 3 percent slopes, severely eroded.
Lobdell silt loam, 0 to 3 percent slopes, severely eroded.

Use suitability and management needs.—Because of the hazards of flooding and erosion, these soils are best kept under permanent vegetation.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular hay or pasture crop. Choose seeding mixtures that will tolerate ponding of water for short periods. Plow only when it is necessary to reseed the hayfields or pastures. Use a nurse crop when reseeding, and reseed late in spring after the danger of the most serious floods has passed. Keep the natural floodways free of obstructions. Keep the surface as smooth as feasible to reduce the turbulence of floodwaters and to lessen the damage done by scouring.

Capability unit VIew-1

This capability unit consists mainly of nearly level to strongly sloping silt loams and gravelly silt loams. The soils are poorly drained to moderately well drained and have formed in lacustrine deposits and in glacial till. They have lost most of their surface layer through erosion. The depth of the root zone is limited by a compact, very slowly permeable layer that generally begins at depths between 6 and 18 inches. Above this layer the soil material is slowly permeable. The soils have high water-supplying capacity. They warm up slowly in spring. Their natural fertility is high. The following soils are in capability unit VIew-1:

Canadice silt loam, 2 to 8 percent slopes, severely eroded.
Caneadea silt loam, 2 to 8 percent slopes, severely eroded.
Caneadea silt loam, 8 to 15 percent slopes, severely eroded.
Caneadea silt loam, 15 to 25 percent slopes, severely eroded.
Mardin gravelly silt loam, 15 to 25 percent slopes, severely eroded.
Platea silt loam, 2 to 8 percent slopes, severely eroded.
Platea silt loam, 8 to 15 percent slopes, severely eroded.
Platea silt loam, 15 to 25 percent slopes, severely eroded.
Platea silt loam, moderately well drained variant, 15 to 25 percent slopes, severely eroded.
Trumbull silt loam, 0 to 3 percent slopes, severely eroded.
Trumbull silt loam, 3 to 8 percent slopes, severely eroded.
Trumbull silt loam, 8 to 15 percent slopes, severely eroded.
Wallington silt loam, 2 to 8 percent slopes, severely eroded.

Use suitability and management needs.—Because of the effects of erosion, these soils are suitable only for permanent hay crops, pasture, or woodland.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular hay or pasture crop. Choose a seeding mixture or planting stock that will tolerate poor drainage. Plow the hayfields or pastures only when they need to be reseeded. Improve the tilth of the soils by plowing deep and turning under coarse crop residues. Cultivate on the contour for reseeding. Divert excess surface water into suitable drainageways.

Capability unit VIew-2

This capability unit consists mainly of gently sloping to strongly sloping, poorly drained, erodible silt loams and gravelly silt loams. The soils have formed in glacial till of the upland. The depth of the root zone is limited by a firm, very slowly permeable layer that generally begins at depths between 10 and 18 inches. Above this layer the soil material is slowly permeable to water and air. The soils have fair water-supplying capacity. They warm up slowly in spring. Their natural fertility is moderate to low. The following soils are in capability unit VIew-2:

Erie silt loam, 3 to 8 percent slopes, severely eroded.
Erie silt loam, 8 to 15 percent slopes, severely eroded.
Erie silt loam, 15 to 25 percent slopes.
Erie silt loam, 15 to 25 percent slopes, moderately eroded.
Volusia gravelly silt loam, 3 to 8 percent slopes, severely eroded.
Volusia gravelly silt loam, 8 to 15 percent slopes, severely eroded.
Volusia gravelly silt loam, 15 to 25 percent slopes.
Volusia silt loam, 0 to 8 percent slopes, severely eroded.
Volusia silt loam, 8 to 15 percent slopes, severely eroded.
Volusia silt loam, 15 to 25 percent slopes.

Use suitability and management needs.—Because of the risk of erosion and the poor drainage, these soils are best used for permanent hay crops, pasture, or woodland.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular hay or pasture crop. Choose a seeding mixture or planting stock that will tolerate poor drainage. Plow only to reseed the hayfields or pastures. Cultivate on the contour for reseeding. Divert surface water into suitable waterways.

Capability unit VIew-3

This capability unit consists of moderately sloping to strongly sloping, erodible fine sandy loams formed in lacustrine materials. The soils are moderately well drained to poorly drained. The depth of the root zone is limited by a firm, slowly permeable layer that generally begins at depths between 10 and 18 inches. Above this layer the soil material is moderately permeable to water and air. The soils have fair water-supplying capacity. They warm up slowly in spring. Their natural fertility is low. The following soils are in capability unit VIew-3:

Wallington fine sandy loam, 8 to 15 percent slopes, severely eroded.
Wallington fine sandy loam, 15 to 25 percent slopes.
Wallington fine sandy loam, 15 to 25 percent slopes, severely eroded.
Williamson and Collamer fine sandy loams, 15 to 25 percent slopes, severely eroded.

Use suitability and management needs.—Because of the effects of erosion and poor drainage, these soils are best used for permanent hay crops, pasture, or woodland. In midseason they are somewhat droughty for high yields of pasture.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular hay or pasture crop. Choose a seeding mixture or planting stock that will tolerate poor drainage. Plow only to reseed the hayfields or pastures. Cultivate on the contour for reseeding. Divert surface water into suitable waterways.

Capability unit VIew-4

This capability unit consists of shallow, level to strongly sloping, poorly drained, erodible silt loams formed in glacial till. The depth of the root zone is limited by a seasonally high water table that occurs at depths between 6 and 10 inches. It is also limited by weathered shale that begins at depths between 10 and 18 inches. Above the water table the soil material is slowly permeable to water and air. The soils have fair water-supplying capacity. They warm up slowly in spring. Their natural fertility is moderate to low. The following soils are in capability unit VIew-4:

Allis silt loam, 0 to 3 percent slopes, severely eroded.
Allis silt loam, 3 to 8 percent slopes, severely eroded.
Allis silt loam, 8 to 15 percent slopes, severely eroded.
Allis silt loam, 15 to 25 percent slopes.
Allis silt loam, 15 to 25 percent slopes, severely eroded.

Use suitability and management needs.—Because of the effects of erosion, these shallow soils are best used for permanent hay crops, pasture, or woodland.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular hay or pasture crop. Choose a seeding mixture or planting stock that will tolerate poor drainage. Plow only to reseed the hayfields or pastures. Cultivate on the contour for reseeding. Divert surface water into suitable waterways.

Capability unit VIw–1

This capability unit consists of level to nearly level, mainly poorly drained to very poorly drained silty clay loams and silt loams of the flood plains. The soils are flooded very frequently. They are ponded longer than the other soils of the flood plains, remaining under water for long periods during and following the flood season. The depth of the root zone is limited by a seasonally high water table. The water table is at the surface or at depths of as much as 12 inches. Above the water table the soil material is slowly permeable to water and air. The soils have a high water-supplying capacity. Their natural fertility is high. The following soils are in capability unit VIw–1:

Sloan silty clay loam, 0 to 3 percent slopes.
Wayland silt loam, 0 to 3 percent slopes.

Use suitability and management needs.—Because of frequent flooding and poor surface drainage, these soils are best used for permanent pasture or woodland. Maintain a vigorous stand of plants to control erosion by floodwaters. Keep the natural drainageways open.

Capability unit VIs–1

This capability unit consists of deep, moderately sloping to strongly sloping, droughty, erodible, sandy soils formed in lacustrine materials. They are rapidly permeable to water and air and have low water-supplying capacity. The soils warm up quickly in spring. Their natural fertility is low. The following soils are in capability unit VIs–1:

Ottawa fine sandy loam, 8 to 15 percent slopes, severely eroded.
Ottawa fine sandy loam, 15 to 25 percent slopes.
Ottawa fine sandy loam, 15 to 25 percent slopes, severely eroded.
Ottawa loamy fine sand, 8 to 15 percent slopes, severely eroded.
Ottawa loamy fine sand, 15 to 25 percent slopes.
Ottawa loamy fine sand, 15 to 25 percent slopes, severely eroded.

Use suitability and management needs.—Because of droughtiness and the effects of erosion, these soils are best used for permanent hay crops or woodland. They are too droughty for high yields of permanent pasture.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular hay crop. Add small amounts of lime, preferably a dolomitic lime, at frequent intervals, because lime and soluble plant nutrients leach rapidly from the root zones of these soils. Choose a seeding mixture or planting stock that will tolerate droughty soils. Plow only to reseed hayfields or pastures. Cultivate on the contour in reseeding. Divert surface water into suitable waterways.

Capability unit VIIe–1

The only soil in the capability unit is Allis silt loam, 25 to 45 percent slopes. This is a shallow, steep, poorly drained soil formed in glacial till. The depth of the root zone is limited by a seasonally high water table that occurs at depths between 4 and 8 inches. It is also limited by the weathered shale that begins at depths between 8 and 18 inches. Above the water table the soil material is slowly permeable to water and air. The soil has fair to low water-supplying capacity. Natural fertility is moderate.

Use suitability and management needs.—Because of the risk of erosion, this soil is best used as woodland. Choose planting stock that tolerates poor drainage. Protect the woodlands from fire and from grazing by livestock.

Capability unit VIIe–2

This capability unit consists of deep, strongly sloping to very steep, well drained to moderately well drained soils formed in lacustrine and terrace materials. The soils are moderately permeable to water and air and have fair to low water-supplying capacity. Their natural fertility is moderate to low. The following mapping units are in capability unit VIIe–2:

Berrien fine sandy loam, 15 to 25 percent slopes, severely eroded.
Escarpments.

Use suitability and management needs.—Because of the effects of erosion, these steep areas are best used as woodland. Most of them are covered with trees. Many cleared areas along the lake bluff are severely eroded. Stabilize these areas through mulching and by planting deep-rooted trees and shrubs. Locust will grow on these sites. Maintain a vigorous stand of trees to control erosion. Protect the woodlands from fire and from grazing by livestock.

Capability unit VIIe–3

This capability unit consists of deep, strongly sloping to steep, well-drained gravelly sandy loams and gravelly silt loams. The soils are droughty and erodible. They have formed on terraces and moraines. They are rapidly permeable to water and air and have low water-supplying capacity. Their natural fertility is moderate to high. The following soils are in capability unit VIIe–3:

Conotton gravelly sandy loam, 15 to 25 percent slopes, severely eroded.
Howard gravelly silt loam, 25 to 40 percent slopes.
Howard gravelly silt loam, 25 to 40 percent slopes, severely eroded.
Wooster gravelly silt loam, 30 to 40 percent slopes.
Wooster gravelly silt loam, 30 to 40 percent slopes, severely eroded.

Use suitability and management needs.—Because of the risk of erosion, these soils are best used as woodland. Conifers can be grown on them for sale as Christmas trees. Maintain a vigorous stand of trees to control erosion. Protect the woodlands from fire and from grazing by livestock.

Capability unit VIIe–4

This capability unit consists of strongly sloping to very steep, moderately well drained to somewhat poorly drained soils that are dominantly silt loams. These droughty, erodible soils have formed in glacial till of the upland. The depth of the root zone is limited by a firm, slowly permeable layer that generally begins at depths between 12 and 30 inches. Above this layer the soil material is moderately to slowly permeable to water and air. The soils have fair water-supplying capacity. Their natural fertility is moderate to low. The following soils are in capability unit VIIe–4:

Langford silt loam, 15 to 25 percent slopes, severely eroded.
Langford and Erie silt loams, 25 to 50 percent slopes, severely eroded.
Manlius and Lordstown soils, shallow, 25 to 80 percent slopes.
Mardin and Volusia gravelly silt loams, 25 to 45 percent slopes, severely eroded.
Volusia silt loam, 15 to 25 percent slopes, severely eroded.

Use suitability and management needs.—Because of the effects of erosion, these soils are best used as woodland. Choose planting stock that will tolerate somewhat poor drainage. Maintain a vigorous stand of trees to control erosion. Protect the woodlands from fire and from grazing by livestock.

Capability unit VIIe–5

This capability unit consists of strongly sloping to very steep, moderately well drained to poorly drained, erodible silt loams and gravelly silt loams. The soils have formed in glacial till and lacustrine deposits. The depth of the root zone is limited by either a seasonally high water table or by a firm, slowly permeable layer that generally begins at depths between 8 and 24 inches. Above the water table or firm layer, the soil material is slowly to moderately permeable to water and air. The soils have fair water-supplying capacity. They warm up slowly in spring. Their natural fertility is moderate to high. The following soils are in capability unit VIIe–5:

Erie silt loam, 15 to 25 percent slopes, severely eroded.
Langford and Erie silt loams, 25 to 50 percent slopes.
Mardin and Volusia gravelly silt loams, 25 to 45 percent slopes.
Volusia gravelly silt loam, 15 to 25 percent slopes, severely eroded.

Use suitability and management needs.—Because of their steep slopes and the risk of erosion, these soils are best used for permanent pasture or woodland.

Apply lime and fertilizer in amounts indicated by soil tests and according to the needs of the particular pasture crop. Maintain a vigorous stand of plants to prevent landslides and the formation of gullies. Divert surface water into suitable waterways.

Capability unit VIIw–1

This capability unit consists of moderately well drained to poorly drained lacustrine sands. Only one miscellaneous land type, Beach sand, stabilized, is in the unit. This land type, also referred to as peninsula sand, is on the peninsula of Presque Isle. The depth of the root zone is limited by a water table that occurs in gravel at depths between 10 and 24 inches. Above the water table the soil material is rapidly permeable to water and air. The surface soil has low water-supplying capacity. Natural fertility is low.

Use suitability and management needs.—Because of poor drainage and low fertility, Beach sand, stabilized, is best kept in woodland and used for wildlife habitats and recreation. Maintain a vigorous stand of trees to control erosion. Protect the woodlands from fire and from overbrowsing by deer.

Capability unit VIIIw–1

This capability unit consists of soils in which water is at or above the surface of the soil. The following mapping units are in capability unit VIIIw–1:

Fresh water marsh.
Sloan silty clay loam, permanently wet, 0 to 3 percent slopes.

Use suitability and management needs.—Because their root zones are permanently saturated with water, these soils can be used only as habitats for waterfowl or other wildlife.

Capability unit VIIIs–1

This capability unit consists of two miscellaneous land types, Beach and Riverwash, and Dune sand. Beach and Riverwash is made up of materials deposited by water. After the materials are deposited, they are either covered by additional debris or removed by water. Dune sand consists of sand blown from lacustrine materials and deposited in the form of dunes.

Use suitability and management needs.—These land types are suitable for recreational purposes. Until stabilized, neither will support vegetation. Using plants to stabilize Beach and Riverwash is not practical, and special engineering structures would be costly and difficult to install. Dune sand is partly stabilized by stunted vegetation. Where feasible, control active dunes by using a seeding mixture or planting stock that will tolerate droughty soils.

Management of Orchards, Vineyards, Pastures, and Woodland

Orchards and vineyards.—Erie County is important for the growing of orchard fruits and grapes. Most of the orchards and vineyards are in an area, 5 to 6 miles wide, along the lakefront east of Erie in the northeastern part of the county. The growing season is fairly short in this area, but it is long enough to grow early maturing varieties of fruit.

Well drained or moderately well drained soils are better suited to fruit trees and grapevines than soils that are poorly drained. In poorly drained soils the roots may not have enough air to develop properly. As a result, the trees grow slowly and may die. Trees on poorly drained soils start their growth later in spring and continue growing later in summer than trees on well-drained soils. They often drop their fruit throughout the growing season.

Some varieties of apples mature later on poorly drained soils and the apples have a less desirable color and poorer keeping quality than apples of similar varieties grown on well-drained soils. On droughty, sandy and gravelly soils, some varieties bear fruit of superior flavor and market quality, but the finer textured soils are better for light-colored varieties. Apples of the light-colored varieties hold their color better until the fruit has been harvested and marketed if they are grown on fine-textured soils than if they are grown on sandy and gravelly soils.

Grapes grown on poorly drained soils often fail to mature properly if the weather is cool and cloudy during the growing season. If the air is too cool when fruit trees are in blossom, optimum pollination by insect activity does not take place. This causes greater losses than spring frosts.

Damage to fruit trees by winter freezing of the wood is not an important factor in this county. The wood of

trees growing on poorly drained soils is more likely to be damaged than that of trees growing on better drained soils. Some damage has occurred in the lower forks of sour cherry trees growing on moderately well drained soils, however, and there has been some damage to the wood of peach trees. The roots of some trees growing on poorly drained soils have been damaged, but it is difficult to determine if the damage was caused by poor aeration or by freezing. Where rodents are controlled, a cover of grass sod around the base of the tree will not only give protection in winter but also will transpire excess water early in the growing season.

When fruit trees are grown on poorly drained soils, the kind of rootstock used determines the resistance the plant has to poor aeration. Some rootstocks are more able than others to extract plant nutrients, especially potash, from the soil. Sweet plums, locally called prunes, tolerate poorly aerated soils. Peaches will not tolerate poor aeration or poor soil drainage. The best quality peaches are produced on the sandy or gravelly soils that are too droughty for optimum yields.

Sweet cherries, grafted on certain rootstocks, tolerate somewhat poor internal drainage. In the humid climate along the lakefront in Erie County, however, the highest quality fruit is produced on the sandy and gravelly soils. The moisture content of the soils is low at the time the cherries ripen. This reduces the tendency of the fruit to crack and rot. Sweet cherry trees are not resistant to drought. A permanent grass sod is usually kept in mature orchards of sweet cherry trees as is done in mature apple orchards.

Sour cherries grow best on fine-textured, well-drained soils. They have a high transpiration rate that makes them susceptible to drought.

Although fruit trees, as a rule, do best on a well drained or moderately well drained soil, they require a large amount of moisture. Generally, the trees need a deep root zone so they can secure the amount of moisture they need. On the lake plain in Erie County, however, the cool, humid climate reduces the rate of transpiration and the amount of water used. Thus, the trees can be grown on soils having shallow root zones. Breaking up the pan layer by deep tillage has been tried in some orchards in the county, but the benefits lasted for only one growing season. The heavy subsoil material ran back together during wet seasons.

Fruit trees use large amounts of nitrogen and have a high requirement for potash, but they have a relatively low requirement for phosphate. The nitrogen is practically all returned to the soil in the leaves and prunings; little is removed in the fruit. Likewise, little of the phosphorus is removed in the fruit, but a large supply of available phosphorus in the soil will hasten ripening. Much of the potassium is removed by the fruit. The soils become depleted quickly if an additional supply of potash is not added to the soil. Peaches have the highest requirement for nitrogen of any of the fruit trees grown in the county and the lowest requirement for potash. Sweet cherries require less nitrogen than peaches and less potash than apples. Sour cherries have a higher nitrogen requirement than sweet cherries. Soils that have been used for orchards over a long period of time are often deficient in one or more of the minor elements.

Fruitgrowers in the county have found that the content of organic matter in the soils used for orchards is even more important than in the soils used for general crops. Trees grow with many of their roots covered only by a layer of organic matter.

In spring and early in summer, the trees in cherry and peach orchards are clean cultivated. This causes erosion on sloping soils. This hazard can be eliminated by planting the trees on the contour, providing diversion terraces to carry off excess surface water, supplying adequate sod waterways, and taking special care to keep a large amount of organic matter in the surface soil.

Grapes are grown on many different kinds of soils in Erie County. In some places they are grown on droughty sands. In others they are grown on poorly drained, fine-textured soils. The vines live longer and yields are higher if the vineyards are on well-drained soils. Growers who have vineyards on poorly drained, fine-textured soils, however, believe that their grapes have a better quality and a higher content of sugar than those grown on the more sandy, droughty soils. If the temperatures during the growing season are cool, however, and the growing season is shorter than normal, grapes grown on fine-textured, poorly drained soils may fail to ripen.

Grapes require a moderate amount of nitrogen and potash. Adequate phosphate will cause the grapes to mature more rapidly. Keeping a large amount of organic matter in the surface soil has increased yields more, however, than increasing the rate of fertilization beyond the customary amount used on vineyards in the county (*1*).[1] The organic matter helps to conserve moisture and is a good source of plant nutrients.

Small fruits are grown fairly extensively in the county. Black raspberries, currants, and strawberries occupy the largest acreage. Small fruits do not need so extensive a root zone as fruit trees, but other requirements are somewhat similar to those of fruit trees.

Pastures.—In Erie County whiteclover and Canada bluegrass are the native pasture plants. These can be grazed in spring and fall because they produce most of their forage at those times. In summer, grazing is provided in many places by pasturing the fields where crops have been harvested. Cradle knolls are common in permanent pastures where the soils have not been cultivated. These make good management difficult by interfering with mowing and with the movement of machinery.

The permanent pastures respond well to good management. The quantity and quality of the forage improves in pastures that have been topdressed with lime and fertilizer. Also, the spring growth of the plants begins earlier so that the grazing season is lengthened.

Many of the permanent pastures are in level to nearly level areas where the soils have poor to very poor internal drainage (fig. 2). These need to have the natural drainageways kept open and surface water in adjacent higher areas diverted. Proper drainage allows the soils to dry out sooner in spring so that plants will start their growth earlier and animals will cause less damage from trampling when they are allowed to graze.

Some of the permanent pastures are on moderately steep to steep soils that have moderately good to somewhat

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

Figure 2.—**Permanent pasture on very poorly drained Halsey loam, 0 to 3 percent slopes.**

Figure 3.—**Permanent pasture on moderately well drained Langford silt loam, 15 to 25 percent slopes, moderately eroded.**

poor internal drainage (fig. 3). Grazing must be regulated carefully in these pastures to protect the sod. In addition, weeds and brush should be controlled on all pastures.

Where the soils have poor internal drainage, the pastures will be improved by reseeding with shallow-rooted grasses and legumes that tolerate poor drainage.

Woodland.—The highest yields of wood products are obtained from woodlands that have been protected from grazing and fire and that are otherwise well managed. Protection from grazing is necessary so that desirable species will have a chance to reproduce. Protection from fire is necessary both for reproduction of desirable species and to avoid damage to existing trees. The trees should be harvested on a sustained-yield basis for the most efficient growth and reproduction and to obtain the highest possible income from the woodland.

In 1954, approximately 129,300 acres in the county was in forests. Forests of northern hardwoods occupied an estimated 65 percent of the commercial forest land. In addition, red oak alone occupied about 13 percent of this

TABLE 1.—*Estimated productivity ratings, at two levels of management, for soils used for field crops*

[In columns A are productivity ratings under normal management, and in columns B are ratings under improved

Soils	Productivity ratings							
	Corn for grain (100=80 bu. per acre)		Corn for silage (100=10 tons per acre)		Oats (100=55 bu. per acre)		Mixed hay (100=2.5 tons per acre)	
	A	B	A	B	A	B	A	B
Allis silt loam, 0 to 3 percent slopes	25	38	40	50	55	70	60	80
Allis silt loam, 0 to 3 percent slopes, severely eroded							20	40
Allis silt loam, 3 to 8 percent slopes	38	50	50	70	65	80	60	80
Allis silt loam, 3 to 8 percent slopes, severely eroded							20	40
Allis silt loam, 8 to 15 percent slopes	38	50	50	70	65	80	60	80
Allis silt loam, 8 to 15 percent slopes, severely eroded							20	40
Allis silt loam, 15 to 25 percent slopes							60	80
Allis silt loam, 15 to 25 percent slopes, severely eroded								
Allis silt loam, 25 to 45 percent slopes								
Beach and Riverwash								
Beach sand, stabilized								
Berrien fine sandy loam, 0 to 2 percent slopes	68	94	80	100	65	70	50	80
Berrien fine sandy loam, 2 to 8 percent slopes	68	94	80	100	55	70	50	80
Berrien fine sandy loam, 2 to 8 percent slopes, severely eroded.	56	88	60	100	36	70	40	80
Berrien fine sandy loam, 8 to 15 percent slopes	50	75	50	80	45	65	50	80
Berrien fine sandy loam, 8 to 15 percent slopes, severely eroded.	50	70	50	80	40	65	20	60
Berrien fine sandy loam, 15 to 25 percent slopes	50	70	50	80	40	65	40	80
Berrien fine sandy loam, 15 to 25 percent slopes, severely eroded.								
Birdsall silt loam, 0 to 2 percent slopes		56		80		90		120
Birdsall silt loam, 2 to 4 percent slopes		56		80		90		120
Canadice silt loam, 0 to 2 percent slopes		56		80	65	90	80	120
Canadice silt loam, 2 to 8 percent slopes		56		80	70	90	80	120
Canadice silt loam, 2 to 8 percent slopes, severely eroded							40	80

See footnotes at end of table.

acreage. Hardwoods alone represented approximately 109,700 thousand cubic feet of growing stock, more than 1 million cords of pulpwood, and 280,300 thousand board feet of sawtimber.

Conifers, grown for sale as Christmas trees, have become an important source of income in this county. Trees grown on well-drained or excessively drained soils are of better quality than those grown on poorly drained soils. On the better drained soils, the trees grow more slowly and nitrification is not retarded by poor drainage. Trees grown on poorly drained soils are of low quality and the needles have a light-green color. This light color appears to result from low nitrification caused by poor internal drainage. The young trees should be pruned to give them a better shape.

Locust is in demand for local use as supports for the wires in vineyards. Locust trees grow well on well-drained, gravelly and sandy soils. They can be encouraged to grow on steep areas or in odd corners not desirable for other uses.

Productivity and Suitability Ratings

Table 1 shows estimated productivity ratings for representative field crops grown in the county. It also gives suitability ratings for certain specialized crops, fruit trees, permanent pasture, and woodland.

Each productivity rating denotes the productivity of the soil for a particular crop in relation to a standard index of 100. The standard index represents the average acre yield obtained on the most productive soils in the county. The average acre yield represented by the standard index is given at the head of the columns for each crop. The average yield figures are based on yields of crops during favorable growing seasons when the soil survey was being made.

The productivity ratings are given under two levels of management. In columns A are ratings to be expected under the normal, or prevailing, management. These ratings are based on records of yields obtained during favorable growing seasons and under management presently practiced by most of the farmers. In columns B are ratings that indicate yields that may be obtained in a favorable season when improved management is practiced.

An index of 50 indicates that the soil is only about half as productive for the specified crop as a soil with the standard index of 100. By fertilizing heavily or by using other intensive management, however, an index of more than 100 can be obtained for some soils. Howard gravelly silt loam, 0 to 3 percent slopes, for example, has a rating of 100 for all crops listed. Consequently, under the prevailing level of management, you can expect to obtain average yields per acre of 80 bushels of corn grown for grain, 10 tons of corn grown for silage, 55 bushels of oats, and 2.5 tons of mixed hay. Under improved management this soil has a productivity rating of 120 for corn grown for grain, 130 for corn grown for silage, 115 for oats, and 140 for mixed hay. This means that yields per acre under improved management would equal 96 bushels of corn grown for grain, 13 tons of corn grown for silage, about 63 bushels of oats, and 3.5 tons of mixed hay.

No suitability ratings are given in table 1 for soils that are unsuitable for the use specified.

and suitability ratings for soils used for specialized crops, fruit trees, permanent pasture, and woodland

management. Lack of productivity or suitability rating indicates the soil is not suited to the specified crop]

Suitability for [1]—							
Alfalfa	Potatoes	Grapes	Apples	Peaches	Cherries	Permanent pasture	Woodland [2]
		Fair				Poor	Fair.
		Poor				Poor	Poor.
		Fair				Fair	Fair.
		Poor				Poor	Poor.
		Fair				Fair	Fair.
						Poor	Poor.
						Fair	Fair.
						Poor	Poor.
						Fair	Fair.
							Fair.
Fair	Fair	Good	Fair	Fair	Fair	Fair	Good.
Fair	Fair	Good	Good	Fair	Fair	Fair	Good.
Poor	Poor	Fair	Fair	Poor	Poor	Poor	Fair.
Good	Poor	Good	Good	Fair	Fair	Fair	Good.
Poor			Poor			Poor	Fair.
Good			Good			Fair	Good.
						Poor	Fair.
						Fair	Poor.
						Good	Good.
						Fair	Fair.
						Good	Fair.
						Fair	Poor.

TABLE 1.—*Estimated productivity ratings, at two levels of management, for soils used for field crops and*

[In columns A are productivity ratings under normal management, and in columns B are ratings under improved

Soils	Productivity ratings							
	Corn for grain (100=80 bu. per acre)		Corn for silage (100=10 tons per acre)		Oats (100=55 bu. per acre)		Mixed hay (100=2.5 tons per acre)	
	A	*B*	*A*	*B*	*A*	*B*	*A*	*B*
Caneadea silt loam, 0 to 2 percent slopes	50	88	70	90	70	90	80	120
Caneadea silt loam, 2 to 8 percent slopes	60	94	80	90	80	90	100	120
Caneadea silt loam, 2 to 8 percent slopes, severely eroded							40	100
Caneadea silt loam, 8 to 15 percent slopes	60	94	80	90	80	90	100	120
Caneadea silt loam, 8 to 15 percent slopes, severely eroded							40	100
Caneadea silt loam, 15 to 25 percent slopes	60	94	80	90	80	90	80	120
Caneadea silt loam, 15 to 25 percent slopes, severely eroded							40	80
Chagrin fine sandy loam, 0 to 3 percent slopes	100	120	100	130	70	80	80	120
Chagrin fine sandy loam, 0 to 3 percent slopes, severely eroded.							40	120
Chagrin silt loam, 0 to 3 percent slopes	100	120	100	130	100	115	100	140
Chagrin silt loam, high bottom, 0 to 3 percent slopes	100	120	100	130	100	115	100	140
Chagrin silt loam, high bottom, 3 to 6 percent slopes	100	120	100	130	100	115	100	140
Chagrin very gravelly loam, fan, 0 to 6 percent slopes	60	88	80	100	55	70	80	120
Conotton gravelly loam, 0 to 3 percent slopes	75	88	80	100	65	90	80	120
Conotton gravelly loam, 3 to 8 percent slopes	60	88	80	100	65	90	80	120
Conotton gravelly loam, 3 to 8 percent slopes, severely eroded.	44	88	60	100	45	80	40	120
Conotton gravelly loam, 8 to 15 percent slopes	60	88	70	100	55	80	80	120
Conotton gravelly loam, 8 to 15 percent slopes, severely eroded.	44	88	60	100	45	80	40	120
Conotton gravelly sandy loam, 3 to 8 percent slopes	60	88	80	100	55	70	80	120
Conotton gravelly sandy loam, 3 to 8 percent slopes, severely eroded.	38	88	60	100	36	70	40	120
Conotton gravelly sandy loam, 8 to 15 percent slopes	50	88	60	100	55	70	60	120
Conotton gravelly sandy loam, 8 to 15 percent slopes, severely eroded.	44	88	60	100	36	70	40	120
Conotton gravelly sandy loam, 15 to 25 percent slopes	50	80	60	100	55	70	60	120
Conotton gravelly sandy loam, 15 to 25 percent slopes, severely eroded.								
Conotton coarse sandy loam, 0 to 8 percent slopes	60	88	80	100	55	70	80	120
Conotton coarse sandy loam, 0 to 8 percent slopes, severely eroded.	38	88	60	100	36	70	40	120
Conotton coarse sandy loam, 8 to 15 percent slopes	50	88	60	100	55	70	60	120
Conotton coarse sandy loam, 8 to 15 percent slopes, severely eroded.							20	80
Conotton coarse sandy loam, 15 to 25 percent slopes							60	120
Conotton coarse sandy loam, 15 to 25 percent slopes, severely eroded.							20	80
Conotton gravelly sandy loam, moderately well drained variant, 0 to 3 percent slopes.	80	106	80	120	70	90	80	120
Conotton gravelly sandy loam, moderately well drained variant, 3 to 8 percent slopes.	80	106	80	120	80	90	80	140
Conotton gravelly sandy loam, moderately well drained variant, 3 to 8 percent slopes, severely eroded.	75	94	60	100	65	90	40	80
Dalton silt loam, 0 to 2 percent slopes	30	38	50	70	65	90	40	120
Dalton silt loam, 2 to 8 percent slopes	60	88	70	100	70	90	70	120
Dalton silt loam, 2 to 8 percent slopes, moderately eroded	60	88	70	100	70	90	70	120
Dune sand							20	80
Ellery and Alden silt loams, 0 to 4 percent slopes		50		70		80	40	80
Erie silt loam, 0 to 3 percent slopes	30	38	50	70	65	90	40	120
Erie silt loam, 3 to 8 percent slopes	60	88	70	100	70	90	70	120
Erie silt loam, 3 to 8 percent slopes, moderately eroded	60	88	70	100	70	90	70	120
Erie silt loam, 3 to 8 percent slopes, severely eroded							40	80
Erie silt loam, 8 to 15 percent slopes	50	60	50	100	70	90	60	120
Erie silt loam, 8 to 15 percent slopes, moderately eroded	50	60	50	100	70	90	60	120
Erie silt loam, 8 to 15 percent slopes, severely eroded							40	80
Erie silt loam, 15 to 25 percent slopes							60	120
Erie silt loam, 15 to 25 percent slopes, moderately eroded							60	120
Erie silt loam, 15 to 25 percent slopes, severely eroded								
Escarpments								
Fredon loam, 0 to 3 percent slopes	38	50	40	60	70	100	80	120
Fredon loam, 3 to 8 percent slopes	60	88	70	90	70	110	100	140
Fresh water marsh								
Halsey loam, 0 to 3 percent slopes	25	55	40	60	65	90	80	120
Howard gravelly silt loam, 0 to 3 percent slopes	100	120	100	130	100	115	100	140
Howard gravelly silt loam, 3 to 8 percent slopes	100	120	100	130	100	115	100	140

See footnotes at end of table.

suitability ratings for soils used for specialized crops, fruit trees, permanent pasture, and woodland—Continued

management. Lack of productivity or suitability rating indicates the soil is not suited to the specified crop]

Suitability for [1]—							
Alfalfa	Potatoes	Grapes	Apples	Peaches	Cherries	Permanent pasture	Woodland [2]
Poor						Good	Good.
Fair						Good	Good.
Poor						Good	Fair.
Fair						Good	Good.
Poor						Good	Fair.
Fair						Good	Good.
Poor						Good	Fair.
Good	Good	Good	Good	Good	Good	Good	Excellent.
Fair			Good			Good	Excellent.
Good	Good	Good	Good	Good	Good	Excellent	Excellent.
Good	Good	Good	Good	Good	Good	Excellent	Excellent.
Good	Good	Good	Good	Good	Good	Excellent	Excellent.
Fair	Poor	Good	Good	Good	Good	Poor	Good.
Good	Good	Good	Good	Good	Good	Fair	Good.
Good	Good	Good	Good	Good	Good	Fair	Good.
Good	Fair	Good	Good	Good	Good	Poor	Good.
Good	Fair	Good	Good	Good	Good	Poor	Good.
Fair	Poor	Good	Good	Good	Fair		Good.
Good	Fair	Good	Good	Good	Good	Fair	Good.
Fair	Poor	Good	Good	Good	Good	Poor	Fair.
Good	Poor	Good	Good	Good	Good	Poor	Good.
Fair			Fair				Fair.
Fair			Good				Good.
							Poor.
Good	Fair	Good	Good	Good	Good	Fair	Good.
Fair	Poor	Good	Good	Good	Good	Poor	Fair.
Good	Fair	Good	Good	Good	Good	Poor	Good.
Fair			Good				Fair.
Good			Good				Good.
Fair			Fair				Poor.
Fair	Good	Good	Fair	Good	Good	Fair	Good.
Good	Good	Good	Good	Good	Good	Fair	Good.
Fair	Fair	Good	Good	Fair	Poor	Poor	Good.
						Fair	Fair.
						Good	Fair.
						Good	Fair.
Fair							Fair to unsuitable.
						Poor	Poor.
		Poor				Fair	Fair.
		Fair				Good	Fair.
		Fair				Good	Fair.
						Poor	Poor.
		Fair				Fair	Fair.
		Fair				Fair	Fair.
						Poor	Poor.
						Fair	Fair.
						Fair	Fair.
						Poor	Poor.
							Poor to good.
Poor	Fair	Fair	Poor	Poor	Poor	Good	Good.
Fair	Good	Good	Good	Fair	Fair	Good	Good.
		Fair	Poor			Fair	Fair.
Good	Good					Good	Good.
Good	Good					Good	Good.

TABLE 1.—*Estimated productivity ratings, at two levels of management, for soils used for field crops and*

[In columns A are productivity ratings under normal management, and in columns B are ratings under improved

Soils	Productivity ratings							
	Corn for grain (100=80 bu. per acre)		Corn for silage (100=10 tons per acre)		Oats (100=55 bu. per acre)		Mixed hay (100=2.5 tons per acre)	
	A	B	A	B	A	B	A	B
Howard gravelly silt loam, 3 to 8 percent slopes, severely eroded.	75	120	70	130	70	115	80	140
Howard gravelly silt loam, 8 to 15 percent slopes	100	120	90	120	90	110	100	140
Howard gravelly silt loam, 8 to 15 percent slopes, severely eroded.							80	120
Howard gravelly silt loam, 15 to 25 percent slopes	80	94	80	100	65	90	80	120
Howard gravelly silt loam, 15 to 25 percent slopes, severely eroded.							60	100
Howard gravelly silt loam, 25 to 40 percent slopes							80	120
Howard gravelly silt loam, 25 to 40 percent slopes, severely eroded.								
Langford silt loam, 0 to 8 percent slopes	80	94	80	100	90	110	80	120
Langford silt loam, 0 to 8 percent slopes, moderately eroded	80	94	80	100	90	110	80	120
Langford silt loam, 0 to 8 percent slopes, severely eroded	70	94	70	100	80	110	40	100
Langford silt loam, 8 to 15 percent slopes	80	94	80	100	90	110	80	120
Langford silt loam, 8 to 15 percent slopes, moderately eroded.	80	94	80	100	90	110	80	120
Langford silt loam, 8 to 15 percent slopes, severely eroded	70	94	70	100	80	110	40	80
Langford silt loam, 15 to 25 percent slopes	80	94	80	100	90	110	80	120
Langford silt loam, 15 to 25 percent slopes, moderately eroded.	80	94	80	100	90	110	80	120
Langford silt loam, 15 to 25 percent slopes, severely eroded								
Langford and Erie silt loams, 25 to 50 percent slopes								
Langford and Erie silt loams, 25 to 50 percent slopes, severely eroded.								
Lobdell silt loam, 0 to 3 percent slopes	88	112	100	130	70	110	80	120
Lobdell silt loam, 0 to 3 percent slopes, severely eroded							40	100
Lobdell silt loam, high bottom, 0 to 3 percent slopes	88	112	100	130	70	110	80	120
Lobdell silt loam, high bottom, 3 to 6 percent slopes	88	112	100	130	70	110	80	120
Mahoning silt loam, 3 to 8 percent slopes	75	88	80	100	90	110	80	120
Mahoning silt loam, 3 to 8 percent slopes, moderately eroded.	75	88	80	100	90	110	80	120
Mahoning silt loam, 8 to 15 percent slopes	75	88	80	100	90	110	80	120
Mahoning silt loam, 8 to 15 percent slopes, moderately eroded.	75	88	80	100	90	110	80	120
Mahoning silt loam, 8 to 15 percent slopes, severely eroded	60	88	70	100	80	110	40	80
Manlius and Lordstown soils, shallow, 8 to 25 percent slopes	35	70	40	80	60	100	50	100
Manlius and Lordstown soils, shallow, 25 to 80 percent slopes.								
Mardin gravelly silt loam, 3 to 8 percent slopes	80	94	80	100	90	110	80	120
Mardin gravelly silt loam, 3 to 8 percent slopes, severely eroded.	38	75	50	80	70	110	40	100
Mardin gravelly silt loam, 8 to 15 percent slopes	80	94	80	100	90	110	80	120
Mardin gravelly silt loam, 8 to 15 percent slopes, severely eroded.	38	75	50	80	70	110	40	100
Mardin gravelly silt loam, 15 to 25 percent slopes	80	94	80	100	90	110	80	120
Mardin gravelly silt loam, 15 to 25 percent slopes, severely eroded.							40	80
Mardin and Volusia gravelly silt loams, 25 to 45 percent slopes.								
Mardin and Volusia gravelly silt loams, 25 to 45 percent slopes, severely eroded.								
Miner silt loam, 0 to 3 percent slopes		50		70		80	40	80
Muck and Peat		88		120		110		
Ottawa loamy fine sand, 0 to 2 percent slopes	38	75	60	100	35	45	40	100
Ottawa loamy fine sand, 2 to 8 percent slopes	38	75	50	100	27	35	40	100
Ottawa loamy fine sand, 2 to 8 percent slopes, severely eroded.	25	75	40	90	18	35	20	80
Ottawa loamy fine sand, 8 to 15 percent slopes	38	75	50	90	27	35	40	100
Ottawa loamy fine sand, 8 to 15 percent slopes, severely eroded.							20	80
Ottawa loamy fine sand, 15 to 25 percent slopes							40	100
Ottawa loamy fine sand, 15 to 25 percent slopes, severely eroded.							20	80
Ottawa fine sandy loam, 0 to 2 percent slopes	68	94	60	100	55	65	80	120
Ottawa fine sandy loam, 2 to 8 percent slopes	60	94	60	100	45	55	80	120

See footnotes at end of table.

suitability ratings for soils used for specialized crops, fruit trees, permanent pasture, and woodland—Continued

management. Lack of productivity or suitability rating indicates the soil is not suited to the specified crop]

Suitability for [1]—							
Alfalfa	Potatoes	Grapes	Apples	Peaches	Cherries	Permanent pasture	Woodland [2]
Good	Fair					Fair	Good.
Good	Good					Good	Good.
Good						Fair	Good.
Good						Fair	Good.
Good						Poor	Fair.
						Fair	Good.
						Poor	Fair.
Fair	Fair	Good	Good	Fair	Fair	Good	Good.
Fair	Fair	Good	Good	Fair	Fair	Good	Good.
Poor			Fair			Fair	Fair.
Fair	Fair	Good	Good	Fair	Fair	Good	Good.
Fair	Fair	Good	Good	Fair	Fair	Good	Good.
Poor			Fair			Fair	Fair.
Fair			Good			Good	Good.
Fair			Good			Good	Good.
						Fair	Fair.
						Good	Good.
						Fair	Fair.
Fair	Good	Good	Good	Fair	Fair	Excellent	Excellent.
Poor			Poor	Poor	Poor	Good	Good.
Fair	Good	Good	Good	Fair	Fair	Excellent	Excellent.
Fair	Good	Good	Good	Fair	Fair	Excellent	Excellent.
Fair						Good	Good.
Fair						Good	Good.
Fair						Good	Good.
Fair						Good	Good.
Poor						Fair	Fair.
Fair			Good			Fair	Good to fair.
						Poor	Fair to poor.
Fair	Fair	Good	Good	Good	Fair	Good	Good.
Poor	Poor	Good	Good	Poor	Poor	Fair	Good.
Fair	Fair	Good	Good	Good	Fair	Good	Good.
Poor			Fair			Fair	Fair.
Fair			Good			Good	Good.
Poor			Fair			Poor	Fair.
						Fair	Good to fair.
						Poor	Fair to poor.
						Fair	Poor.
						Poor	Poor.
Good	Poor	Good	Good	Good	Good	Poor	Good.
Good	Poor	Good	Good	Good	Good	Poor	Good.
Poor	Poor	Fair	Fair	Fair	Fair		Fair.
Fair	Poor	Good	Good	Good	Good		Good.
Poor			Poor				Poor.
Fair			Fair				Fair.
Poor			Poor				Poor.
Good	Fair	Good	Good	Good	Good	Fair	Good.
Good	Fair	Good	Good	Good	Good	Fair	Good.

TABLE 1.—*Estimated productivity ratings, at two levels of management, for soils used for field crops and*

[In columns A are productivity ratings under normal management; and in columns B are ratings under improved

Soils	Productivity ratings							
	Corn for grain (100=80 bu. per acre)		Corn for silage (100=10 tons per acre)		Oats (100=55 bu. per acre)		Mixed hay (100=2.5 tons per acre)	
	A	*B*	*A*	*B*	*A*	*B*	*A*	*B*
Ottawa fine sandy loam, 2 to 8 percent slopes, severely eroded.	38	94	50	100	35	55	40	120
Ottawa fine sandy loam, 8 to 15 percent slopes	60	94	60	100	45	55	60	120
Ottawa fine sandy loam, 8 to 15 percent slopes, severely eroded.							40	100
Ottawa fine sandy loam, 15 to 25 percent slopes							60	100
Ottawa fine sandy loam, 15 to 25 percent slopes, severely eroded.							20	80
Phelps gravelly silt loam, 0 to 3 percent slopes	94	120	100	130	90	115	100	120
Phelps gravelly silt loam, 3 to 8 percent slopes	94	120	100	130	90	115	100	140
Phelps gravelly silt loam, 3 to 8 percent slopes, severely eroded.	88	112	80	120	70	110	80	120
Phelps gravelly silt loam, 8 to 15 percent slopes	94	120	100	130	90	115	100	140
Phelps gravelly silt loam, 8 to 15 percent slopes, severely eroded.	88	112	80	120	70	110	80	120
Platea silt loam, 0 to 2 percent slopes	30	38	60	90	70	90	60	120
Platea silt loam, 2 to 8 percent slopes	60	88	60	90	70	90	60	120
Platea silt loam, 2 to 8 percent slopes, severely eroded							20	100
Platea silt loam, 8 to 15 percent slopes	60	88	60	90	70	90	60	120
Platea silt loam, 8 to 15 percent slopes, severely eroded							20	100
Platea silt loam, 15 to 25 percent slopes	60	88	60	90	70	90	60	120
Platea silt loam, 15 to 25 percent slopes, severely eroded							20	100
Platea silt loam, moderately well drained variant, 0 to 2 percent slopes.	60	88	70	100	90	110	80	140
Platea silt loam, moderately well drained variant, 2 to 8 percent slopes.	75	100	80	100	90	110	80	140
Platea silt loam, moderately well drained variant, 2 to 8 percent slopes, severely eroded.	38	80	50	90	70	110	40	120
Platea silt loam, moderately well drained variant, 8 to 15 percent slopes.	75	100	80	100	90	110	80	140
Platea silt loam, moderately well drained variant, 8 to 15 percent slopes, severely eroded.	38	80	50	90	70	110	40	120
Platea silt loam, moderately well drained variant, 15 to 25 percent slopes.	75	100	80	100	90	110	80	140
Platea silt loam, moderately well drained variant, 15 to 25 percent slopes, severely eroded.							40	120
Rimer fine sandy loam, 0 to 2 percent slopes	38	60	50	80	55		40	120
Rimer fine sandy loam, 2 to 8 percent slopes	38	60	50	80	55		40	120
Rimer fine sandy loam, 2 to 8 percent slopes, severely eroded							20	80
Scio silt loam, 0 to 3 percent slopes	94	120	100	130	90	115	100	120
Scio silt loam, 3 to 8 percent slopes	94	120	100	130	90	115	100	140
Scio silt loam, 8 to 15 percent slopes	94	120	100	130	90	115	100	140
Scio silt loam, 8 to 15 percent slopes, severely eroded	80	110	90	120	80	115	80	120
Sloan silty clay loam, 0 to 3 percent slopes								
Sloan silty clay loam, permanently wet, 0 to 3 percent slopes.								
Trumbull silt loam, 0 to 3 percent slopes	38	50	50	80	70	100	60	120
Trumbull silt loam, 0 to 3 percent slopes, severely eroded							40	120
Trumbull silt loam, 3 to 8 percent slopes	44	55	60	80	70	100	60	120
Trumbull silt loam, 3 to 8 percent slopes, moderately eroded.	44	55	60	80	70	100	60	120
Trumbull silt loam, 3 to 8 percent slopes, severely eroded							40	120
Trumbull silt loam, 8 to 15 percent slopes	44	55	60	80	70	100	60	120
Trumbull silt loam, 8 to 15 percent slopes, moderately eroded.	44	55	60	80	70	100	60	120
Trumbull silt loam, 8 to 15 percent slopes, severely eroded								
Unadilla fine sandy loam, 0 to 3 percent slopes	100	120	100	130	90	110	80	140
Unadilla fine sandy loam, 3 to 8 percent slopes	100	120	100	130	90	110	80	120
Unadilla fine sandy loam, 3 to 8 percent slopes, severely eroded.	75	120	80	120	70	110	60	80
Unadilla fine sandy loam, 8 to 15 percent slopes	100	120	90	120	90	110	80	120
Unadilla fine sandy loam, 8 to 15 percent slopes, severely eroded.							40	80
Volusia gravelly silt loam, 0 to 3 percent slopes	50	60	50	70	65	90	40	120
Volusia gravelly silt loam, 3 to 8 percent slopes	60	75	70	100	70	90	70	120
Volusia gravelly silt loam, 3 to 8 percent slopes, severely eroded.							20	80

See footnotes at end of table.

suitability ratings for soils used for specialized crops, fruit trees, permanent pasture, and woodland—Continued

management. Lack of productivity or suitability rating indicates the soil is not suited to the specified crop]

Suitability for [1]—							
Alfalfa	Potatoes	Grapes	Apples	Peaches	Cherries	Permanent pasture	Woodland [2]
Fair	Poor	Good	Good	Good	Good	Poor	Fair.
Good	Poor	Good	Good	Good	Good	Poor	Good.
Fair			Fair				Fair.
Fair			Fair			Poor	Good.
Poor			Poor				Fair.
Fair	Good					Good	Good.
Good	Good					Good	Good.
Fair	Fair					Good	Good.
Fair	Good					Good	Good.
Poor						Fair	Good.
		Poor				Good	Fair.
		Fair				Good	Good.
						Fair	Fair.
						Good	Good.
						Fair	Poor.
						Good	Good.
						Fair	Poor.
Poor		Fair				Good	Good.
Fair		Fair				Good	Good.
Poor						Good	Fair.
Fair		Fair				Good	Good.
Poor						Good	Fair.
Fair						Good	Good.
Poor						Fair	Fair.
	Poor	Fair	Poor	Poor	Poor	Poor	Fair.
	Poor	Good	Poor	Poor	Poor	Fair	Good.
			Poor	Poor	Poor	Poor	Poor.
Fair	Good	Good	Good	Good	Good	Good	Good.
Good	Good	Good	Good	Good	Good	Good	Good.
Good	Fair	Good	Good	Good		Good	Good.
Poor		Poor	Poor			Fair	Fair.
						Fair	Poor.
						Fair	Fair.
						Poor	Poor.
						Good	Good.
						Good	Good.
						Good	Fair.
						Good	Good.
						Good	Good.
						Good	Fair.
Good	Good	Good	Good	Good	Good	Good	Good.
Good	Good	Good	Good	Good	Good	Good	Good.
Good	Fair	Good	Good	Good	Good	Fair	Good.
Good	Good	Good	Good	Good	Good	Good	Good.
Fair			Fair			Fair	Good.
		Poor				Fair	Fair.
		Fair				Good	Fair.
						Poor	Poor.

TABLE 1.—*Estimated productivity ratings, at two levels of management, for soils used for field crops and*

[In columns A are productivity ratings under normal management, and in columns B are ratings under improved

Soils	Productivity ratings							
	Corn for grain (100=80 bu. per acre)		Corn for silage (100=10 tons per acre)		Oats (100=55 bu. per acre)		Mixed hay (100=2.5 tons per acre)	
	A	B	A	B	A	B	A	B
Volusia gravelly silt loam, 8 to 15 percent slopes	60	75	70	100	70	90	70	120
Volusia gravelly silt loam, 8 to 15 percent slopes, severely eroded.							20	80
Volusa gravelly silt loam, 15 to 25 percent slopes							60	120
Volusia gravelly silt loam, 15 to 25 percent slopes, severely eroded.								
Volusia silt loam, 0 to 3 percent slopes	50	60	50	70	65	90	40	120
Volusia silt loam, 3 to 8 percent slopes	60	75	70	100	70	90	70	120
Volusia silt loam, 0 to 8 percent slopes, severely eroded							20	80
Volusia silt loam, 8 to 15 percent slopes	60	75	70	1)	70	90	70	120
Volusia silt loam, 8 to 15 percent slopes, severely eroded							20	80
Volusia silt loam, 15 to 25 percent slopes							60	120
Volusia silt loam, 15 to 25 percent slopes, severely eroded								
Wallington silt loam, 0 to 2 percent slopes	50	60	60	90	65	90	40	120
Wallington silt loam, 2 to 8 percent slopes	60	75	60	90	70	90	60	120
Wallington silt loam, 2 to 8 percent slopes, severely eroded							20	80
Wallington silt loam, 8 to 15 percent slopes	60	75	60	90	70	90	60	120
Wallington fine sandy loam, 0 to 2 percent slopes	50	60	50	80	65	90	40	120
Wallington fine sandy loam, 2 to 8 percent slopes	60	75	70	100	70	90	60	120
Wallington fine sandy loam, 2 to 8 percent slopes, severely eroded.	25	50	40	70	55	90	20	80
Wallington fine sandy loam, 8 to 15 percent slopes	50	75	60	100	70	90	60	120
Wallington fine sandy loam, 8 to 15 percent slopes, severely eroded.							20	80
Wallington fine sandy loam, 15 to 25 percent slopes							60	120
Wallington fine sandy loam, 15 to 25 percent slopes, severely eroded.							20	80
Wauseon fine sandy loam, 0 to 2 percent slopes	25	50	60	80	45	65	20	80
Wayland silt loam, 0 to 3 percent slopes								
Williamson and Collamer fine sandy loams, 0 to 2 percent slopes.	75	88	90	110	90	110	80	120
Williamson and Collamer fine sandy loams, 2 to 8 percent slopes.	75	88	90	110	90	110	80	120
Williamson and Collamer fine sandy loams, 2 to 8 percent slopes, severely eroded.	60	88	70	100	70	110	40	120
Williamson and Collamer fine sandy loams, 8 to 15 percent slopes.	75	88	90	110	90	110	80	120
Williamson and Collamer fine sandy loams, 8 to 15 percent slopes, severely eroded.	65	88	80	110	80	110	40	120
Williamson and Collamer fine sandy loams, 15 to 25 percent slopes.	75	88	90	110	90	110	80	120
Williamson and Collamer fine sandy loams, 15 to 25 percent slopes, severely eroded.							40	120
Williamson and Collamer silt loams, 0 to 2 percent slopes	75	88	80	100	90	110	80	120
Williamson and Collamer silt loams, 2 to 8 percent slopes	75	88	80	100	90	110	80	120
Williamson and Collamer silt loams, 8 to 15 percent slopes	75	88	80	100	90	110	80	120
Wooster gravelly silt loam, 3 to 12 percent slopes	100	120	100	130	100	115	100	140
Wooster gravelly silt loam, 12 to 20 percent slopes	100	120	100	130	100	115	100	140
Wooster gravelly silt loam, 20 to 30 percent slopes	100	120	100	130	100	115	80	140
Wooster gravelly silt loam, 30 to 40 percent slopes								
Wooster gravelly silt loam, 30 to 40 percent slopes, severely eroded.								

[1] For grapes, apples, peaches, and cherries, ratings are given only for soils on parts of the lake plain having a favorable climate.

suitability ratings for soils used for specialized crops, fruit trees, permanent pasture, and woodland—Continued

management. Lack of productivity or suitability rating indicates the soil is not suited to the specified crop]

Suitability for [1]—							
Alfalfa	Potatoes	Grapes	Apples	Peaches	Cherries	Permanent pasture	Woodland [2]
		Fair				Good	Fair.
						Poor	Poor.
						Good	Fair.
						Poor	Poor.
		Poor				Fair	Fair.
		Fair				Good	Fair.
						Poor	Poor.
		Poor				Good	Fair.
						Poor	Poor.
						Good	Fair.
						Poor	Poor.
		Poor				Fair	Poor.
		Fair				Good	Fair.
						Poor	Poor.
		Fair				Good	Fair.
		Fair				Good	Fair.
		Fair				Good	Fair.
		Poor				Fair	Poor.
		Fair				Good	Fair.
						Fair	Poor.
						Good	Fair.
						Poor	Poor.
		Poor				Poor	Poor.
						Good	Fair.
Fair	Fair	Good	Fair	Fair	Poor	Good	Good.
Good	Good	Good	Good	Good	Fair	Good	Good.
Fair	Poor	Fair	Fair	Poor	Poor	Good	Fair.
Good		Good	Good	Fair	Poor	Good	Good.
Fair			Poor			Fair	Fair.
Good			Fair			Good	Good.
Fair			Poor			Fair	Fair.
Poor	Poor	Good	Fair	Fair	Poor	Fair	Fair.
Fair	Fair	Good	Fair	Fair	Fair	Good	Good.
Fair	Fair	Good	Fair	Fair	Poor	Good	Good.
Good	Good					Good	Good.
Good	Good					Good	Good.
Good						Fair	Good.
						Poor	Good.
							Fair.

[2] Refers to trees that are native to the soils.

Engineering Applications

This soil survey report for Erie County, Pa., contains information that can be used by engineers to—

(1) Make soil and land use studies that will aid in selecting and developing industrial, business, residential, and recreational sites.
(2) Make estimates of runoff and erosion characteristics for use in designing drainage structures and in planning dams and other structures for soil and water conservation.
(3) Estimate the suitability of sites for disposal of liquid waste from processing plants.
(4) Estimate the nature of material encountered when excavating for buildings and other structures.
(5) Make reconnaissance surveys of soil and ground conditions that will aid in selecting highway and airport locations and in planning detailed soil surveys of the intended locations.
(6) Locate sand and gravel for structural uses.
(7) Correlate pavement performance with the types of soil and thus develop information useful in designing and maintaining pavements on these soil types.
(8) Determine the suitability of soil units for cross-country movement of vehicles and construction equipment.
(9) Supplement information obtained from other published maps, reports, and aerial photographs for the purpose of making available soil information that can be used readily by engineers.

The mapping and the descriptive report are somewhat generalized and should be used only in planning more detailed field surveys to determine the in-place condition of the soil at the site of proposed engineering construction.

Definitions of Terms

Some of the terms used by the agricultural soil scientist may be unfamiliar to the engineer, and some words—for example, soil, clay, silt, sand, and aggregate—may have special meanings in soil science. These and other special terms that are used in the soil survey report are defined in the glossary in the back part of the report.

Engineers commonly use two classification systems that express, by means of symbols, the relative suitability of soil materials for use in structures. These classification systems, as well as several engineering terms (*7*) that may be unfamiliar, are explained as follows:

AASHO system (*2*).—Most highway engineers classify soil materials in accordance with the system approved by the American Association of State Highway Officials. In this system soil materials are classified in seven principal groups. The groups range from A–1, consisting of gravelly soils of high bearing capacity, to A–7, consisting of clayey soils having low strength when wet. Within each group the relative engineering value of the soil material is indicated by a group index number. Group indexes range from 0, for the best materials, to 20, for the poorest.

Unified system (*13*).—In this system soil materials are identified as coarse grained (8 classes), fine grained (6

TABLE 2.—*Estimated physical properties*

Symbol on map	Soil mapping unit	Description	Depth	Reaction
			Inches	*pH*
AaA	Allis silt loam, 0 to 3 percent slopes	Shallow, poorly drained, acid soils formed mainly from thin glacial till; in general, weathered shale occurs at depths ranging from 12 to 30 inches; depth to the seasonally high water table ranges from 0 to 12 inches.	0 to 7	6. 0
AaA3	Allis silt loam, 0 to 3 percent slopes, severely eroded.		7 to 18	5. 8
AaB	Allis silt loam, 3 to 8 percent slopes.			
AaB3	Allis silt loam, 3 to 8 percent slopes, severely eroded.			
AaC	Allis silt loam, 8 to 15 percent slopes.			
AaC3	Allis silt loam, 8 to 15 percent slopes, severely eroded.			
AaD	Allis silt loam, 15 to 25 percent slopes.			
AaD3	Allis silt loam, 15 to 25 percent slopes, severely eroded.			
AaE	Allis silt loam, 25 to 45 percent slopes.			
Ba	Beach and Riverwash	Deep, gravelly and sandy alluvium and beach strands; the water table is at the level of Lake Erie or of streams, and in many places it is at the surface.	0 to 48+	--------
Bb	Beach sand, stabilized	Deep, sandy deposits just above the level of Lake Erie; the water table is at depths ranging from 0 to 24 inches.	0 to 120+	--------

See footnotes at end of table.

classes), or highly organic (1 class). The symbols expressing these various classes are shown in tables 2 and 4.

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

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

Shrink-swell potential.—The indication of the volume change to be expected in soil material with changes in the content of moisture.

Soil Engineering Data and Recommendations

Some engineering information can be obtained from the soil map. It will often be necessary, however, to refer to other parts of the report, particularly to the sections, Descriptions of the Soils, Use and Management of the Soils, Formation and Classification of the Soils, and Geology.

Tables 2 and 3 give engineering data on the soils of Erie County. Information in these tables is based on the engineering test data in table 4 and on material from other parts of the report. Table 2 shows estimated physical properties of the soils significant to engineering. Table 3 gives factors important to engineering and also hazards that affect different kinds of engineering on the various soils.

In table 4 supplementary engineering information is given. The engineering data were obtained during the construction of the Erie Thruway. This table was included to provide additional information for engineers who will be working with the soils.

As shown in table 3, the position of the water table and the drainage characteristics of the soils help determine the suitability ratings of the soils as sources of borrow materials. Areas of poorly drained and very poorly drained soils occur on valley floors and also on the upland. Some of these soils contain highly organic materials that should be removed from the roadway section and replaced with suitable materials. Some soils, particularly those near French Creek, may be flooded frequently. In this and in other low-lying areas, roads should be built on embankments so that the pavement surface is at least 3 feet above the level reached by the water table.

In areas of moderately well drained to poorly drained soils, earthwork is difficult when the water table is high or when there are prolonged wet periods. Seepage along the back slopes of cuts may cause slumping of the overlying materials. The high water table beneath the road pavement may cause freezing and thawing in the saturated subgrade. This may result in differential volume change, causing the pavement to break. These areas should be inspected closely to determine the need for interceptor drains and underdrains and to determine the proper location of the road grade in relation to the water table. The best time to work in these areas is during July and August. The average depth of frost penetration has been estimated to be 38 inches.

of the soils significant to engineering

Classification		Percentage passing sieve—		Percolation rate [3]	Structure	Shrink-swell potential
Unified [1]	AASHO [2]	No. 200 (0.074 mm.)	No. 4 (4.7 mm.)			
				Inches per hour		
OL or ML	A–4	75	90	0.63 to 2.0	Weak, fine, granular	Moderate.
CL	A–6	85	90	0.2 to 0.63	Coarse, subangular blocky	Moderate.
GP	A–1	0	25	More than 8.3	Single grain	Low.
SP	A–3	5	90	More than 6.3	Single grain	Low.

TABLE 2.—*Estimated physical properties of*

Symbol on map	Soil mapping unit	Description	Depth	Reaction
			Inches	*pH*
BcA	Berrien fine sandy loam, 0 to 2 percent slopes	Deep, moderately well drained soils of the lake plain; the parent material of stratified sands is underlain by gray calcareous material, locally called quicksand, and is at depths of 40 to 72 inches; depth to the seasonally high water table ranges from 9 to 28 inches.	0 to 7	6. 2
BcB	Berrien fine sandy loam, 2 to 8 percent slopes.		7 to 40	5. 8
BcB3	Berrien fine sandy loam, 2 to 8 percent slopes, severely eroded.		40 to 120+	(4)
BcC	Berrien fine sandy loam, 8 to 15 percent slopes.			
BcC3	Berrien fine sandy loam, 8 to 15 percent slopes, severely eroded.			
BcD	Berrien fine sandy loam, 15 to 25 percent slopes.			
BcD3	Berrien fine sandy loam, 15 to 25 percent slopes, severely eroded.			
BdA	Birdsall silt loam, 0 to 2 percent slopes	Deep, very poorly drained to poorly drained soils formed from lacustrine silts and clays; the soils occur in gently sloping areas and in depressions; they are slightly acid to calcareous at depths below 12 inches; depth to the water table ranges from 0 to 18 inches.	0 to 5	5. 4
BdB	Birdsall silt loam, 2 to 4 percent slopes.		5 to 120+	7. 0
CaA	Canadice silt loam, 0 to 2 percent slopes	Deep, poorly drained soils formed on terraces of glacial lakebeds; the soils have formed from slack-water deposits of silt and clay; depth to the seasonally high water table ranges from 0 to 18 inches.	0 to 7	5. 8
CaB	Canadice silt loam, 2 to 8 percent slopes.		7 to 18	6. 4
CaB3	Canadice silt loam, 2 to 8 percent slopes, severely eroded.		18 to 120+	(5)
CbA	Caneadea silt loam, 0 to 2 percent slopes	Deep, moderately well drained soils formed on the terraces of glacial lakebeds; the soils have formed from slack-water deposits of silt and clay; depth to the seasonally high water table ranges from 12 to 30 inches; the soils are slightly acid to calcareous at depths below 26 to 36 inches.	0 to 5	5. 4
CbB	Caneadea silt loam, 2 to 8 percent slopes.		5 to 18	6. 0
CbB3	Caneadea silt loam, 2 to 8 percent slopes, severely eroded.		18 to 120+	(4)
CbC	Caneadea silt loam, 8 to 15 percent slopes.			
CbC3	Caneadea silt loam, 8 to 15 percent slopes, severely eroded.			
CbD	Caneadea silt loam, 15 to 25 percent slopes.			
CbD3	Caneadea silt loam, 15 to 25 percent slopes, severely eroded.			
CcA	Chagrin fine sandy loam, 0 to 3 percent slopes	Deep, well-drained soils on flood plains that are frequently flooded by streams; the soils have formed from sandy sediments laid down by streams; in places pockets of silt or clay occur in the soil material; depth to the seasonally high water table ranges from 0 to 28 inches.	0 to 14	6. 4
CcA3	Chagrin fine sandy loam, 0 to 3 percent slopes, severely eroded.		14 to 72+	6. 2
CdA	Chagrin silt loam, 0 to 3 percent slopes	Deep, well-drained soils on flood plains that are occasionally flooded by streams; the soils have formed from silty sediments laid down by streams; in places pockets of sand or clay occur in the soil material; depth to the seasonally high water table ranges from 0 to 30 inches.	0 to 18	6. 0
CeA	Chagrin silt loam, high bottom, 0 to 3 percent slopes.		18 to 72+	5. 8
CeB	Chagrin silt loam, high bottom, 3 to 6 percent slopes.			
Cf	Chagrin very gravelly loam, fan, 0 to 6 percent slopes.	Deep, well-drained soil formed from very gravelly deposits; this soil occurs on fans at the bases of slopes at the point where the streams leave the upland and enter the flood plain; depth to the seasonally high water table ranges from 12 to 36 inches.	0 to 15	5. 5
			15 to 72+	5. 0

See footnotes at end of table.

the soils significant to engineering—Continued

Classification		Percentage passing sieve—		Percolation rate [3]	Structure	Shrink-swell potential
Unified [1]	AASHO [2]	No. 200 (0.074 mm.)	No. 4 (4.7 mm.)			
				Inches per hour		
SM	A-2	30	90	0.63 to 2.0	Weak, medium, granular	Low.
SM	A-2	30	90	0.63 to 2.0	Weak, medium, subangular blocky	Low.
ML	A-4	70	95	Less than 0.2	Massive	Low.
OL or ML	A-4	80	85	0.2 to 0.63	Moderate, fine, granular	Moderate.
CL	A-6	80	90	Less than 0.2	Strong, coarse, subangular blocky	Moderate.
OL or ML	A-5	95	99	0.2 to 0.63	Moderate, medium, granular	Moderate.
CL	A-6	98	99	0.2 to 0.63	Strong, medium, blocky	Moderate.
CL	A-6	98	99	Less than 0.2	Strong, very coarse, blocky	Moderate.
OL or ML	A-4	95	99	0.2 to 0.63	Moderate, fine, granular	Moderate.
ML	A-4	98	99	0.63 to 2.0	Strong, medium, blocky	Moderate.
CL	A-6	98	99	0.2 to 0.63	Strong, coarse, blocky	Moderate.
SM	A-2	35	95	2.0 to 6.3	Weak, medium, granular	Low.
SM	A-2	30	90	6.3 to 20.0	Weak, medium, granular	Low.
ML	A-4	70	95	0.63 to 2.0	Weak, medium, granular	Low.
ML	A-4	60	90	2.0 to 6.3	Weak, medium, granular	Low.
GM	A-1	20	60	2.0 to 6.3	Single grain	Low.
SM	A-1	15	70	6.3 to 20.0	Single grain	Low.

TABLE 2.—*Estimated physical properties of*

Symbol on map	Soil mapping unit	Description	Depth	Reaction
			Inches	*pH*
CgB	Conotton coarse sandy loam, 0 to 8 percent slopes.	Deep, well-drained soils on terraces of the beach ridges; the soils have formed from stratified, acid, coarse sand and fine gravel containing a few thin layers of silt and clay; in most places the stratified material is underlain by calcareous quicksand at depths of 4 to 20 feet; depth to the seasonally high water table ranges from 18 to 72 inches.	0 to 96	5.0
CgB3	Conotton coarse sandy loam, 0 to 8 percent slopes, severely eroded.		96 to 120+	(4)
CgC	Conotton coarse sandy loam, 8 to 15 percent slopes.			
CgC3	Conotton coarse sandy loam, 8 to 15 percent slopes, severely eroded.			
CgD	Conotton coarse sandy loam, 15 to 25 percent slopes.			
CgD3	Conotton coarse sandy loam, 15 to 25 percent slopes, severely eroded.			
ChA	Conotton gravelly loam, 0 to 3 percent slopes	Deep, well-drained soils on terraces of the beach ridges; the soils have formed from stratified, acid gravel and sand containing a few thin layers of silt and clay; in most places the stratified material is underlain by calcareous quicksand at depths of 4 to 20 feet; depth to the seasonally high water table ranges from 18 to 72 inches.	0 to 26	5.8
ChB	Conotton gravelly loam, 3 to 8 percent slopes.		26 to 96	6.2
ChB3	Conotton gravelly loam, 3 to 8 percent slopes, severely eroded.		96 to 120+	(4)
ChC	Conotton gravelly loam, 8 to 15 percent slopes.			
ChC3	Conotton gravelly loam, 8 to 15 percent slopes, severely eroded.			
CkB	Conotton gravelly sandy loam, 3 to 8 percent slopes.			
CkB3	Conotton gravelly sandy loam, 3 to 8 percent slopes, severely eroded.			
CkC	Conotton gravelly sandy loam, 8 to 15 percent slopes.			
CkC3	Conotton gravelly sandy loam, 8 to 15 percent slopes, severely eroded.			
CkD	Conotton gravelly sandy loam, 15 to 25 percent slopes.			
CkD3	Conotton gravelly sandy loam, 15 to 25 percent slopes, severely eroded.			
CmA	Conotton gravelly sandy loam, moderately well drained variant, 0 to 3 percent slopes.	Deep, moderately well drained soils on terraces of the beach ridges; the soils have formed from stratified, acid sand and gravel containing a few thin layers of silt and clay; in most places the stratified material is underlain by calcareous quicksand at depths of 4 to 15 feet; depth to the seasonally high water table ranges from 12 to 30 inches.	0 to 7	5.6
CmB	Conotton gravelly sandy loam, moderately well drained variant, 3 to 8 percent slopes.		7 to 33	5.8
CmB3	Conotton gravelly sandy loam, moderately well drained variant, 3 to 8 percent slopes, severely eroded.		33 to 108	6.0
			108+	(4)
DaA	Dalton silt loam, 0 to 2 percent slopes	Deep, somewhat poorly drained soils of the uplands; about 18 inches of very silty material overlies glacial till; depth to the seasonally high water table ranges from 0 to 12 inches.	0 to 7	6.6
DaB	Dalton silt loam, 2 to 8 percent slopes.		7 to 18	6.2
DaB2	Dalton silt loam, 2 to 8 percent slopes, moderately eroded.		18 to 96+	(6)
Ds	Dune sand	Loose, droughty fine sand that has been piled into dunes by the wind; the soil material is deep and well drained; the water table is deep.	0 to 72+	4.5
EaB	Ellery and Alden silt loams, 0 to 4 percent slopes.	Deep, poorly drained to very poorly drained soils formed from glacial till; the soils are slightly acid to calcareous at depths below 18 inches; depth to the seasonally high water table ranges from 0 to 10 inches.	0 to 10	6.0
			10 to 36	6.5
			36 to 72+	(4)
EbA	Erie silt loam, 0 to 3 percent slopes	Deep, somewhat poorly drained soils formed on glacial till; the soils occur on upland throughout the county; the parent material was an unassorted mixture of gravel, sand, silt, and clay; depth to the seasonally high water table ranges from 0 to 12 inches; an impervious layer, which is unstable when wet and hard when dry, is at depths between 6 and 18 inches.	0 to 6	5.5
EbB	Erie silt loam, 3 to 8 percent slopes.		6 to 30	5.0
EbB2	Erie silt loam, 3 to 8 percent slopes, moderately eroded.		30 to 96+	(6)
EbB3	Erie silt loam, 3 to 8 percent slopes, severely eroded.			
EbC	Erie silt loam, 8 to 15 percent slopes.			
EbC2	Erie silt loam, 8 to 15 percent slopes, moderately eroded.			
EbC3	Erie silt loam, 8 to 15 percent slopes, severely eroded.			
EbD	Erie silt loam, 15 to 25 percent slopes.			
EbD2	Erie silt loam, 15 to 25 percent slopes, moderately eroded.			
EbD3	Erie silt loam, 15 to 25 percent slopes, severely eroded.			

See footnotes at end of table.

the soils significant to engineering—Continued

Classification		Percentage passing sieve—		Percolation rate [3]	Structure	Shrink-swell potential
Unified [1]	AASHO [2]	No. 200 (0.074 mm.)	No. 4 (4.7 mm.)			
				Inches per hour		
SM	A–2	10	80	2.0 to 6.3	Single grain	Low.
SM	A–4	70	95	Less than 0.2	Massive	Low.
SM	A–2	15	75	2.0 to 6.3	Weak, medium, subangular blocky	Low.
SM	A–2	20	85	6.3 to 20.0	Single grain	Low.
SM	A–4	70	95	Less than 0.2	Massive	Low.
SM	A–2	15	75	6.3 to 20.0	Weak, coarse, granular	Low.
SM	A–2	20	85	2.0 to 6.3	Weak, coarse, subangular blocky	Low.
SM	A–2	15	90	2.0 to 6.3	Single grain	Low.
SM	A–2	70	95	Less than 0.2	Massive	Low.
OL or ML	A–6	90	95	0.2 to 0.63	Weak, fine, granular	Moderate.
ML	A–6	90	95	0.2 to 0.63	Weak, subangular blocky	Moderate.
ML	A–6	75	70	Less than 0.2	Prismatic but breaks to coarse platy	Moderate.
SM	A–2	15	95	More than 20.0	Single grain	Low.
OL or ML	A–4	75	90	0.63 to 2.0	Moderate, medium, granular	Moderate.
ML	A–6	85	90	0.2 to 0.63	Moderate, coarse, blocky	Moderate.
CL	A–6	75	80	Less than 0.2	Weak, medium, blocky	Moderate.
OL or ML	A–4	60	80	0.63 to 2.0	Weak, medium, subangular blocky	Moderate.
ML	A–6	75	95	0.2 to 0.63	Weak, medium, blocky	Moderate.
CL	A–6	75	95	Less than 0.2	Very coarse prismatic but breaks to blocky and platy.	Moderate.

TABLE 2.—*Estimated physical properties of*

Symbol on map	Soil mapping unit	Description	Depth	Reaction
			Inches	*pH*
FaA	Fredon loam, 0 to 3 percent slopes	Deep, somewhat poorly drained to poorly drained soils; the soils occur on flats and in depressions in the beach ridges and on terraces in the upland; the soils have formed from stratified sand, silt, and clay; in most places this material is underlain by calcareous quicksand at depths of 4 to 18 feet; depth to the seasonally high water table ranges from 0 to 18 inches.	0 to 8	5. 5
FaB	Fredon loam, 3 to 8 percent slopes.		8 to 48	6. 5
			48 to 72+	(4)
Fm	Fresh water marsh	Partly decomposed organic material underlain by lacustrine sand and gravel; the surface is covered by 1 to 3 feet of water.	0 to 12	5. 5
			12 to 120+	6. 0
HaA	Halsey loam, 0 to 3 percent slopes	Deep, very poorly drained soils on beach ridges and on terraces in the upland; the parent material consisted mainly of stratified sand, silt, and gravel; in most places calcareous quicksand occurs at depths of 3 to 15 feet; depth to the seasonally high water table ranges from 0 to 12 inches.	0 to 10	6. 0
			10 to 72	7. 0
			72 to 120+	(4)
HbA	Howard gravelly silt loam, 0 to 3 percent slopes	Deep, well-drained soils on kames and gravelly outwash terraces; the kettle and kame topography is complex; the soils have formed from stratified gravel and sand mixed with some thin layers of silt and clay; a cemented horizon, locally called fossil rock, generally occurs at depths of 3½ to 8 feet; the water table is deep.	0 to 8	5. 0
HbB	Howard gravelly silt loam, 3 to 8 percent slopes.		8 to 84	6. 0
HbB3	Howard gravelly silt loam, 3 to 8 percent slopes, severely eroded.		84 to 120+	(4)
HbC	Howard gravelly silt loam, 8 to 15 percent slopes.			
HbC3	Howard gravelly silt loam, 8 to 15 percent slopes, severely eroded.			
HbD	Howard gravelly silt loam, 15 to 25 percent slopes.			
HbD3	Howard gravelly silt loam, 15 to 25 percent slopes, severely eroded.			
HbE	Howard gravelly silt loam, 25 to 40 percent slopes.			
HbE3	Howard gravelly silt loam, 25 to 40 percent slopes, severely eroded.			
LaB	Langford silt loam, 0 to 8 percent slopes	Deep, moderately well drained soils formed on glacial till; the soils occupy the more favorably drained positions in the upland; the parent material was an unassorted mixture of gravel, sand, silt, and clay; depth to the seasonally high water table ranges from 18 to 30 inches.	0 to 6	5. 5
LaB2	Langford silt loam, 0 to 8 percent slopes, moderately eroded.		6 to 20	5. 5
LaB3	Langford silt loam, 0 to 8 percent slopes, severely eroded.		20 to 120+	7. 0
LaC	Langford silt loam, 8 to 15 percent slopes.			
LaC2	Langford silt loam, 8 to 15 percent slopes, moderately eroded.			
LaC3	Langford silt loam, 8 to 15 percent slopes, severely eroded.			
LaD	Langford silt loam, 15 to 25 percent slopes.			
LaD2	Langford silt loam, 15 to 25 percent slopes, moderately eroded.			
LaD3	Langford silt loam, 15 to 25 percent slopes, severely eroded.			
LbE	Langford and Erie silt loams, 25 to 50 percent slopes.	Deep, moderately well drained and somewhat poorly drained upland soils formed from glacial till consisting of an unassorted mixture of local flagstone, silt and clay; depth to the seasonally high water table ranges from 6 to 30 inches.	0 to 6	5. 5
LbE3	Langford and Erie silt loams, 25 to 50 percent slopes, severely eroded.		6 to 72+	6. 5

See footnotes at end of table.

the soils significant to engineering—Continued

Classification		Percentage passing sieve—		Percolation rate [3]	Structure	Shrink-swell potential
Unified [1]	AASHO [2]	No. 200 (0.074 mm.)	No. 4 (4.7 mm.)			
				Inches per hour		
OL or ML	A–4	60	80	2.0 to 6.3	Moderate, medium, granular	Low.
ML	A–4	60	80	0.63 to 2.0	Moderate, medium, subangular blocky	Low.
ML	A–4	70	95	Less than 0.2	Massive	Low.
PT						
ML	A–4	70	95	Less than 0.2	Massive	Low.
OL or ML	A–4	80	95	2.0 to 6.3	Moderate, medium, granular	Low.
GM	A–4	40	65	0.63 to 2.0	Moderate, medium, subangular blocky	Low.
ML	A–4	70	95	Less than 0.2	Massive	Low.
ML	A–4	50	60	2.0 to 6.3	Moderate, fine, granular	Low.
GM	A–4	40	65	0.63 to 2.0	Massive to single grain	Low.
GP	A–3	10	25	2.0 to 6.3	Massive	None.
OL or ML	A–4	60	70	0.63 to 2.0	Weak, fine, granular	Low.
CL	A–4	70	80	0.63 to 2.0	Weak, medium, subangular blocky	Moderate.
ML	A–4	50	60	0.2 to 0.63	Weak, medium, subangular blocky	Moderate.
OL or ML	A–4	60	70	0.63 to 2.0	Weak, fine, granular	Low.
CL	A–4	70	75	0.2 to 6.3	Weak, medium, subangular blocky	Moderate.

TABLE 2.—*Estimated physical properties of*

Symbol on map	Soil mapping unit	Description	Depth	Reaction
			Inches	*pH*
LcA	Lobdell silt loam, 0 to 3 percent slopes	Deep, moderately well drained soils on flood plains that are subject to occasional overflow by streams; the soils have formed from silty deposits; in some places pockets of sand or gravel occur in the soil material; depth to the seasonally high water table ranges from 0 to 18 inches.	0 to 12	6. 5
LcA3	Lobdell silt loam, 0 to 3 percent slopes, severely eroded.		12 to 48+	6. 0
LdA	Lobdell silt loam, high bottom, 0 to 3 percent slopes.			
LdB	Lobdell silt loam, high bottom, 3 to 6 percent slopes.			
MbB	Mahoning silt loam, 3 to 8 percent slopes	Deep, moderately well drained to somewhat poorly drained soils that have formed from medium-textured glacial till; the soils occupy the more favorably drained positions in the upland in the southwestern part of the county; depth to the seasonally high water table ranges from 18 to 30 inches.	0 to 6	5. 5
MbB2	Mahoning silt loam, 3 to 8 percent slopes, moderately eroded.		6 to 120+	6. 5
MbC	Mahoning silt loam, 8 to 15 percent slopes.			
MbC2	Mahoning silt loam, 8 to 15 percent slopes, moderately eroded.			
MbC3	Mahoning silt loam, 8 to 15 percent slopes, severely eroded.			
McC	Manlius and Lordstown soils, shallow, 8 to 25 percent slopes.	Shallow, excessively drained to well drained soils formed from thin, acid glacial till containing many fragments of local flagstone and shale; weathered shale or sandstone bedrock generally occurs at depths of 12 to 30 inches; the water table is deep.	0 to 30	5. 5
McE	Manlius and Lordstown soils, shallow, 25 to 80 percent slopes.		30+	5. 0
MdB	Mardin gravelly silt loam, 3 to 8 percent slopes	Deep, moderately well drained upland soils formed from acid glacial till; the till contains unassorted material derived from sandstone and shale bedrock mixed with some sand, silt, and clay; the soils occupy the more favorably drained positions in the upland in the northeastern part of the county; depth to the seasonally high water table ranges from 18 to 30 inches.	0 to 6	5. 5
MdB3	Mardin gravelly silt loam, 3 to 8 percent slopes, severely eroded.		6 to 20	5. 0
MdC	Mardin gravelly silt loam, 8 to 15 percent slopes.		20 to 120+	5. 5
MdC3	Mardin gravelly silt loam, 8 to 15 percent slopes, severely eroded.			
MdD	Mardin gravelly silt loam, 15 to 25 percent slopes.			
MdD3	Mardin gravelly silt loam, 15 to 25 percent slopes, severely eroded.			
MeE	Mardin and Volusia gravelly silt loams, 25 to 45 percent slopes.	Deep, moderately well drained to somewhat poorly drained, acid soils of the glaciated upland; the soils have formed from unassorted material derived from local flagstone mixed with silt and clay; depth to the seasonally high water table ranges from 6 to 30 inches.	0 to 6	5. 0
MeE3	Mardin and Volusia gravelly silt loams, 25 to 45 percent slopes, severely eroded.		6 to 72+	6. 0
MfA	Miner silt loam, 0 to 3 percent slopes	Deep, very poorly drained soil formed from medium-textured glacial till; this soil occurs on flats and in depressions on the glaciated upland in the southwestern part of the county; depth to the seasonally high water table ranges from 0 to 6 inches.	0 to 8	6. 0
			8 to 72+	7. 0
Mp	Muck and Peat	Deep, very poorly drained, highly organic soils; depth to the seasonally high water table ranges from 0 to 10 inches; depth to the mineral soil ranges from 1½ to 40 feet.	0 to 18	6. 5
			18 to 48+	7. 0
OaA	Ottawa fine sandy loam, 0 to 2 percent slopes	Deep, well-drained, sandy lacustrine soils of the lake plain; the soils have formed on stratified fine sand containing some thin layers of silt and clay; this material is underlain by gray, calcareous quicksand at depths of 60 to 108 inches; the water table is deep.	0 to 60	4. 5
OaB	Ottawa fine sandy loam, 2 to 8 percent slopes.		60 to 120+	(4)
OaB3	Ottawa fine sandy loam, 2 to 8 percent slopes, severely eroded.			
OaC	Ottawa fine sandy loam, 8 to 15 percent slopes.			
OaC3	Ottawa fine sandy loam, 8 to 15 percent slopes, severely eroded.			
OaD	Ottawa fine sandy loam, 15 to 25 percent slopes.			
OaD3	Ottawa fine sandy loam, 15 to 25 percent slopes, severely eroded.			

See footnotes at end of table.

the soils significant to engineering—Continued

Classification		Percentage passing sieve—		Percolation rate [3]	Structure	Shrink-swell potential
Unified [1]	AASHO [2]	No. 200 (0.074 mm.)	No. 4 (4.7 mm.)			
				Inches per hour		
ML	A-4	60	80	2.0 to 6.3	Weak, medium, granular	Low.
ML	A-4	50	70	0.2 to 0.63	Weak, medium, granular	Low.
OL or ML	A-4	70	90	0.63 to 2.0	Moderate, fine, granular	Moderate.
ML	A-4	60	90	0.2 to 0.63	Strong, coarse, blocky	Moderate.
ML	A-4	50	80	0.63 to 2.0	Weak, fine, granular	Low.
		20	30	0.2 to 0.63	Massive	None.
OL or ML	A-4	60	75	0.63 to 2.0	Moderate, fine, granular	Low.
ML	A-4	60	75	0.63 to 2.0	Moderate, medium, subangular blocky	Low.
CL	A-4	60	80	0.2 to 0.63	Moderate, coarse, subangular blocky	Low.
OL or ML	A-4	60	60	0.63 to 2.0	Moderate, medium, granular	Low.
ML	A-4	70	70	0.2 to 0.63	Moderate, medium, subangular blocky	Low.
OL or ML	A-6	90	95	6.2 to 0.63	Strong, medium, blocky	Moderate.
CL	A-6	80	85	Less than 0.2	Strong, medium, subangular blocky	Moderate.
PT					Structureless	Moderate.
CL	A-5	98	99		Structureless	Moderate.
SM	A-2	20	98	0.63 to 2.0	Weak, thick, platy	Low.
ML	A-4	70	95	Less than 0.2	Massive	Low.

TABLE 2. *Estimated physical properties of*

Symbol on map	Soil mapping unit	Description	Depth	Reaction
			Inches	*pH*
ObA	Ottawa loamy fine sand, 0 to 2 percent slopes	Deep, well-drained, sandy lacustrine soils of the lake plain; the soils have formed in weakly stratified fine sand that flows when dry; in most places this material is underlain by calcareous quicksand; the water table is deep; the soil material that is free of iron is used for molding sand.	0 to 60	4. 0
ObB	Ottawa loamy fine sand, 2 to 8 percent slopes.		60 to 120+	(4)
ObB3	Ottawa loamy fine sand, 2 to 8 percent slopes, severely eroded.			
ObC	Ottawa loamy fine sand, 8 to 15 percent slopes.			
ObC3	Ottawa loamy fine sand, 8 to 15 percent slopes, severely eroded.			
ObD	Ottawa loamy fine sand, 15 to 25 percent slopes.			
ObD3	Ottawa loamy fine sand, 15 to 25 percent slopes, severely eroded.			
PaA	Phelps gravelly silt loam, 0 to 3 percent slopes	Deep, moderately well drained soils of the glacial outwash terraces; the soils have formed on stratified gravel and sand containing some layers of silt and clay; depth to the seasonally high water table ranges from 18 to 30 inches.	0 to 8	6. 0
PaB	Phelps gravelly silt loam, 3 to 8 percent slopes.		8 to 120+	7. 0
PaB3	Phelps gravelly silt loam, 3 to 8 percent slopes, severely eroded.			
PaC	Phelps gravelly silt loam, 8 to 15 percent slopes.			
PaC3	Phelps gravelly silt loam, 8 to 15 percent slopes, severely eroded.			
PbA	Platea silt loam, 0 to 2 percent slopes	Deep, somewhat poorly drained soils of the glaciated upland; the soils have formed from an unassorted mixture of medium-textured glacial till containing a few fragments of gravel and coarse sand; depth to the seasonally high water table ranges from 6 to 18 inches; in level and nearly level areas east of Cranesville, there is less than 2 feet of medium-textured soil material; this overlies coarse-textured glacial till; in places calcareous quicksand occurs at depths below 72 inches.	0 to 8	5. 5
PbB	Platea silt loam, 2 to 8 percent slopes.		8 to 72	7. 0
PbB3	Platea silt loam, 2 to 8 percent slopes, severely eroded.		72 to 120+	(4)
PbC	Platea silt loam, 8 to 15 percent slopes.			
PbC3	Platea silt loam, 8 to 15 percent slopes, severely eroded.			
PbD	Platea silt loam, 15 to 25 percent slopes.			
PbD3	Platea silt loam, 15 to 25 percent slopes, severely eroded.			
PcA	Platea silt loam, moderately well drained variant, 0 to 2 percent slopes.	Deep, moderately well drained soils of the glaciated upland; the soils have formed from an unassorted mixture of medium-textured glacial till containing a few fragments of gravel and coarse sand; the soils occupy favorably drained positions; depth to the seasonally high water table ranges from 18 to 30 inches.	0 to 6	5. 0
PcB	Platea silt loam, moderately well drained variant, 2 to 8 percent slopes.		6 to 120+	6. 5
PcB3	Platea silt loam, moderately well drained variant, 2 to 8 percent slopes, severely eroded.			
PcC	Platea silt loam, moderately well drained variant, 8 to 15 percent slopes.			
PcC3	Platea silt loam, moderately well drained variant, 8 to 15 percent slopes, severely eroded.			
PcD	Platea silt loam, moderately well drained variant, 15 to 25 percent slopes.			
PcD3	Platea silt loam, moderately well drained variant, 15 to 25 percent slopes, severely eroded.			
RaA	Rimer fine sandy loam, 0 to 2 percent slopes	Deep, somewhat poorly drained to poorly drained lacustrine soils of the lake plain; the soils have formed from stratified sand containing some layers of silt and clay; this material overlies gray, calcareous quicksand that generally begins at depths of 36 to 48 inches; depth to the seasonally high water table ranges from 0 to 30 inches.	0 to 8	6. 0
RaB	Rimer fine sandy loam, 2 to 8 percent slopes.		8 to 40	6. 5
RaB3	Rimer fine sandy loam, 2 to 8 percent slopes, severely eroded.		40 to 120+	(4)
SaA	Scio silt loam, 0 to 3 percent slopes	Deep, moderately well drained soils on stream terraces; the soils have formed from medium-textured sediments deposited by streams; depth to the seasonally high water table ranges from 18 to 30 inches.	0 to 8	6. 0
SaB	Scio silt loam, 3 to 8 percent slopes.		8 to 72+	6. 0
SaC	Scio silt loam, 8 to 15 percent slopes.			
SaC3	Scio silt loam, 8 to 15 percent slopes, severely eroded.			
SbA	Sloan silty clay loam, 0 to 3 percent slopes	Deep, poorly drained soils on flood plains that are subject to frequent overflow by streams; the soils have formed from medium- and fine-textured sediments; depth to the water table ranges from 0 to 10 inches.	0 to 10	6. 0
			10 to 72+	7. 0
ScA	Sloan silty clay loam, permanently wet, 0 to 3 percent slopes.	This soil is in swamps that occupy depressions in the flood plains; the areas are permanently wet.	0 to 12	7. 0
			12 to 72+	7. 0

See footnotes at end of table.

the soils significant to engineering—Continued

Classification		Percentage passing sieve—		Percolation rate [3]	Structure	Shrink-swell potential
Unified [1]	AASHO [2]	No. 200 (0.074 mm.)	No. 4 (4.7 mm.)			
				Inches per hour		
SM	A–4	40	98	2.0 to 6.3	Single grain	Low.
ML	A–4	70	95	Less than 0.2	Massive	Low.
OL or ML	A–4	40	60	0.63 to 2.0	Moderate, medium, granular	Low.
GM	A–2	25	50	0.2 to 0.63	Massive to single grain	Low.
OL or ML	A–4	70	90	0.2 to 0.63	Weak, fine, granular	Moderate.
ML	A–4	60	80	0.2 to 0.63	Moderate, medium, blocky	Moderate.
CL	A–4	70	95	Less than 0.2	Massive	Low.
OL or ML	A–4	70	90	0.2 to 0.63	Weak, fine, granular	Moderate.
ML	A–4	60	80	0.63 to 2.0	Moderate, medium, blocky	Moderate.
SM	A–2	30	90	0.63 to 2.0	Weak, medium, granular	Low.
SM	A–2	30	90	0.63 to 2.0	Weak, medium, subangular blocky	Low.
SM	A–4	70	95	Less than 0.2	Massive	Low.
OL or ML	A–4	70	90	0.63 to 2.0	Moderate, fine, granular	Moderate.
ML	A–4	60	80	0.2 to 0.63	Moderate, medium, subangular blocky	Moderate.
OL	A–6	80	95	.02 to 0.63	Weak, medium, granular	Moderate.
CL	A–6	70	90	Less than 0.2	Moderate, medium, granular	Moderate.
OL	A–6	80	95	0.2 to 0.63	Structureless	Moderate.
CL	A–6	70	90	Less than 0.2	Structureless	Moderate.

TABLE 2.—*Estimated physical properties of*

Symbol on map	Soil mapping unit	Description	Depth	Reaction
			Inches	*pH*
TaA	Trumbull silt loam, 0 to 3 percent slopes	Deep, poorly drained soils of the glaciated upland; the soils have formed from an unassorted mixture of medium-textured glacial till, which is calcareous at depths of 18 to 24 inches; depth to the water table ranges from 0 to 18 inches.	0 to 8 8 to 120+	6. 0 7. 0
TaA3	Trumbull silt loam, 0 to 3 percent slopes, severely eroded.			
TaB	Trumbull silt loam, 3 to 8 percent slopes.			
TaB2	Trumbull silt loam, 3 to 8 percent slopes, moderately eroded.			
TaB3	Trumbull silt loam, 3 to 8 percent slopes, severely eroded.			
TaC	Trumbull silt loam, 8 to 15 percent slopes.			
TaC2	Trumbull silt loam, 8 to 15 percent slopes, moderately eroded.			
TaC3	Trumbull silt loam, 8 to 15 percent slopes, severely eroded.			
UaA	Unadilla fine sandy loam, 0 to 3 percent slopes	Deep, well-drained soils on stream terraces; the soils have formed from medium-textured sediments deposited by streams; the water table is deep. In places stratified sand and gravel occur below a depth of 4 feet.	0 to 8 8 to 72+	5. 5 6. 0
UaB	Unadilla fine sandy loam, 3 to 8 percent slopes.			
UaB3	Unadilla fine sandy loam, 3 to 8 percent slopes, severely eroded.			
UaC	Unadilla fine sandy loam, 8 to 15 percent slopes.			
UaC3	Unadilla fine sandy loam, 8 to 15 percent slopes, severely eroded.			
VaA	Volusia gravelly silt loam, 0 to 3 percent slopes	Deep, somewhat poorly drained to poorly drained upland soils; the soils that formed from acid glacial till consisting of an unassorted mixture of material weathered from sandstone and shale bedrock and some sand, silt, and clay; an impervious layer, which is unstable when wet and hard when dry, begins at depths of 6 to 18 inches; depth to the seasonally high water table ranges from 0 to 18 inches.	0 to 6 6 to 30 30 to 96+	5. 5 5. 0 6. 0
VaB	Volusia gravelly silt loam, 3 to 8 percent slopes.			
VaB3	Volusia gravelly silt loam, 3 to 8 percent slopes, severely eroded.			
VaC	Volusia gravelly silt loam, 8 to 15 percent slopes.			
VaC3	Volusia gravelly silt loam, 8 to 15 percent slopes, severely eroded.			
VaD	Volusia gravelly silt loam, 15 to 25 percent slopes.			
VaD3	Volusia gravelly silt loam, 15 to 25 percent slopes, severely eroded.			
VbA	Volusia silt loam, 0 to 3 percent slopes.			
VbB	Volusia silt loam, 3 to 8 percent slopes.			
VbB3	Volusia silt loam, 0 to 8 percent slopes, severely eroded.			
VbC	Volusia silt loam, 8 to 15 percent slopes.			
VbC3	Volusia silt loam, 8 to 15 percent slopes, severely eroded.			
VbD	Volusia silt loam, 15 to 25 percent slopes.			
VbD3	Volusia silt loam, 15 to 25 percent slopes, severely eroded.			
WaA	Wallington fine sandy loam, 0 to 2 percent slopes	Deep, somewhat poorly drained to poorly drained lacustrine soils on the lake plain and in inland areas formerly occupied by glacial lakes; the soils have formed from stratified silt, fine sand, and clay; an impervious layer, which is unstable when wet and hard when dry, begins at depths of 6 to 18 inches; in most places the stratified material is underlain by gray, calcareous quicksand at depths of 4 to 8 feet; depth to the seasonally high water table ranges from 0 to 18 inches.	0 to 8 8 to 60 60 to 120+	5. 5 6. 0 (4)
WaB	Wallington fine sandy loam, 2 to 8 percent slopes.			
WaB3	Wallington fine sandy loam, 2 to 8 percent slopes, severely eroded.			
WaC	Wallington fine sandy loam, 8 to 15 percent slopes.			
WaC3	Wallington fine sandy loam, 8 to 15 percent slopes, severely eroded.			
WaD	Wallington fine sandy loam, 15 to 25 percent slopes.			
WaD3	Wallington fine sandy loam, 15 to 25 percent slopes, severely eroded.			
WbA	Wallington silt loam, 0 to 2 percent slopes	Deep, somewhat poorly drained to poorly drained lacustrine soils on the lake plain and in inland areas formerly occupied by glacial lakes; the soils have formed from stratified silt, clay, and fine sand; an impervious layer, which is unstable when wet and hard when dry, begins at depths of 6 to 14 inches; depth to the seasonally high water table ranges from 0 to 18 inches.	0 to 6 6 to 120+	6. 0 6. 0
WbB	Wallington silt loam, 2 to 8 percent slopes.			
WbB3	Wallington silt loam, 2 to 8 percent slopes, severely eroded.			
WbC	Wallington silt loam, 8 to 15 percent slopes.			
WcA	Wauseon fine sandy loam, 0 to 2 percent slopes	Deep, very poorly drained lacustrine soil on flats and in depressions in the lake plain; the soil has formed from stratified sand, silt, and clay that is underlain by gray, calcareous quicksand at depths of 18 to 48 inches; depth to the seasonally high water table ranges from 0 to 18 inches.	0 to 40 40 to 72+	5. 5 (4)

See footnotes at end of table.

the soils significant to engineering—Continued

Classification		Percentage passing sieve—		Percolation rate [3]	Structure	Shrink-swell potential
Unified [1]	AASHO [2]	No. 200 (0.074 mm.)	No. 4 (4.7 mm.)			
				Inches per hour		
OL or ML	A–6	90	95	0.2 to 0.63	Weak, fine, granular	Moderate.
ML	A–6	85	90	0.2 to 0.63	Moderate, coarse, blocky	Moderate.
ML	A–4	50	95	0.63 to 2.0	Weak, fine, granular	Low.
ML	A–4	55	90	0.63 to 2.0	Moderate, medium, subangular blocky	Low.
OL or ML	A–4	65	80	0.63 to 2.0	Moderate, medium, granular	Moderate.
ML	A–6	65	75	0.2 to 0.63	Strong, coarse, blocky	Moderate.
CL	A–6	60	75	0.2 to 0.63	Very coarse, prismatic but breaks to blocky structure.	Moderate.
SM	A–4	50	95	0.63 to 2.0	Weak, medium, granular	Low.
CL	A–6	55	90	0.2 to 0.63	Weak, medium, subangular blocky	Low.
ML	A–4	70	95	Less than 0.2	Massive	Low.
OL or ML	A–4	70	90	0.63 to 2.0	Moderate, medium, granular	Moderate.
ML	A–4	60	80	0.2 to 0.63	Very coarse prismatic but breaks to strong, coarse, subangular blocky.	Moderate.
SM	A–2	35	95	0.63 to 2.0	Weak, medium, subangular blocky	Low.
ML	A–4	70	95	Less than 0.2	Massive	Low.

TABLE 2.—*Estimated physical properties of*

Symbol on map	Soil mapping unit	Description	Depth	Reaction
			Inches	*pH*
WdA	Wayland silt loam, 0 to 3 percent slopes	Deep, somewhat poorly drained to poorly drained soil on flood plains that are subject to frequent overflow by streams; this soil has formed from medium- and fine-textured sediments; depth to the water table ranges from 0 to 18 inches.	0 to 10 10 to 72+	6. 0 7. 0
WeA	Williamson and Collamer fine sandy loams, 0 to 2 percent slopes.	Deep, moderately well drained lacustrine soils on the lake plain and in inland areas formerly occupied by glacial lakes; the soils have formed from stratified silt, fine sand, and clay; in most places this material is underlain by gray, calcareous quicksand at depths of 4 to 10 feet; depth to the seasonally high water table ranges from 18 to 30 inches.	0 to 72 72 to 120+	5. 5 (4)
WeB	Williamson and Collamer fine sandy loams, 2 to 8 percent slopes.			
WeB3	Williamson and Collamer fine sandy loams, 2 to 8 percent slopes, severely eroded.			
WeC	Williamson and Collamer fine sandy loams, 8 to 15 percent slopes.			
WeC3	Williamson and Collamer fine sandy loams, 8 to 15 percent slopes, severely eroded.			
WeD	Williamson and Collamer fine sandy loams, 15 to 25 percent slopes.			
WeD3	Williamson and Collamer fine sandy loams, 15 to 25 percent slopes, severely eroded.			
WfA	Williamson and Collamer silt loams, 0 to 2 percent slopes.			
WfB	Williamson and Collamer silt loams, 2 to 8 percent slopes.			
WfC	Williamson and Collamer silt loams, 8 to 15 percent slopes.			
WgB	Wooster gravelly silt loam, 3 to 12 percent slopes.	Deep, well-drained upland soils on glacial terminal moraines; the kettle-and-kame topography is complex; the soils have formed from an unassorted mixture of gravel, sand, silt, and clay; the water table is deep.	0 to 120+	5. 0
WgC	Wooster gravelly silt loam, 12 to 20 percent slopes.			
WgD	Wooster gravelly silt loam, 20 to 30 percent slopes.			
WgE	Wooster gravelly silt loam, 30 to 40 percent slopes.			
WgE3	Wooster gravelly silt loam, 30 to 40 percent slopes, severely eroded.			

[1] Based on The Unified Soil Classification System, Tech. Memo. No. 3–357, v. 1, Waterways Experiment Station, Corps of Engineers, March 1953 (*13*).

[2] Based on Standard Specifications for Highway Materials and Methods of Sampling and Testing (Pt. 1): The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes, AASHO Designation: M 145–49 (*2*).

TABLE 3.—*Characteristics of*

[Absence of information indicates that there is no

Soils and mapping unit symbols	Range of slopes	Depth to seasonally high water table	Suggested location of earth gradeline	Suggested grade of side slopes	Suitability as source of—		
					Topsoil	Sand	Gravel
	Percent	*Feet*		*Ratio*			
Allis silt loam (AaA, AaA3, AaB, AaB3, AaC, AaC3, AaD, AaD3, AaE).	0–45	0	2 feet above surface.	2:1	Poor	(2)	(2)
Beach and Riverwash (Ba)	0–3	0	(2)	(2)	(2)	(2)	Good
Beach sand, stabilized (Bb)	0–3	0	Ground level	(2)	(2)	Good	Poor
Berrien fine sandy loam (BcA, BcB, BcB3, BcC, BcC3, BcD, BcD3).	0–25	1	Ground level or above.	4:1	Good	Good	Poor

See footnotes at end of table.

the soils significant to engineering—Continued

Classification		Percent passing sieve—		Percolation rate [3]	Structure	Shrink-swell potential
Unified [1]	AASHO [2]	No. 200 (0.074 mm.)	No. 4 (4.7 mm.)			
				Inches per hour		
OL or ML	A–6	60	90	0.63 to 2.0	Moderate, medium, granular	Low.
ML	A–6	80	90	0.2 to 0.63	Moderate, coarse, granular	Low.
SM	A–4	50	95	0.63 to 2.0	Moderate, medium, subangular blocky.	Low.
ML	A–4	70	95	Less than 0.2	Massive	Low.
GM	A–2	30	60	2.0 to 0.63	Moderate, medium, subangular blocky	Low.

[3] Refers to estimated permeability of the soil material as it occurs without compaction. Estimates based on the kind of soil structure after the method developed by Alfred O'Neill.

[4] Calcareous.
[5] Slightly acid to calcareous.
[6] Neutral.

the soils affecting engineering

particular hazard for type of engineering specified]

Hazards affecting—							
Infiltration systems [1]	Building sites	Excavations and pipelines	Drainage		Irrigation	Ponds	Diversion terraces
			Open ditch	Tile			
High water table; shallow bedrock.	High water table; shallow bedrock.	Shallow to bedrock; acid reaction.	Shallowness	Shallow to bedrock.	Shallowness	Shallowness	Shallow to bedrock.
High water table; flooding.	Flooding	Unstable				Rapid permeability.	
High water table; flooding.	Flooding	Unstable				Rapid permeability.	
	Seasonally high water table; unstable substratum.	Quicksand				Rapid permeability.	

TABLE 3.—*Characteristics of the soils*

Soils and mapping unit symbols	Range of slopes	Depth to seasonally high water table	Suggested location of earth gradeline	Suggested grade of side slopes	Suitability as source of—		
					Topsoil	Sand	Gravel
	Percent	*Feet*		*Ratio*			
Birdsall silt loam (BdA, BdB)	0–4	0	2 feet above surface.	3:1	Poor	(2)	(2)
Canadice silt loam (CaA, CaB, CaB3)	0–8	0	2 feet above surface.	3:1	Poor	(2)	(2)
Caneadea silt loam (CbA, CbB, CbB3, CbC, CbC3, CbD, CbD3).	0–25	1	Ground level	3:1	Poor	(2)	(2)
Chagrin fine sandy loam (CcA, CcA3)	0–3	0	Above flood level	2:1	Good	Poor	Poor
Chagrin silt loam (CdA)	0–3	0	Above flood level	2:1	Good	(2)	(2)
Chagrin silt loam, high bottom (CeA, CeB).	0–6	0	Above flood level	2:1	Good	(2)	(2)
Chagrin very gravelly loam, fan (Cf)	0–6	0	Above flood level	2:1	Poor	Poor	Good
Conotton coarse sandy loam (CgB, CgB3, CgC, CgC3, CgD, CgD3).	0–25	(3)	At any suitable level.	3:1	Fair	Good	Good
Conotton gravelly loam (ChA, ChB, ChB3, ChC, ChC3).	0–15	(3)	At any suitable level.	2:1	Good	Fair	Good
Conotton gravelly sandy loam (CkB, CkB3, CkC, CkC3, CkD, CkD3).	0–25	(3)	At any suitable level.	2:1	Fair	Good	Good
Conotton gravelly sandy loam, moderately well drained variant (CmA, CmB, CmB3).	0–8	1	Ground level or above.	3:1	Fair	Good	Good
Dalton silt loam (DaA, DaB, DaB2)	0–8	0	1 foot above surface.	2:1	Fair	(2)	(2)
Dune sand (Ds)	0–25	(3)	At any suitable level.	4:1	Poor	Very good	(2)
Ellery and Alden silt loams (EaB)	0–4	0	2 feet above surface.	2:1	Poor	(2)	(2)
Erie silt loam (EbA, EbB, EbB2, EbB3, EbC, EbC2, EbC3, EbD, EbD2, EbD3).	0–25	0	1 foot above surface.	2:1	Fair	(2)	(2)
Fredon loam (FaA, FaB)	0–8	0	2 feet above surface.	3:1	Good	Fair	Fair
Fresh water marsh (Fm)	0	(4)	(2)	(2)	(2)	(2)	(2)
Halsey loam (HaA)	0–3	0	2 feet above surface.	3:1	Good	Fair	Fair
Howard gravelly silt loam (HbA, HbB, HbB3, HbC, HbC3, HbD, HbD3, HbE, HbE3).	0–40	(3)	At any suitable level.	2:1	Good	Good	Good
Langford silt loam (LaB, LaB2, LaB3, LaC, LaC2, LaC3, LaD, LaD2, LaD3).	3–25	1	Ground level or above.	2:1	Good	(2)	Poor
Langford and Erie silt loams (LbE, LbE3)	25–50	0–2	Ground level or above.	2:1	Fair	(2)	(2)
Lobdell silt loam (LcA, LcA3)	0–3	0	Above flood level.	2:1	Good	(2)	(2)
Lobdell silt loam, high bottom (LdA, LdB).	0–6	0	Above flood level.	2:1	Good	(2)	(2)
Mahoning silt loam (MbB, MbB2, MbC, MbC2, MbC3).	3–15	1	Ground level or above.	2:1	Fair	(2)	(2)
Manlius and Lordstown soils, (McC, McE).	8–80	(3)	At any suitable level.	2:1	Fair	(2)	(2)
Mardin gravelly silt loam (MdB, MdB3, MdC, MdC3, MdD, MdD3).	3–25	2	Ground level or above.	2:1	Good	(2)	Poor.
Mardin and Volusia gravelly silt loams (MeE, MeE3).	25–45	0–2	Ground level or above.	2:1	Fair	(2)	Poor
Miner silt loam (MfA)	0–3	0	2 feet above surface.	3:1	Poor	(2)	(2)
Muck and Peat (Mp)	0–3	0	(2)	(2)	Good	(2)	(2)
Ottawa fine sandy loam (OaA, OaB, OaB3, OaC, OaC3, OaD, OaD3).	0–25	(3)	At any suitable level.	4:1	Fair	Good	Poor

See footnotes at end of table.

affecting engineering—Continued

Hazards affecting—							
Infiltration systems [1]	Building sites	Excavations and pipelines	Drainage		Irrigation	Ponds	Diversion terraces
			Open ditch	Tile			
Very slow permeability; high water table.	High water table.				Poor drainage.		
Very slow permeability; high water table.	High water table; unstable.				Slow infiltration.		
Very slow permeability; seasonally high water table.	Unstable.				Slow infiltration.		
Flooding.	Flooding.						
Flooding.	Flooding.						
Occasional flooding.	Occasional flooding.						
Flooding.	Flooding.					Rapid permeability.	
		Quicksand.				Rapid permeability.	
		Quicksand.				Rapid permeability.	
		Quicksand.				Rapid permeability.	
Seasonally high water table.	Seasonally high water table; unstable substratum.	Quicksand.					
Seasonally high water table.	Seasonally high water table.			Slow permeability.	Shallow to pan.		
	Unstable.	Unstable.				Rapid permeability.	
High water table.	High water table.			Slow permeability.	Poor drainage.		
Seasonally high water table.	Seasonally high water table.			Slow permeability.	Shallow to pan.		
High water table.	High water table.	Quicksand.		Quicksand.		Quicksand.	
High water table.	Flooding.						
High water table.	High water table.	Quicksand.		Quicksand.	Poor drainage.	Quicksand.	
		Cemented horizon.				Rapid permeability.	
Seasonally high water table.	High water table.						
Seasonally high water table.	High water table.						
Flooding.	Flooding.						
Seasonally high water table.	Occasional flooding.						
Slow permeability; seasonally high water table.	Seasonally high water table.			Slow permeability.	Slow infiltration.		
Shallow to bedrock.	Shallow to bedrock.	Shallow to bedrock.	Shallowness.			Shallowness.	Shallow to bedrock.
Seasonally high water table.	Seasonally high water table.						
Very slow permeability; high water table.	High water table.			Slow permeability.	Poor drainage.		
Very slow permeability; high water table.	Unstable.	Unstable.		Unstable.		Unstable.	
						Rapid permeability.	

TABLE 3.—*Characteristics of the soils*

Soils and mapping unit symbols	Range of slopes	Depth to seasonally high water table	Suggested location of earth gradeline	Suggested grade of side slopes	Suitability as source of—		
					Topsoil	Sand	Gravel
	Percent	*Feet*		*Ratio*			
Ottawa loamy fine sand (ObA, ObB, ObB3, ObC, ObC3, ObD, ObD3).	0–25	(3)	At any suitable level.	4:1	Poor	Very good.	Poor
Phelps gravelly silt loam (PaA, PaB, PaB3, PaC, PaC3).	0–15	1	Ground level or above.	2:1	Good	Poor	Fair.
Platea silt loam (PbA, PbB, PbB3, PbC, PbC3, PbD, PbD3).	0–25	1	1 foot above surface.	3:1	Fair	(2)	(2)
Platea silt loam, moderately well drained variant (PcA, PcB, PcB3, PcC, PcC3, PcD, PcD3).	0–25	2	Ground level or above.	2:1	Good	(2)	(2)
Rimer fine sandy loam (RaA, RaB, RaB3).	0–8	0	1 foot above surface.	3:1	Fair	Fair	Poor
Scio silt loam (SaA, SaB, SaC, SaC3)	0–15	1	Ground level or above.	3:1	Good	(2)	Poor
Sloan silty clay loam (SbA)	0–3	0	Above flood level	3:1	Poor	(2)	(2)
Sloan silty clay loam, permanently wet (ScA).	0	(5)	(2)	(2)	(2)	(2)	(2)
Trumbull silt loam (TaA, TaA3, TaB, TaB2, TaB3, TaC, TaC2, TaC3).	0–15	0	1 foot above surface.	3:1	Poor	(2)	(2)
Unadilla fine sandy loam (UaA, UaB, UaB3, UaC, UaC3).	0–15	(3)	At any suitable level.	2:1	Good	Fair	Fair.
Volusia gravelly silt loam (VaA, VaB, VaB3, VaC, VaC3, VaD, VaD3).	0–25	0	1 foot above surface.	2:1	Fair	(2)	Poor
Volusia silt loam (VbA, VbB, VbB3, VbC, VbC3, VbD, VbD3).	0–25	0	1 foot above surface.	2:1	Fair	(2)	(2)
Wallington fine sandy loam (WaA, WaB, WaB3, WaC, WaC3, WaD, WaD3).	0–25	0	1 foot above surface.	3:1	Fair	Poor	Poor
Wallington silt loam (WbA, WbB, WbB3, WbC).	0–15	0	1 foot above surface.	3:1	Fair	(2)	(2)
Wauseon fine sandy loam (WcA)	0–2	0	2 feet above surface.	3:1	Poor	Poor	Poor
Wayland silt loam (WdA)	0–3	0	Above flood level.	3:1	Poor	(2)	(2)
Williamson and Collamer fine sandy loams (WeA, WeB, WeB3, WeC, WeC3, WeD, WeD3).	0–25	2	Ground level	3:1	Good	Poor	(2)
Williamson and Collamer silt loams (WfA, WfB, WfC).	0–15	2	Ground level or above.	3:1	Good	(2)	(2)
Wooster gravelly silt loam (WgB, WgC, WgD, WgE, WgE3).	3–40	(3)	At any suitable level.	2:1	Good	Poor	Fair

[1] On sites used for the disposal of industrial waste.
[2] Not applicable.
[3] At depths of more than 3 feet.

affecting engineering—Continued

Hazards affecting—							
Infiltration systems [1]	Building sites	Excavations and pipelines	Drainage		Irrigation	Ponds	Diversion terraces
			Open ditch	Tile			
	Unstable	Unstable				Rapid permeability.	
Very slow permeability; seasonally high water table.	Seasonally high water table.	Quicksand		Slow permeability.	Slow infiltration.		
Slow permeability		Quicksand			Slow infiltration.		
Seasonally high water table.	Seasonally high water table.	Quicksand		Quicksand		Quicksand.	
Seasonally high water table.	Seasonally high water table.						
Flooding	Flooding			Slow permeability.	Poor drainage		
Permanently wet	Permanently wet.						
Very slow permeability; seasonally high water table.	Seasonally high water table.			Slow permeability.	Slow infiltration.		
Seasonally high water table.	Seasonally high water table.						
Slow permeability; seasonally high water table.	Seasonally high water table.	Shallow to bedrock.		Shallow to bedrock.	Slow infiltration.		
Seasonally high water table.	Seasonally high water table.	Quicksand		Quicksand	Slow infiltration.	Quicksand.	
Very slow permeability; seasonally high water table.	Seasonally high water table.			Slow permeability.	Slow infiltration.		
Seasonally high water table.	Seasonally high water table.	Quicksand		Quicksand	Poor drainage	Quicksand.	
Flooding	Flooding				Poor drainage.		
Seasonally high water table.	Seasonally high water table.	Quicksand		Quicksand	Slow infiltration.	Quicksand.	
Slow permeability; seasonally high water table.	Seasonally high water table.			Slow permeability.	Slow infiltration.		
						Rapid permeability.	

[4] Soil covered by approximately 3 feet of water.

[5] Soil covered by approximately 2 feet of water.

TABLE 4.—*Engineering test data* [1] *for soil samples taken from sites along the Erie Thruway—Legislative Route 797*

Soil type	Depth	Mechanical analysis				Liquid limit	Plasticity index	Natural moisture content	Engineering classification	
		Percentage passing sieve—			Percentage smaller than [2]—					
		No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.02 mm.				AASHO	Unified
	Feet					*Percent*	*Percent*	*Percent*		
Allis silt loam	3. 0–4. 0	86	74	57	41	27	9	15. 5	A–4(4)	CL.
	1. 0–7. 0	85	81	72	54	36	14	18. 4	A–6(9)	CL.
	6. 0–7. 0	75	68	64	53	38	17	11. 3	A–6(9)	CL.
	6. 0–7. 0	67	60	56	45	37	16	8. 9	A–6(7)	CL.
	6. 0–7. 0	90	82	74	67	40	18		A–6(11)	CL.
	9. 0–10. 0	71	62	56	49	35	15	10. 8	A–6(6)	CL.
	9. 0–10. 0	70	58	52	42	33	14	6. 8	A–6(5)	CL.
	0. 8–2. 8	71	62	55	44	34	14	22. 4	A–6(6)	CL.
	6. 0–7. 0	82	76	71	62	40	19	5. 6	A–6(11)	CL.
	12. 0–13. 0	81	72	68	58	35	15	17. 3	A–6(9)	CL.
	12. 0–13. 0	76	68	65	47	34	14	10. 9	A–6(8)	CL.
	1. 0–2. 0	77	64	56	44	29	10	17. 1	A–4(4)	CL.
	3. 0–4. 0	74	58	49	38	31	8	31. 8	A–4(3)	SM–SC.
	3. 0–4. 0	94	92	91	55	43	16	26. 6	A–7(6)	ML–CL.
	3. 0–4. 0	96	91	81	64	34	16	15. 9	A–6(10)	CL.
	8. 0	79	72	63	46	29	11	11. 5	A–6(7)	CL.
	6. 0–7. 0	96	89	80	56	34	8	47. 2	A–4(8)	ML.
	0. 7–9. 0	73	67	60	41	27	9	18. 0	A–4(5)	CL.
	3. 0–4. 0	87	81	78	65	35	15	17. 2	A–6(10)	CL.
	3. 0–4. 0	86	78	69	48	31	11	16. 4	A–6(7)	CL.
	3. 0–4. 0	71	32	44	30	28	9	12. 8	A–4(2)	SC.
	9. 0–8. 0	95	81	70	50	22	4	20. 6	A–4(7)	ML–CL.
	6. 0–7. 0	76	72	50	37	26	16	14. 7	A–6(5)	SC.
	9. 0–10. 0	94	86	82	72	32	12	18. 9	A–6(9)	CL.
	9. 0–10. 0	93	88	85	72	38	19	14. 4	A–6(12)	CL.
	0. 8–10. 2	76	72	68	48	36	15	20. 9	A–6(7)	CL.
	6. 0–7. 0	100	98	97	78	35	15	15. 4	A–6(10)	CL.
	6. 0–7. 0	63	49	41	27	26	5	13. 8	A–4(1)	SM–SC.
	6. 0–7. 0	89	79	69	55	30	11	13. 8	A–6(8)	CL.
	3. 0–4. 0	88	80	75	61	35	15	17. 3	A–6(10)	CL.
	3. 0–4. 0	98	89	74	50	32	12	34. 9	A–6(9)	CL.
Berrien fine sandy loam	4. 0–6. 0	99	90	12	9	20	[3]	23. 5	A–2–4(0)	SP–SM.
	9. 0–10. 0	95	84	33	24	16	[3]	23. 9	A–2–4(0)	SM.
	9. 0–10. 0	98	94	64	41	17	[3]	22. 1	A–4(6)	ML.
	0. 9–7. 0	99	90	7	5	22	[3]	8. 1	A–3(0)	SP–SM.
	6. 0–7. 0	99	88	22	16	15	[3]	9. 9	A–2–4(0)	SM.
	9. 0–10. 0	89	77	59	41	21	6	17. 2	A–4(5)	SM–SC.
	2. 0–4. 0	90	84	75	52	26	4	18. 9	A–4(3)	ML–CL.
	6. 0–7. 0	94	84	30	16	18	[3]	21. 0	A–2–4(0)	SM.
	0. 1–5. 0	100	95	4	3	21	[3]	5. 3	A–3(0)	SP.
Birdsall silt loam	3. 0– 4. 0	87	74	59	43	22	5	19. 8	A–4(5)	ML–CL.
	6. 0– 7. 0	96	77	55	39	23	4	17. 2	A–4(4)	ML–CL.
	3. 0– 4. 0	97	94	86	60	29	11	24. 1	A–6(9)	CL.
	3. 0– 4. 0	91	84	75	50	30	8	25. 0	A–4(8)	ML–CL.
	6. 0– 7. 0	87	76	68	45	25	7	17. 4	A–4(7)	ML–CL.
	6. 0– 7. 0	92	81	72	51	25	7	22. 4	A–4(8)	ML–CL.
	3. 0– 4. 0	86	78	66	45	30	10	30. 3	A–4(6)	CL.
	6. 0– 7. 0	100	97	92	63	34	12	38. 3	A–6(9)	ML–CL.
	9. 0–10. 0	93	82	69	52	23	11	19. 2	A–6(8)	CL.
	0. 8– 6. 0	90	80	65	49	26	9		A–4(6)	CL.
	6. 0– 7. 0	94	84	70	46	24	6	17. 3	A–4(5)	ML–CL.
	6. 0– 7. 0	99	98	95	71	27	9	24. 7	A–4(8)	CL.
Conotton coarse sandy loam.	1. 0– 6. 5	99	86	19	13	18	[3]	6. 2	A–2–4(0)	
Conotton gravelly sandy loam, moderately well drained variant.	0– 8. 0	100	89	7	6	21	[3]	22. 1	A–3(0)	SP–SM.
	6. 0– 7. 0	99	88	22	16	15	[3]	9. 9	A–2–4(0)	SM.
	14. 0–15. 0	99	98	25	15	17	[3]	16. 6	A–2–4(0)	SM.
	0. 9– 7. 0	99	90	7	5	22	[3]	8. 1	A–3(0)	SP–SM.
Ellery and Alden silt loams.	18. 0–19. 0	94	87	78	58	30	10	29. 6	A–4(8)	ML–CL.
	3. 0– 4. 5	98	93	85	52	39	11	49. 4	A–6(9)	ML.
	3. 0– 4. 0	93	86	74	55	35	11	32. 2	A–6(8)	ML–CL.

See footnotes at end of table.

TABLE 4.—*Engineering test data*[1] *for soil samples taken from sites along the Erie Thruway—Legislative Route 797*—Con.

Soil type	Depth	Mechanical analysis: Percentage passing sieve— No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	Percentage smaller than [2]— 0.02 mm.	Liquid limit	Plasticity index	Natural moisture content	Engineering classification: AASHO	Unified
	Feet					*Percent*	*Percent*	*Percent*		
Ellery and Alden silt loams—Continued	4. 0– 6. 0	73	64	55	44	31	11	21. 4	A–6(4)	CL.
	3. 0– 4. 0	93	79	71	55	35	12	20. 6	A–6(8)	ML–CL.
	3. 0– 4. 0	88	75	58	39	28	11	15. 6	A–6(5)	CL.
	3. 0– 4. 0	91	83	75	44	29	11	16. 4	A–6(8)	CL.
	2. 0– 3. 0	97	92	78	50	(4)	(4)	42. 8		
	5. 0– 6. 0	77	57	50	35	33	9	29. 0	A–4(3)	SM–SC.
	3. 0– 4. 0	99	98	96	79	39	15	26. 0	A–6(10)	ML–CL.
	9. 0–10. 0	96	88	70	44	20	5	17. 8	A–4(7)	ML–CL.
	6. 0– 7. 0	85	74	70	54	32	12	12. 7	A–6(8)	CL.
	3. 0– 4. 0	76	64	56	44	36	16	16. 4	A–6(8)	CL.
	3. 0– 4. 0	96	93	87	63	26	8	19. 8	A–4(8)	CL.
Erie silt loam	9. 0–10. 0	91	78	65	49	25	7	18. 6	A–4(6)	ML–CL.
	6. 0– 7. 0	100	98	91	66	29	11	22. 7	A–6(8)	CL.
	3. 0– 9. 5	93	85	76	52	32	13	18. 1	A–6(9)	CL.
	3. 0– 4. 0	93	87	82	59	34	9	26. 7	A–4(8)	ML–CL.
	3. 0– 4. 0	88	69	54	31	25	8	15. 6	A–4(4)	CL.
	1. 0– 7. 5	65	56	50	33	32	12	31. 3	A–6(3)	SC.
	1. 0– 6. 0	57	47	45	21	38	15	15. 6	A–6(4)	SM–SC.
	3. 0– 4. 0	91	78	72	41	33	12	18. 8	A–6(8)	CL.
	0. 4– 1. 6	45	42	40	27	38	7		A–4(1)	GM.
	3. 0– 4. 0	83	76	73	48	40	13	21. 8	A–6(8)	ML–CL.
	3. 0– 4. 0	89	80	71	40	31	12	17. 2	A–6(8)	CL.
	3. 0– 4. 0	89	76	62	33	26	8	17. 4	A–6(6)	CL.
	3. 0– 4. 0	83	72	60	29	24	7	15. 0	A–4(5)	ML–CL.
	3. 0– 4. 0	100	99	93	42	34	7	35. 2	A–4(8)	ML–CL.
	9. 0–10. 0	87	74	58	24	23	5	19. 1	A–4(5)	ML–CL.
	3. 0– 4. 0	100	99	94	51	33	14	22. 5	A–6(9)	CL.
	3. 0– 4. 0	95	89	81	40	30	10	19. 7	A–4(8)	CL.
	9. 0–10. 0	82	63	54	29	24	6	13. 8	A–4(4)	ML–CL.
	3. 0– 4. 0	92	82	70	42	26	8	19. 1	A–4(7)	CL.
	15. 0–16. 0	92	81	70	45	23	6	17. 6	A–4(7)	ML–CL.
	0. 6– 8. 5	84	72	62	46	26	8	29. 7	A–4(5)	CL.
	3. 0– 4. 0	94	92	91	55	43	16	26. 6	A–7–6(10)	ML–CL.
	3. 0– 4. 0	84	74	65	52	29	10	14. 2	A–4(6)	CL.
	3. 0– 4. 0	91	85	82	59	36	9	36. 8	A–4(8)	ML.
	9. 5	83	78	68	45	25	7	17. 5	A–4(7)	ML–CL.
	12. 0	87	80	71	49	22	7	14. 8	A–4(7)	ML–CL.
		89	83	70	50	27	10	22. 3	A–4(8)	CL.
	9. 0–10. 0	100	91		81	38	16	25. 6	A–6(10)	CL.
	6. 0– 7. 0	88	78	63	54	23	5	15. 2	A–4(6)	ML–CL.
	9. 0–10. 0	99	98	97	96	36	17	26. 4	A–6(11)	CL.
	3. 0– 4. 0	93	91	89	74	34	15	16. 5	A–6(10)	CL.
	3. 0– 4. 0	94	77	66	47	34	7	34. 0	A–4(6)	ML–CL.
	9. 0–10. 0	96	85	75	52	34	9	31. 9	A–4(8)	ML–CL.
	9. 0–10. 0	85	78	66	52	25	8	35. 4	A–4(6)	CL.
	6. 0– 7. 0	81	63	53	42	28	8	17. 8	A–4(6)	CL.
	3. 0– 4. 0	98	79	70	50	30	11	16. 0	A–4(7)	CL.
	3. 4	81	75	67	48	29	8	21. 4	A–4(7)	ML–CL.
	3. 3	76	72	68	52	37	14	23. 1	A–6(8)	ML–CL.
	3. 0– 4. 0	84	76	62	51	28	8	16. 6	A–4(6)	CL.
	3. 0– 4. 0	98	95	93	80	39	16	18. 1	A–6(10)	CL.
	3. 0– 4. 0	80	68	51	36	25	8	15. 0	A–4(3)	CL.
	3. 0– 4. 0	83	73	57	41	24	6	16. 9	A–4(4)	ML–CL.
	3. 0– 4. 0	83	75	70	51	33	12	12. 3	A–6(8)	CL.
	0. 7– 4. 5	84	74	61	42	26	6	14. 0	A–4(5)	ML–CL.
Fredon loam	0. 6– 2. 6	90	80	70	55	31	12	16. 3	A–6(8)	CL.
	8. 1–11. 0	82	71	60	46	24	9	12. 0	A–4(5)	CL.
	9. 0–10. 0	87	79	67	53	29	13	14. 8	A–6(7)	CL.
	9. 0–10. 0	93	84	74	59	28	11	15. 8	A–6(8)	CL.
	3. 0– 4. 0	87	76	65	50	29	11	15. 5	A–6(7)	CL.
	3. 0– 4. 0	76	51	44	28	28	8	19. 1	A–4(2)	SC.
	9. 0–10. 0	74	40	27	19	25	7	29. 3	A–2–4(0)	SM–SC.

See footnotes at end of table.

TABLE 4.—*Engineering test data*[1] *for soil samples taken from sites along the Erie Thruway—Legislative Route 797*—Con.

Soil type	Depth	Mechanical analysis				Liquid limit	Plasticity index	Natural moisture content	Engineering classification	
		Percentage passing sieve—			Percentage smaller than [2]—					
		No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.02 mm.				AASHO	Unified
	Feet					*Percent*	*Percent*	*Percent*		
Fredon loam—Con.	10. 0	85	70	51	36	25	5	15. 4	A-4(3)	ML-CL.
	10. 0–11. 0	86	78	69	55	25	10	14. 0	A-4(7)	CL.
	3. 0– 4. 0	80	70	60	41	27	7	19. 0	A-4(5)	ML-CL.
	3. 0– 4. 0	93	82	63	44	30	10	21. 0	A-4(6)	CL.
	0. 8– 5. 0	86	75	53	30	19	3	17. 1	A-4(4)	ML.
	6. 0– 7. 0	77	53	28	19	19	3	21. 4	A-2-4(0)	SM.
	6. 0– 7. 0	94	83	68	40	22	6	18. 0	A-4(7)	ML-CL.
	6. 0– 7. 0	94	87	75	40	22	5	20. 7	A-4(8)	ML-CL.
	6. 0– 7. 0	75	55	47	30	26	8	15. 3	A-4(2)	SC.
	9. 0–10. 0	86	75	59	41	20	6	20. 2	A-4(5)	ML-CL.
Halsey loam	3. 0– 4. 0	92	92	92	56	30	11	24. 0	A-6(8)	CL.
	3. 0– 4. 0	94	83	64	46	24	7	16. 5	A-4(6)	ML-CL.
	6. 0– 7. 0	91	76	45	30	20	3	17. 2	A-4(2)	SM.
	6. 0– 7. 0	90	79	63	45	24	8	12. 5	A-4(6)	CL.
	9. 0–10. 0	94	86	70	50	23	8	10. 0	A-4(7)	CL.
Howard gravelly silt loam.	6. 0– 7. 0	81	42	13	8	17	[3]	11. 0	A-1-b(0)	SM.
	9. 0–10. 0	87	75	61	38	24	3	23. 8	A-4(5)	ML.
	3. 0– 4. 0	85	77	59	40	28	10	20. 1	A-4(5)	CL.
	12. 0–13. 0	78	64	52	33	20	5	15. 0	A-4(3)	ML-CL.
	0. 8– 4. 8	91	85	68	45	26	7	15. 9	A-4(7)	ML-CL.
Langford silt loam	3. 0– 4. 0	76	55	37	23	25	5	17. 9	A-4(0)	SM-SC.
	6. 0– 7. 0	94	83	69	53	31	13	22. 2	A-6(8)	CL.
	13. 0–14. 0	77	67	56	44	23	8	12. 5	A-4(4)	CL.
	24. 0–25. 0	92	87	41	31	18	4	11. 6	A-4(1)	SM.
	3. 0– 4. 0	93	83	73	57	30	12	15. 7	A-6(8)	CL.
	6. 0– 7. 0	77	65	55	32	25	9	16. 1	A-4(4)	CL.
	12. 0–13. 0	84	77	66	39	24	8	11. 9	A-4(6)	CL.
	6. 0– 7. 0	93	84	73	48	32	14	18. 6	A-6(9)	CL.
	3. 0– 4. 0	95	86	78	53	33	13	21. 0	A-6(9)	CL.
	3. 0– 4. 0	86	78	70	36	39	10	34. 5	A-4(8)	ML.
	3. 0– 4. 0	87	65	49	25	-------	-------	13. 5	-------	-------
	1. 0– 7. 5	76	66	56	36	28	9	17. 1	A-4(4)	CL.
	2. 0– 6. 0	85	75	65	47	29	9	18. 7	A-4(6)	CL.
	9. 0–10. 0	97	92	84	59	29	13	19. 4	A-6(9)	CL.
	3. 0– 4. 0	97	88	79	41	26	6	21. 4	A-4(8)	ML-CL.
	9. 0–10. 0	83	70	58	29	25	8	15. 7	A-4(8)	CL.
Lobdell silt loam	3. 0– 4. 0	95	87	76	66	30	13	17. 7	A-6(9)	CL.
	6. 0– 7. 0	100	98	84	51	27	7	25. 4	A-4(8)	ML-CL.
	6. 0– 7. 0	57	38	28	21	24	7	7. 9	A-2-4(0)	SM-SC.
	9. 0–10. 0	79	73	67	52	26	9	13. 6	A-4(6)	CL.
	4. 0– 6. 0	97	93	21	14	21	[3]	18. 9	A-2-4(0)	SM.
Manlius and Lordstown soils, shallow.	12. 0–13. 0	75	66	61	47	34	13	60. 0	A-6(7)	CL.
	1. 0– 4. 0	90	82	75	58	34	12	18. 9	A-6(9)	ML-CL.
	6. 0– 7. 0	74	60	40	19	23	4	11. 7	A-4(1)	SM-SC.
	3. 0– 4. 0	90	80	69	31	29	9	18. 4	A-4(7)	CL.
Mardin gravelly silt loam.	3. 0– 4. 0	83	68	47	31	20	5	13. 4	A-4(2)	SM-SC.
	6. 0– 7. 0	85	72	55	35	20	4	16. 4	A-4(4)	ML-CL.
	6. 0– 7. 0	91	78	60	41	25	5	19. 0	A-4(5)	ML-CL.
	3. 0– 4. 0	84	76	64	54	31	13	16. 5	A-6(7)	CL.
	12. 0–13. 0	87	76	58	42	24	9	16. 4	A-4(5)	CL.
	12. 0–13. 0	91	80	61	42	25	7	23. 6	A-4(5)	ML-CL.
	15. 0–16. 0	75	63	59	45	26	10	17. 3	A-4(5)	CL.
	1. 0– 3. 5	72	64	56	39	28	5	24. 6	A-4(4)	ML-CL.
	6. 0– 7. 0	90	79	64	45	27	17	17. 8	A-6(9)	CL.
	21. 0–22. 0	100	99	85	40	21	3	21. 6	A-4(8)	ML.
	3. 0– 4. 0	91	86	82	62	35	15	16. 9	A-6(10)	CL.
	6. 0– 7. 0	82	71	66	44	31	13	7. 2	A-6(7)	CL.
	1. 2– 4. 0	77	65	53	36	27	6	15. 7	A-4(4)	ML-CL.
	6. 0– 7. 0	91	84	80	55	31	13	10. 6	A-6(9)	CL.
	9. 0–11. 0	79	63	54	33	25	9	18. 8	A-4(4)	CL.
	3. 0– 5. 5	91	78	71	48	30	12	28. 8	A-6(9)	CL.
	3. 0– 4. 0	92	81	69	53	29	11	16. 0	A-6(7)	CL.
	3. 0– 4. 0	73	59	52	40	29	10	11. 6	A-4(4)	CL.

See footnotes at end of table.

TABLE 4.—*Engineering test data*[1] *for soil samples taken from sites along the Erie Thruway—Legislative Route 797*—Con.

Soil type	Depth	Mechanical analysis: Percentage passing sieve— No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	Percentage smaller than [2]— 0.02 mm.	Liquid limit	Plasticity index	Natural moisture content	Engineering classification: AASHO	Unified
	Feet					*Percent*	*Percent*	*Percent*		
Mardin gravelly silt loam—Continued	1. 0– 2. 5	66	54	51	36	37	8	31. 6	A–4(3)	ML.
	9. 0–10. 0	90	73	59	46	23	8	17. 4	A–4(5)	CL.
	9. 0–10. 0	93	81	70	56	26	9	16. 7	A–4(7)	CL.
	6. 0– 7. 0	92	81	76	52	28	9	26. 1	A–4(6)	CL.
	3. 0– 4. 0	97	95	92	71	39	14	28. 0	A–6(10)	ML–CL.
	9. 0–10. 0	90	80	67	53	28	12	14. 0	A–6(7)	CL.
Ottawa fine sandy loam	9. 0–10. 0	100	96	25	16	18	[3]	21. 0	A–2–4(0)	SM.
	6. 0– 7. 0	100	92	8	6	20	[3]	6. 5	A–3(0)	SP–SM.
	4. 0– 5. 3	95	88	60	35	24	[3]		A–4(5)	ML.
	6. 0– 7. 0	100	94	21	15	17	[3]	20. 2	A–2–4(0)	SM.
	15. 0–16. 0					20	3	18. 2		
	6. 0– 7. 0	100	92	8	6	20	[3]	6. 5	A–3(0)	SP–SM.
	6. 0– 7. 0	99	93	80	56	25	8	19. 7	A–4(8)	CL.
	15. 0–16. 0	98	93	78	53	21	6	13. 7	A–4(8)	ML–CL.
Ottawa loamy fine sand	9. 0–10. 0	86	80	13	10	19	[3]	20. 6	A–2–4(0)	SM.
	3. 0– 4. 0	100	89	47	30	19	2	23. 2	A–4(2)	SM.
	9. 0–10. 0	100	99	90	72	25	7	25. 1	A–4(8)	ML–CL.
	6. 0– 7. 0	100	99	72	35	20	3	26. 8	A–4(7)	ML.
	9. 0–10. 0	100	99	67	44	19	3	25. 6	A–4(6)	ML.
	0. 8– 4. 0	100	99	64	44	20	[3]	16. 5	A–4(6)	ML.
	4. 0– 6. 5	100	99	97	75	26	[3]	30. 4	A–4(8)	ML.
	1. 0– 6. 0	97	88	8	5	21	[3]	9. 3	A–3(0)	SP–SM.
	6. 0– 7. 0	98	95	20	13	17	[3]	10. 5	A–2–4(0)	SM.
	3. 0– 4. 0	96	92	78	58	31	12	18. 8	A–6(9)	CL.
Phelps gravelly silt loam	0. 9– 3. 0	82	71	59	33	27	4	28. 4	A–4(5)	ML–CL.
	9. 0–10. 0	76	44	15		19	5	20. 9	A–1–b(0)	SM–SC.
	9. 0–10. 0	97	95	94	50	22	6	23. 5	A–4(8)	ML–CL.
	6. 0– 7. 0	88	80	71	49	24	6	16. 7	A–4(7)	ML–CL.
	12. 0–13. 0	98	95	90	63	23	7	19. 0	A–4(8)	ML–CL.
	9. 0–10. 0	92	82	58	41	20	6	16. 9	A–4(5)	ML–CL.
	3. 0– 4. 0	93	69	47	32	23	4	19. 0	A–4(2)	SM–SC.
	9. 0–10. 0	82	64	57	57	27	8	20. 3	A–4(4)	CL.
	12. 0–14. 0	100	99	98	86	31	13	27. 0	A–6(9)	CL.
	5. 0– 6. 0	69	53	35	17	21	[3]	14. 1	A–2–4(0)	SM.
	3. 0– 4. 0	96	93	81	63	31	13	17. 8	A–6(9)	CL.
	6. 0– 7. 0	44	33	17	12	18	1	9. 4	A–1–b(0)	GM.
	3. 0– 4. 0	89	64	40	28	23	5	14. 8	A–4(1)	SM–SC.
	9. 0–10. 0	86	70	45	29	22	5	13. 9	A–4(2)	SM–SC.
	6. 0– 7. 0	94	82	66	44	23	5	18. 5	A–4(6)	ML–CL.
	12. 0–13. 0	89	77	51	34	21	6	12. 3	A–4(3)	ML–CL.
	20. 0–21. 0	93	81	65	46	20	7	15. 9	A–4(6)	ML–CL.
	0. 9– 8. 5	80	58	39	26	22	6	23. 0	A–4(1)	SM–SC.
	9. 0–10. 0	75	52	32	21	21	6	18. 3	A–2–4(0)	SM–SC.
	15. 0–16. 0	74	54	40	28	20	6	15. 7	A–4(1)	SM–SC.
	3. 0– 4. 0	47	40	34	22	28	7	12. 8	A–2–4(0)	GM–GC.
	9. 0–10. 0	58	42	35	24	27	9	10. 9	A–2–4(0)	GC.
	19. 0–20. 0	96	83	62	37	20	4	18. 1	A–4(5)	ML–CL.
	0. 9–12. 0	73	62	52	30	29	9	16. 8	A–4(3)	CL.
	0. 7– 6. 0	86	63	30	18	18	[3]		A–2–4(0)	SM.
Platea silt loam	0. 8– 9. 0	80	70	59	40	24	4	17. 2	A–4(5)	ML–CL.
	6. 0– 7. 0	92	86	74	55	26	8	17. 4	A–4(8)	CL.
	3. 0– 4. 0	89	92	78	60	26	6	17. 8	A–4(8)	ML–CL.
	3. 0– 4. 0	92	83	70	51	25	9	18. 8	A–4(7)	CL.
	3. 0– 4. 0	84	76	67	47	28	11	15. 2	A–6(7)	CL.
	3. 0– 4. 0	94	87	79	58	29	11	18. 0	A–6(9)	CL.
	6. 0– 7. 0	74	62	56	39	26	10	12. 6	A–4(4)	CL.
	3. 0– 4. 0	89	77	61	48	24	5	20. 2	A–4(5)	ML–CL.
	0. 5– 8. 0	82	66	51	35	24	7	15. 0	A–4(3)	ML–CL.
	2. 5– 8. 0	86	69	59	44	26	8	12. 1	A–4(5)	CL.
	9. 0–10. 0	89	77	60	42	20	5	16. 6	A–4(5)	ML–CL.
	5. 0– 8. 0	92	83	54	24	19	[3]	19. 9	A–4(4)	ML.
	3. 0– 4. 0	92	80	60	45	26	10	16. 8	A–4(5)	CL.
	12. 0–13. 0	87	76	55	35	19	5	14. 5	A–4(4)	ML–CL.

See footnotes at end of table.

TABLE 4.—*Engineering test data*[1] *for soil samples taken from sites along the Erie Thruway—Legislative Route 797*—Con.

Soil type	Depth	Mechanical analysis				Liquid limit	Plasticity index	Natural moisture content	Engineering classification	
		Percentage passing sieve—			Percentage smaller than [2]—					
		No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.02 mm.				AASHO	Unified
	Feet					*Percent*	*Percent*	*Percent*		
Platea silt loam—Con.	3. 0– 4. 0	76	63	47	31	24	6	15. 4	A–4(2)	SM–SC.
	3. 0– 4. 0	98	93	75	49	26	10	17. 0	A–4(8)	CL.
Platea silt loam, moderately well drained variant.	3. 0– 4. 0	90	76	65	46	32	13	20. 4	A–6(7)	CL.
	6. 0– 7. 0	90	76	61	48	23	7	15. 0	A–4(5)	ML–CL.
	9. 0–10. 0	93	81	60	33	22	6	16. 6	A–4(5)	ML–CL.
Rimer fine sandy loam	3. 0– 4. 0	97	93	29	19	22	[3]	24. 0	A–2–4(0)	SM.
	9. 0–10. 0	100	97	11	8	23	[3]	23. 5	A–2–4(0)	SP–SM.
	6. 0– 7. 0	100	97	26	20	19	[3]	35. 8	A–2–4(0)	SM.
	3. 0– 4. 0	100	99	27	20	17	[3]	18. 4	A–2–4(0)	SM.
	9. 0–10. 0	100	99	10	7	22	[3]	23. 2	A–3(0)	SP–SM.
	9. 0–10. 0	100	98	53	41	15	1	26. 0	A–4(4)	ML.
	6. 0– 7. 0	100	98	20	13	19	[3]	24. 5	A–2–4(0)	SM.
	9. 0–10. 0	98	96	76	59	21	6	25. 2	A–4(8)	ML–CL.
	3. 0– 4. 0	100	99	23	18	17	[3]	19. 5	A–2–4(0)	SM.
	6. 0– 7. 0	100	98	19	15	17	[3]	24. 1	A–2–4(0)	SM.
	9. 0–10. 0	100	99	9	6	24	[3]	21. 5	A–3(0)	SP–SM.
	3. 0– 4. 0	100	96	30	20	15	[3]	15. 1	A–2–4(0)	SM.
	6. 0– 7. 0	100	92	10	9	20	[3]	20. 7	A–3(0)	SP–SM.
	6. 0– 7. 0	100	97	18	15	19	[3]	25. 1	A–2–4(0)	SM.
	9. 0–10. 0	98	95	8	6	22	[3]	20. 8	A–3(0)	SP–SM.
	6. 0– 8. 0	99	96	5	4		[3]	22. 3	A–3(0)	SP.
	6. 0– 7. 0	100	98	17	12	18	[3]	21. 4	A–2–4(0)	SM.
	3. 0– 4. 0	98	86	36	24	17	[3]	17. 3	A–4(0)	SM.
	9. 0–10. 0	99	95	88	65	24	5	26. 0	A–4(8)	ML–CL.
Scio silt loam	14. 0–16. 0	99	97	95	85	33	14	27. 0	A–6(10)	CL.
	6. 0– 7. 0	100	99	98	87	30	9	22. 8	A–4(8)	ML–CL.
Sloan silty clay loam	3. 0– 4. 0	98	96	92	69	38	15	24. 7	A–6(10)	ML–CL.
Volusia silt loam	6. 0– 7. 0	89	75	50	45	26	9	15. 2	A–4(5)	SC.
	12. 0–13. 0	86	73	54	34	18	3	11. 0	A–4(4)	ML.
	3. 0– 4. 0	88	77	59	45	22	6	15. 7	A–4(5)	ML–CL.
	3. 0– 4. 0	84	65	40	29	21	3	15. 8	A–4(1)	SM.
	3. 0– 4. 0	95	88	74	50	25	9	18. 8	A–4(8)	CL.
	1. 0– 5. 0	67	55	44	31	27	9	15. 6	A–4(2)	SC.
	21. 0–22. 0	91	83	71	50	24	9	22. 5	A–4(7)	CL.
	3. 0– 4. 0	95	91	87	58	38	11	36. 9	A–6(9)	ML.
	3. 0– 4. 0	98	93	87	58	38	12	38. 2	A–6(9)	ML–CL.
	1. 0– 3. 0	90	84	75	46	26	6	17. 0	A–4(8)	ML–CL.
	3. 0– 4. 5	93	86	79	50	37	9	46. 8	A–4(8)	ML.
	3. 0– 4. 0	96	92	87	66	34	14	16. 4	A–6(10)	CL.
	6. 0– 7. 0	90	85	77	50	29	11	16. 4	A–6(8)	CL.
	6. 0– 7. 0	89	81	74	47	27	20	21. 9	A–6(12)	CL.
	6. 0– 7. 0	97	91	88	75	37	15	16. 1	A–6(10)	CL.
	3. 0– 4. 0	82	76	71	50	37	12	21. 7	A–6(8)	ML–CL.
	3. 0– 4. 0	95	87	81	62	34	14	18. 2	A–6(6)	CL.
	3. 0– 7. 0	94	87	82	53	30	5	49. 0	A–4(8)	ML.
	3. 0– 4. 0	94	87	84	68	37	16	15. 6	A–6(10)	CL.
	1. 3– 4. 5	85	73	62	40	27	7		A–4(5)	ML–CL.
	9. 0–10. 0	84	68	57	45	26	10	22. 2	A–4(4)	CL.
	6. 0– 7. 0	88	79	69	53	31	13	15. 8	A–6(8)	CL.
	0. 8– 1. 8	82	70	62	43	32	12	21. 7	A–6(6)	CL.
	9. 0–10. 0	95	86	75	54	24	9	17. 2	A–4(8)	CL.
	3. 0– 4. 0	94	86	75	40	29	10	16. 0	A–4(8)	CL.
	8. 0	71	61	50	30	24	6	17. 1	A–4(3)	SM–SC.
	6. 7	74	67	63	39	27	8	19. 1	A–4(6)	CL.
	6. 0– 7. 0	85	75	62	46	26	8	14. 7	A–4(6)	CL.
	9. 0–10. 0	84	71	62	49	24	6	14. 7	A–4(5)	ML–CL.
	3. 0– 4. 0	92	84	76	56	30	8	24. 3	A–4(8)	ML–CL.
	9. 0–10. 0	84	73	68	55	27	8	15. 2	A–4(7)	CL.
	6. 0– 7. 0	69	59	55	50	26	8	12. 8	A–4(4)	CL.
	3. 0– 4. 0	93	88	80	56	28	9	23. 4	A–4(8)	CL.
	6. 0– 7. 0	79	69	66	55	27	10	11. 3	A–4(6)	CL.

See footnotes at end of table.

TABLE 4.—*Engineering test data*[1] *for soil samples taken from sites along the Erie Thruway—Legislative Route 797*—Con.

Soil type	Depth	Mechanical analysis				Liquid limit	Plasticity index	Natural moisture content	Engineering classification	
		Percentage passing sieve—			Percentage smaller than [2]—					
		No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.02 mm.				AASHO	Unified
	Feet					*Percent*	*Percent*	*Percent*		
Volusia silt loam—Con.	6. 0– 7. 0	96	89	86	74	33	12	17. 4	A–6(9)	CL.
	3. 0– 4. 0	92	85	75	51	27	9	17. 4	A–4(8)	CL.
	3. 0– 4. 0	90	83	74	57	35	12	26. 7	A–6(9)	ML–CL.
	3. 0– 4. 0	92	84	78	58	34	7	31. 0	A–4(8)	ML–CL.
	3. 0– 4. 0	84	76	72	55	35	14	18. 6	A–6(9)	CL.
	3. 0– 4. 0	97	89	83	64	35	14	22. 6	A–6(10)	CL.
	9. 0–10. 0	94	85	77	60	33	12	33. 3	A–6(9)	CL.
	3. 0– 4. 0	98	94	88	67	35	14	21. 6	A–6(10)	CL.
	3. 0– 4. 0	98	90	83	63	36	16	17. 7	A–6(10)	CL.
	6. 0– 7 0	98	91	85	64	35	15	25. 2	A–6(10)	CL.
	6. 0– 7. 0	96	90	86	68	34	13	19. 9	A–6(9)	CL.
	3. 0– 4. 0	98	93	87	59	36	11	39. 0	A–6(9)	ML–CL.
	3. 0– 4. 0	67	54	46	31	27	6	19. 3	A–4(2)	SM–SC.

[1] Soils tested by the Pennsylvania Department of Highways.
[2] Analyzed by the hydrometer method.
[3] Nonplastic.
[4] Not determined.

Descriptions of the Soils

The soil scientists who prepared this survey went over the area at appropriate intervals and examined the soils by digging with a spade or soil auger. They examined the different layers, or horizons, in each boring, and they compared the different borings. By such comparisons, they determined the different kinds of soils in the area.

Then, they described the various soils and drew boundaries on aerial photographs to separate them. The soils are described in the following pages. Their acreage and proportionate extent are shown in table 5, and their location can be seen on the detailed map at the back of this report.

TABLE 5.—*Approximate acreage and proportionate extent of the soils*

Soil	Area	Extent	Soil	Area	Extent
	Acres	*Percent*		*Acres*	*Percent*
Allis silt loam, 0 to 3 percent slopes	1, 798	0. 3	Canadice silt loam, 2 to 8 percent slopes, severely eroded	16	[1]
Allis silt loam, 0 to 3 percent slopes, severely eroded	26	[1]	Caneadea silt loam, 0 to 2 percent slopes	29	[1]
Allis silt loam, 3 to 8 percent slopes	835	. 2	Caneadea silt loam, 2 to 8 percent slopes	506	0. 1
Allis silt loam, 3 to 8 percent slopes, severely eroded	476	. 1	Caneadea silt loam, 2 to 8 percent slopes, severely eroded	2	[1]
Allis silt loam, 8 to 15 percent slopes	171	[1]	Caneadea silt loam, 8 to 15 percent slopes	223	[1]
Allis silt loam, 8 to 15 percent slopes, severely eroded	163	[1]	Caneadea silt loam, 8 to 15 percent slopes, severely eroded	28	[1]
Allis silt loam, 15 to 25 percent slopes	94	[1]	Caneadea silt loam, 15 to 25 percent slopes	208	[1]
Allis silt loam, 15 to 25 percent slopes, severely eroded	19	[1]	Caneadea silt loam, 15 to 25 percent slopes, severely eroded	7	[1]
Allis silt loam, 25 to 45 percent slopes	28	[1]	Chagrin fine sandy loam, 0 to 3 percent slopes	1, 215	. 2
Beach and Riverwash	752	. 1	Chagrin fine sandy loam, 0 to 3 percent slopes, severely eroded	6	[1]
Beach sand, stabilized	1, 072	. 2	Chagrin silt loam, 0 to 3 percent slopes	652	. 1
Berrien fine sandy loam, 0 to 2 percent slopes	2, 338	. 4	Chagrin silt loam, high bottom, 0 to 3 percent slopes	902	. 2
Berrien fine sandy loam, 2 to 8 percent slopes	2, 512	. 5	Chagrin silt loam, high bottom, 3 to 6 percent slopes	168	[1]
Berrien fine sandy loam, 2 to 8 percent slopes, severely eroded	21	[1]	Chagrin very gravelly loam, fan, 0 to 6 percent slopes	263	. 1
Berrien fine sandy loam, 8 to 15 percent slopes	105	[1]	Conotton gravelly loam, 0 to 3 percent slopes	1, 256	. 2
Berrien fine sandy loam, 8 to 15 percent slopes, severely eroded	33	[1]	Conotton gravelly loam, 3 to 8 percent slopes	3, 379	. 6
Berrien fine sandy loam, 15 to 25 percent slopes	100	[1]	Conotton gravelly loam, 3 to 8 percent slopes, severely eroded	19	[1]
Berrien fine sandy loam, 15 to 25 percent slopes, severely eroded	4	[1]	Conotton gravelly loam, 8 to 15 percent slopes	393	. 1
Birdsall silt loam, 0 to 2 percent slopes	9, 997	1. 9	Conotton gravelly loam, 8 to 15 percent slopes, severely eroded	217	[1]
Birdsall silt loam, 2 to 4 percent slopes	898	. 2			
Canadice silt loam, 0 to 2 percent slopes	1, 099	. 2			
Canadice silt loam, 2 to 8 percent slopes	2, 771	. 5			

See footnote at end of table.

TABLE 5.—*Approximate acreage and proportionate extent of the soils*—Continued

Soil	Area	Extent
	Acres	*Percent*
Conotton gravelly sandy loam, 3 to 8 percent slopes	1, 108	0. 2
Conotton gravelly sandy loam, 3 to 8 percent slopes, severely eroded	23	(1)
Conotton gravelly sandy loam, 8 to 15 percent slopes	309	. 1
Conotton gravelly sandy loam, 8 to 15 percent slopes, severely eroded	92	(1)
Conotton gravelly sandy loam, 15 to 25 percent slopes	412	. 1
Conotton gravelly sandy loam, 15 to 25 percent slopes, severely eroded	120	(1)
Conotton coarse sandy loam, 0 to 8 percent slopes	9, 432	1. 8
Conotton coarse sandy loam, 0 to 8 percent slopes, severely eroded	49	(1)
Conotton coarse sandy loam, 8 to 15 percent slopes	932	. 2
Conotton coarse sandy loam, 8 to 15 percent slopes, severely eroded	114	(1)
Conotton coarse sandy loam, 15 to 25 percent slopes	238	(1)
Conotton coarse sandy loam, 15 to 25 percent slopes, severely eroded	11	(1)
Conotton gravelly sandy loam, moderately well drained variant, 0 to 3 percent slopes	4, 348	. 8
Conotton gravelly sandy loam, moderately well drained variant, 3 to 8 percent slopes	6, 066	1. 2
Conotton gravelly sandy loam, moderately well drained variant, 3 to 8 percent slopes, severely eroded	15	(1)
Dalton silt loam, 0 to 2 percent slopes	7, 282	1. 4
Dalton silt loam, 2 to 8 percent slopes	622	. 1
Dalton silt loam, 2 to 8 percent slopes, moderately eroded	3, 432	. 7
Dune sand	574	. 1
Ellery and Alden silt loams, 0 to 4 percent slopes	28, 066	5. 4
Erie silt loam, 0 to 3 percent slopes	18, 655	3. 6
Erie silt loam, 3 to 8 percent slopes	27, 883	5. 3
Erie silt loam, 3 to 8 percent slopes, moderately eroded	96, 105	18. 3
Erie silt loam, 3 to 8 percent slopes, severely eroded	812	. 2
Erie silt loam, 8 to 15 percent slopes	3, 897	. 7
Erie silt loam, 8 to 15 percent slopes, moderately eroded	15, 846	3. 0
Erie silt loam, 8 to 15 percent slopes, severely eroded	2, 815	. 5
Erie silt loam, 15 to 25 percent slopes	1, 504	. 3
Erie silt loam, 15 to 25 percent slopes, moderately eroded	3, 056	. 6
Erie silt loam, 15 to 25 percent slopes, severely eroded	650	. 1
Escarpments	3, 392	. 6
Fredon loam, 0 to 3 percent slopes	7, 937	1. 5
Fredon loam, 3 to 8 percent slopes	10, 204	1. 9
Fresh water marsh	522	. 1
Halsey loam, 0 to 3 percent slopes	7, 935	1. 5
Howard gravelly silt loam, 0 to 3 percent slopes	2, 689	. 5
Howard gravelly silt loam, 3 to 8 percent slopes	12, 572	2. 4
Howard gravelly silt loam, 3 to 8 percent slopes, severely eroded	41	(1)
Howard gravelly silt loam, 8 to 15 percent slopes	5, 355	1. 0
Howard gravelly silt loam, 8 to 15 percent slopes, severely eroded	266	. 1
Howard gravelly silt loam, 15 to 25 percent slopes	2, 620	. 5
Howard gravelly silt loam, 15 to 25 percent slopes, severely eroded	195	(1)
Howard gravelly silt loam, 25 to 40 percent slopes	493	. 1
Howard gravelly silt loam, 25 to 40 percent slopes, severely eroded	127	(1)
Langford silt loam, 0 to 8 percent slopes	2, 915	0. 6
Langford silt loam, 0 to 8 percent slopes, moderately eroded	13, 815	2. 6
Langford silt loam, 0 to 8 percent slopes, severely eroded	110	(1)
Langford silt loam, 8 to 15 percent slopes	1, 665	. 3
Langford silt loam, 8 to 15 percent slopes, moderately eroded	9, 031	1. 7
Langford silt loam, 8 to 15 percent slopes, severely eroded	776	. 1
Langford silt loam, 15 to 25 percent slopes	1, 531	. 3
Langford silt loam, 15 to 25 percent slopes, moderately eroded	4, 561	. 9
Langford silt loam, 15 to 25 percent slopes, severely eroded	398	. 1
Langford and Erie silt loams, 25 to 50 percent slopes	2, 451	. 5
Langford and Erie silt loams, 25 to 50 percent slopes, severely eroded	480	. 1
Lobdell silt loam, 0 to 3 percent slopes	5, 856	1. 1
Lobdell silt loam, 0 to 3 percent slopes, severely eroded	44	(1)
Lobdell silt loam, high bottom, 0 to 3 percent slopes	1, 177	. 2
Lobdell silt loam, high bottom, 3 to 6 percent slopes	517	. 1
Made land	380	. 1
Mahoning silt loam, 3 to 8 percent slopes	172	(1)
Mahoning silt loam, 3 to 8 percent slopes, moderately eroded	51	(1)
Mahoning silt loam, 8 to 15 percent slopes	39	(1)
Mahoning silt loam, 8 to 15 percent slopes, moderately eroded	85	(1)
Mahoning silt loam, 8 to 15 percent slopes, severely eroded	7	(1)
Manlius and Lordstown soils, shallow, 8 to 25 percent slopes	794	. 2
Manlius and Lordstown soils, shallow, 25 to 80 percent slopes	4, 300	. 8
Mardin gravelly silt loam, 3 to 8 percent slopes	2, 565	. 5
Mardin gravelly silt loam, 3 to 8 percent slopes, severely eroded	115	(1)
Mardin gravelly silt loam, 8 to 15 percent slopes	1, 820	. 3
Mardin gravelly silt loam, 8 to 15 percent slopes, severely eroded	391	. 1
Mardin gravelly silt loam, 15 to 25 percent slopes	751	. 1
Mardin gravelly silt loam, 15 to 25 percent slopes, severely eroded	114	(1)
Mardin and Volusia gravelly silt loams, 25 to 45 percent slopes	111	(1)
Mardin and Volusia gravelly silt loams, 25 to 45 percent slopes, severely eroded	10	(1)
Miner silt loam, 0 to 3 percent slopes	1, 311	. 3
Muck and Peat	362	. 1
Ottawa loamy fine sand, 0 to 2 percent slopes	1, 127	. 2
Ottawa loamy fine sand, 2 to 8 percent slopes	2, 921	. 6
Ottawa loamy fine sand, 2 to 8 percent slopes, severely eroded	6	(1)
Ottawa loamy fine sand, 8 to 15 percent slopes	278	. 1
Ottawa loamy fine sand, 8 to 15 percent slopes, severely eroded	69	(1)
Ottawa loamy fine sand, 15 to 25 percent slopes	246	(1)
Ottawa loamy fine sand, 15 to 25 percent slopes, severely eroded	17	(1)
Ottawa fine sandy loam, 0 to 2 percent slopes	372	. 1
Ottawa fine sandy loam, 2 to 8 percent slopes	1, 844	. 4
Ottawa fine sandy loam, 2 to 8 percent slopes, severely eroded	80	(1)
Ottawa fine sandy loam, 8 to 15 percent slopes	91	(1)
Ottawa fine sandy loam, 8 to 15 percent slopes, severely eroded	54	(1)

See footnote at end of table.

TABLE 5.—*Approximate acreage and proportionate extent of the soils*—Continued

Soil	Area	Extent
	Acres	*Percent*
Ottawa fine sandy loam, 15 to 25 percent slopes	38	(1)
Ottawa fine sandy loam, 15 to 25 percent slopes, severely eroded	4	(1)
Phelps gravelly silt loam, 0 to 3 percent slopes	1, 644	0. 3
Phelps gravelly silt loam, 3 to 8 percent slopes	19, 439	3. 7
Phelps gravelly silt loam, 3 to 8 percent slopes, severely eroded	49	(1)
Phelps gravelly silt loam, 8 to 15 percent slopes	2, 879	. 5
Phelps gravelly silt loam, 8 to 15 percent slopes, severely eroded	97	(1)
Platea silt loam, 0 to 2 percent slopes	2, 882	. 5
Platea silt loam, 2 to 8 percent slopes	18, 182	3. 5
Platea silt loam, 2 to 8 percent slopes, severely eroded	309	. 1
Platea silt loam, 8 to 15 percent slopes	1, 386	. 3
Platea silt loam, 8 to 15 percent slopes, severely eroded	612	. 1
Platea silt loam, 15 to 25 percent slopes	210	(1)
Platea silt loam, 15 to 25 percent slopes, severely eroded	61	(1)
Platea silt loam, moderately well drained variant, 0 to 2 percent slopes	309	(1)
Platea silt loam, moderately well drained variant, 2 to 8 percent slopes	3, 877	. 7
Platea silt loam, moderately well drained variant, 2 to 8 percent slopes, severely eroded	53	(1)
Platea silt loam, moderately well drained variant, 8 to 15 percent slopes	871	. 2
Platea silt loam, moderately well drained variant, 8 to 15 percent slopes, severely eroded	383	. 1
Platea silt loam, moderately well drained variant, 15 to 25 percent slopes	164	(1)
Platea silt loam, moderately well drained variant, 15 to 25 percent slopes, severely eroded	62	(1)
Rimer fine sandy loam, 0 to 2 percent slopes	4, 551	. 9
Rimer fine sandy loam, 2 to 8 percent slopes	694	. 1
Rimer fine sandy loam, 2 to 8 percent slopes, severely eroded	9	(1)
Scio silt loam, 0 to 3 percent slopes	789	. 2
Scio silt loam, 3 to 8 percent slopes	1, 424	. 3
Scio silt loam, 8 to 15 percent slopes	41	(1)
Scio silt loam, 8 to 15 percent slopes, severely eroded	8	(1)
Sloan silty clay loam, 0 to 3 percent slopes	6, 522	1. 2
Sloan silty clay loam, permanently wet, 0 to 3 percent slopes	243	(1)
Trumbull silt loam, 0 to 3 percent slopes	4, 340	. 8
Trumbull silt loam, 0 to 3 percent slopes, severely eroded	1	(1)
Trumbull silt loam, 3 to 8 percent slopes	989	. 2
Trumbull silt loam, 3 to 8 percent slopes, moderately eroded	2, 766	. 5
Trumbull silt loam, 3 to 8 percent slopes, severely eroded	53	(1)
Trumbull silt loam, 8 to 15 percent slopes	6	(1)
Trumbull silt loam, 8 to 15 percent slopes, moderately eroded	36	(1)
Trumbull silt loam, 8 to 15 percent slopes, severely eroded	3	(1)
Unadilla fine sandy loam, 0 to 3 percent slopes	381	. 1
Unadilla fine sandy loam, 3 to 8 percent slopes	842	. 2
Unadilla fine sandy loam, 3 to 8 percent slopes, severely eroded	28	(1)
Unadilla fine sandy loam, 8 to 15 percent slopes	74	(1)
Unadilla fine sandy loam, 8 to 15 percent slopes, severely eroded	5	(1)
Volusia gravelly silt loam, 0 to 3 percent slopes	560	. 1
Volusia gravelly silt loam, 3 to 8 percent slopes	2, 625	. 5
Volusia gravelly silt loam, 3 to 8 percent slopes, severely eroded	132	(1)
Volusia gravelly silt loam, 8 to 15 percent slopes	292	. 1
Volusia gravelly silt loam, 8 to 15 percent slopes, severely eroded	158	(1)
Volusia gravelly silt loam, 15 to 25 percent slopes	79	(1)
Volusia gravelly silt loam, 15 to 25 percent slopes, severely eroded	35	(1)
Volusia silt loam, 0 to 3 percent slopes	2, 288	0. 4
Volusia silt loam, 3 to 8 percent slopes	9, 191	1. 8
Volusia silt loam, 0 to 8 percent slopes, severely eroded	727	. 1
Volusia silt loam, 8 to 15 percent slopes	499	. 1
Volusia silt loam, 8 to 15 percent slopes, severely eroded	503	. 1
Volusia silt loam, 15 to 25 percent slopes	642	. 1
Volusia silt loam, 15 to 25 percent slopes, severely eroded	100	(1)
Wallington silt loam, 0 to 2 percent slopes	2, 774	. 5
Wallington silt loam, 2 to 8 percent slopes	1, 536	. 3
Wallington silt loam, 2 to 8 percent slopes, severely eroded	60	(1)
Wallington silt loam, 8 to 15 percent slopes	68	(1)
Wallington fine sandy loam, 0 to 2 percent slopes	1, 979	. 4
Wallington fine sandy loam, 2 to 8 percent slopes	2, 346	. 4
Wallington fine sandy loam, 2 to 8 percent slopes, severely eroded	17	(1)
Wallington fine sandy loam, 8 to 15 percent slopes	53	(1)
Wallington fine sandy loam, 8 to 15 percent slopes, severely eroded	64	(1)
Wallington fine sandy loam, 15 to 25 percent slopes	67	(1)
Wallington fine sandy loam, 15 to 25 percent slopes, severely eroded	24	(1)
Wauseon fine sandy loam, 0 to 2 percent slopes	2, 663	. 5
Wayland silt loam, 0 to 3 percent slopes	21, 218	4. 0
Williamson and Collamer fine sandy loams, 0 to 2 percent slopes	109	(1)
Williamson and Collamer fine sandy loams, 2 to 8 percent slopes	646	. 1
Williamson and Collamer fine sandy loams, 2 to 8 percent slopes, severely eroded	. 4	(1)
Williamson and Collamer fine sandy loams, 8 to 15 percent slopes	77	(1)
Williamson and Collamer fine sandy loams, 8 to 15 percent slopes, severely eroded	62	(1)
Williamson and Collamer fine sandy loams, 15 to 25 percent slopes	73	(1)
Williamson and Collamer fine sandy loams, 15 to 25 percent slopes, severely eroded	20	(1)
Williamson and Collamer silt loams, 0 to 2 percent slopes	36	(1)
Williamson and Collamer silt loams, 2 to 8 percent slopes	424	. 1
Williamson and Collamer silt loams, 8 to 15 percent slopes	85	(1)
Wooster gravelly silt loam, 3 to 12 percent slopes	149	(1)
Wooster gravelly silt loam, 12 to 20 percent slopes	60	(1)
Wooster gravelly silt loam, 20 to 30 percent slopes	18	(1)
Wooster gravelly silt loam, 30 to 40 percent slopes	5	(1)
Wooster gravelly silt loam, 30 to 40 percent slopes, severely eroded	13	(1)
Mines, pits, and unclassified areas	446	. 1
Total land area	519, 680	97. 9
Water	4, 480	. 9
Total	524, 160	98. 8

[1] Less than 0.1 percent. These soils make up approximately 1.2 percent of the total acreage.

The soil series (groups of soils) and the mapping units are described in approximate alphabetic order.

An important part of each series description is the soil profile, a record of what the soil scientist saw and learned when he dug into the ground. It is to be assumed that all soils of one series have essentially the same kind of profile. Differences, such as those caused by the removal of part of the surface layer through erosion, are explained in the description of the soil and are indicated in the soil name.

After the name of each soil, there is a set of symbols in parentheses. These symbols identify the soil on the detailed map. In the description of an individual soil, the capability unit (or management group) to which that soil belongs is given. The capability units are described in the section, Use and Management of the Soils.

Following are explanations of some of the terms used in describing the soils in this and other parts of the report. Definitions of other technical terms are in the glossary in the back part of the report.

Color is usually related to the amount of organic matter in soils of the same texture and clay mineralogy. The darker the surface soil, the more organic matter it generally contains. Dark soils readily absorb heat from the sun, and plants can begin growing early in spring. The dark, well-drained soils of the lake plain are, therefore, well suited to the growing of early maturing vegetables. Streaks and spots of gray, yellow, and brown in the lower soil layers generally indicate poor drainage and poor aeration.

Texture, or the content of sand, silt, and clay, is determined by the way the soil feels when rubbed between the fingers. It is later checked by laboratory analysis. Texture determines how well the soil retains moisture, plant nutrients, and fertilizer, and whether it is easy or difficult to cultivate. Each individual soil is identified by a textural name, such as silt loam. This refers to the texture of the surface layer, or A horizon.

Structure is indicated by the way the individual soil particles are arranged in larger grains, or aggregates, and the amount of pore space between the grains. The structure of a soil is determined by the strength or grade and by the size and shape of the aggregates. For example, a horizon may consist of soil materials having weak, fine, blocky structure. Except for the clayey soils, the soils of the county generally have a weak, poorly developed structure. In many of the soils, the subsoil contains a pan layer that is slowly permeable to air and water. Because of the high content of organic matter, the surface soils have a durable structure.

Relief is important in soils that are used for agriculture. Most of the soils of the county have uniform, smooth slopes. The percentage of slope given for a soil indicates the number of feet of fall per 100 feet of horizontal distance.

Some of the soils are on undulating and rolling slopes known as kettle-and-kame topography. Slopes on these soils can be described as gently undulating, moderately rolling, and strongly rolling.

The effective depth of the soil, or the zone in which plant roots can penetrate and function, is important in agriculture. The effective depth refers to the zone above a slowly permeable pan layer, the permanent water table, or any other material that limits penetration of roots.

All the soils of Erie County, except the members of the Allis, Lordstown, and Manlius series, are deep (more than 3 feet) to bedrock. Many of the soils, however, have a pan layer that cannot be penetrated readily by roots. The pan layer occurs at varying depths in the soils. The effective depth of a number of soils is limited by a seasonally high water table.

Accelerated erosion is active in many parts of the county. Except on Dune sand, which is affected by wind erosion, most of the soil losses have been caused by water erosion. (Natural, or geologic, erosion, is discussed in the section, Geology.)

Typically, the profile of a moderately or severely eroded soil differs from the uneroded phase of the same soil in the following ways: (1) The present surface layer is thinner and lighter colored; (2) the soil contains less organic matter; and (3) the root zone is shallower.

Natural drainage is influenced by the depth, texture, structure, permeability, and water-supplying capacity of the soil. In this report the terms used to describe natural drainage indicate the thickness of the aerated root zone of the soils. The principal terms are—*well drained*, at least 36 inches of aerated root zone; *moderately well drained*, 16 to 36 inches; *somewhat poorly drained*, 6 to 16 inches; *poorly drained*, 0 to 6 inches; and *very poorly drained*, lacks a well-aerated root zone.

Reaction (pH), which is determined by laboratory tests, shows how acid or alkaline a soil is. In the root zone of the soils of the county, the pH ranges from 4.0 (extremely acid) to 8.2 (moderately alkaline). The pH of soils of the same type is fairly uniform.

Alden Series

The Alden series consists of deep, very poorly drained soils. The soils have formed on glacial till in the upland. They occur in shallow depressions or in kettle holes. The parent material was made up of material derived from acid shale bedrock mixed with sediments of sandstone, granite, and limestone of glacial origin.

The surface layer of the Alden soils consists of very dark gray to black, heavy silt loam that has a few, medium, faint mottles of gray; in many places material has washed down from the adjacent slopes and has covered the former surface layer. Otherwise, the profile is like the profile described for the Ellery series. The upper part of the profile is slightly acid to neutral, but free lime occurs at a depth of 36 inches.

These soils are in the same catena as the poorly drained Ellery soils, the moderately well drained Langford soils, and the somewhat poorly drained Erie soils.

The native plants consisted of sedges, cattails, and other swamp vegetation.

In Erie County the Alden soil is mapped only in an undifferentiated unit with the Ellery soil. This mapping unit, Ellery and Alden silt loams, 0 to 4 percent slopes, is described under the Ellery series.

Allis Series

The soils of the Allis series are shallow, poorly drained, and silty. They lie on the parts of the lake plain and the upland that have been scoured by lake water or scraped by glacial ice. The largest areas are near Erie and North East. The parent material was glacial till that contained gray, acid shale and some sandstone.

Movement of air and water downward through the profile is retarded by a slowly permeable layer of silt and clay; this material lies just above the bedrock of unweathered shale. The soils warm up slowly in spring and become wet early in fall. They tend to be droughty in summer. The shallow, poorly drained root zone limits their suitability for crops.

The Allis soils are in the same catena as the well-drained Manlius soils and the very poorly drained Alden soil.

The native vegetation on the Allis soils consisted of a beech-maple type of forest. Now, aspen, wild crabapple, sumac, and goldenrod grow in idle areas.

Typical profile of an Allis silt loam (cultivated):

0 to 7 inches, very dark brown silt loam; moderate, medium, granular structure; friable when moist; pH 6.0; abrupt, smooth lower boundary.

7 to 10 inches, very dark grayish-brown, heavy silt loam with a few, fine, faint mottles of olive brown; moderate, medium, subangular blocky structure; friable when moist, sticky when wet; pH 5.8; smooth lower boundary.

10 to 15 inches, grayish-brown silty clay loam with common, coarse, distinct mottles of dark yellowish brown and a few, dark, iron or manganese stains; moderate, coarse, subangular blocky structure; hard when dry, firm when moist, and sticky when wet; pH 5.8; diffuse, wavy lower boundary.

15 to 18 inches, grayish-brown silty clay to clay loam with common, coarse, distinct mottles of olive brown and a few streaks of yellowish red; moderate, thick, platy structure; hard when dry, firm when moist, and plastic when wet; pH 6.0; abrupt, wavy lower boundary.

18 inches+, gray, acid weathered shale that is more or less fractured.

In forested sites the surface is covered with leaf litter from mixed hardwoods. In these areas there is a layer of leaf mold about 1 inch thick, and the boundary between it and the mineral soil is sharp and distinct.

The depth to weathered shale is generally between 12 and 30 inches. In some severely eroded spots, however, the weathered shale is within 12 inches of the surface. In a few places there is a thin layer of calcareous shale in the weathered material; lime from this calcareous material makes the subsoil less acid. In a few small areas, lacustrine silt and clay occur at depths between 12 and 30 inches. This material is underlain by weathered shale.

Allis silt loam, 0 to 3 percent slopes (AcA).—The profile of this soil resembles the profile described for the series except that grayish-brown silty clay loam is at shallower depths. The soil is level to nearly level. Surface and internal drainage are poor. During wet periods shallow water remains in the depressions for several days.

This soil is suitable for small grains, grasses, and legumes. Where the climate is favorable, it is also suitable for vineyards.

Careful management is needed. Maintain good tilth by cultivating only when the soil contains the proper amount of moisture. If tilth is good, crops can make the best use of the shallow root zone. Keep natural drainageways open. Divert surface water from the adjoining higher areas into suitable waterways.

Because of its poor drainage and shallowness, this soil is in capability unit IVws–2.

Allis silt loam, 0 to 3 percent slopes, severely eroded (AcA3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is less than 4 inches thick. The soil also contains less organic matter and is shallower. Where the soil has been cultivated, part of the material from the dark grayish-brown subsoil has been mixed with the surface soil.

This soil needs careful management. It is suited to grasses and legumes. Choose hay and pasture mixtures that will tolerate poor drainage. Keep the natural drainageways open, and divert surface water from adjoining higher areas into suitable waterways.

Because of the effects of erosion and the very poor internal drainage, this soil is in capability unit VIew–4.

Allis silt loam, 3 to 8 percent slopes (AcB).—The profile of this soil is the same as that described for the series. The soil has uniform gentle slopes that are as much as 700 feet long. Internal drainage is poor, and surface drainage is moderate.

This soil is better suited to small grains, grasses, and legumes than to crops that are cultivated intensively. Where the climate is favorable, it can also be used for vineyards. The grapes ripen slowly, however, and the vines do not live long. The fields are wet in fall, and, therefore, harvesting is usually difficult.

This soil needs careful management. Choose hay and pasture mixtures that tolerate poor drainage. Maintain good tilth by cultivating only when the soil contains the proper amount of moisture. If tilth is good, crops can make the best use of the shallow root zone. Keep natural drainageways open. Divert surface water into suitable waterways. Protect the soil with a cover of plants during as much of the year as feasible.

Because of its poor internal drainage and shallowness, this soil is in capability unit IVws–1.

Allis silt loam, 3 to 8 percent slopes, severely eroded (AcB3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is less than 4 inches thick. The soil also contains less organic matter and is shallower. Where the soil has been cultivated, part of the material from the dark grayish-brown subsoil has been mixed with the surface soil.

This soil needs careful management. It is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate poor internal drainage. Divert surface water into suitable drainageways.

Because of the effects of erosion and the very poor internal drainage, this soil is in capability unit VIew–4.

Allis silt loam, 8 to 15 percent slopes (AcC).—The profile of this soil resembles that described for the series, but the surface layer is less than 6 inches thick. In addition, the depth to weathered shale varies considerably. The soil has uniform slopes that are generally less than 300 feet long. It has good surface drainage, but internal drainage is poor.

This soil is suited to small grains, grasses, and legumes. Where the climate is favorable, it is also suited to vineyards. Grapes ripen slowly, however, and the vines soon

die. The soil is wet in fall, and, therefore, harvesting of field crops is usually difficult.

This soil needs careful management. Maintain good tilth by cultivating only when the soil contains the proper amount of moisture. If tilth is good, crops can make the best use of the shallow root zone. Use long rotations in which sod crops are grown at least half the time. Choose hay and pasture mixtures that tolerate poor drainage. Protect the soil with a cover of plants as much of the time as feasible. Divert surface water into suitable drainageways.

Because of its poor internal drainage and shallowness, this soil is in capability unit IVws–1.

Allis silt loam, 8 to 15 percent slopes, severely eroded (AaC3).—The surface layer of this soil is lighter colored than that described for the series and is less than 4 inches thick. The soil contains less organic matter and is shallower. Where the soil has been cultivated, part of the material from the dark grayish-brown subsoil has been mixed with the surface soil.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate poor drainage. Divert surface water into suitable drainageways.

Because of the effects of erosion and the very poor internal drainage, this soil is in capability unit VIew–4.

Allis silt loam, 15 to 25 percent slopes (AaD).—The profile of this soil resembles the profile described for the series, but weathered shale is at shallower depths. The soil has uniform slopes that are generally less than 200 feet long. Surface drainage is good to excessive, and internal drainage is poor.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate poor internal drainage. Divert surface water into suitable drainageways.

Because of the risk of erosion and the poor internal drainage, this soil is in capability unit VIew–4.

Allis silt loam, 15 to 25 percent slopes, severely eroded (AaD3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is less than 4 inches thick. The soil also contains less organic matter and is shallower over bedrock. Where the soil has been cultivated, part of the material from the dark grayish-brown subsoil has been mixed with the surface soil.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that will tolerate very poor internal drainage.

Because of the effects of erosion and the very poor internal drainage, this soil is in capability unit VIew–4.

Allis silt loam, 25 to 45 percent slopes (AaE).—The profile of this soil resembles the profile described for the series, but the depth to weathered shale is less. The slopes are uniform and generally are less than 200 feet long. Surface drainage is excessive and internal drainage is poor.

This soil is suitable for trees. Because of the effects of erosion, it is in capability class VIIe–1.

Beach and Riverwash

Beach and Riverwash (Ba).—This miscellaneous land type is made up of unassorted sand, gravel, and small fragments of flagstone. Some of the larger beaches are near the mouths of streams that empty into Lake Erie. Others are on Presque Isle, a baymouth bar north of Erie. In places there are narrow beaches along the lake front between the Ohio border and the New York State line. Riverwash forms temporary islands or bars in or along streams that have steeply sloping beds.

Before sediments are deposited on the beach, they are transported by streams and are then dropped into the waters of the lake. Here, they are reworked by wave action and are then washed onto the beach. During storms the beach material is again reworked and is carried eastward by shore currents. In its place new sediments are deposited by waves. During the winter a well-defined beach is often altered greatly by storms.

Beach and Riverwash is not stable enough to maintain a cover of plants. It consists largely of material weathered from the underlying shale; it also includes some sediments of sandstone, granite, and quartzite that were carried into the area by glaciers. No soil profile has developed.

This miscellaneous land type has no value for agriculture, but it provides valuable areas for recreation. Beach erosion can be controlled by building costly engineering structures. This land type is in capability unit VIIIs–1.

Beach Sand, Stabilized

Beach sand, stabilized (Bb).—This miscellaneous land type consists of deep, sandy beach material that is nearly level and moderately well drained to poorly drained. This material is acid. It is protected by a beach ridge from the waves of Lake Erie. The material has been in place long enough so that it has a cover of plants but not long enough for a soil profile to form. It does, however, have an organic surface layer. No erosion has taken place.

This inextensive land type occurs only on Presque Isle. The vegetation consists primarily of aspen, bayberry, laurel, and several western grasses—Indiangrass, switchgrass, big bluestem, and little bluestem. The seeds of these grasses apparently were brought to Presque Isle by the lake current.

This miscellaneous land type formerly consisted of shifting sand. The sand became stablized after a ridge was built up that protected it from wave action. The beach sand is only 1 to 1½ feet above the level of the lake. The permanent water table, therefore, is only about that depth below the surface. The beach sand is low in plant nutrients, but the ground water has minerals and nitrogen in solution. These plant nutrients, along with the favorable permeability of the material and the stable supply of moisture, cause plants to make a dense growth.

This land type has little agricultural value. It is suitable for recreational use and occurs in the State park on Presque Isle. It is also suitable for trees or for wildlife habitats. It is in capability unit VIIw–1.

Berrien Series

The Berrien series is made up of deep, moderately well drained soils that are sandy and acid. The soils are on the lake plain. Some of them are important for growing

vegetables and fruits. The parent material was acid, lacustrine sands that were sorted and deposited by water.

These soils are low in clay; consequently, plant nutrients leach downward readily. A firm layer, or pan, that is slowly permeable to air and water is 20 to 30 inches below the surface. At depths of 40 to 72 inches is gray, calcareous material that is also slowly permeable to air and water. When saturated with water, this material is known locally as quicksand.

The Berrien soils are in the same catena as the well-drained Ottawa soils, the somewhat poorly drained to poorly drained Rimer soils, and the very poorly drained Wauseon soils.

The native vegetation consisted of an oak-beech-maple type of forest. Now, aspen, goldenrod, little bluestem, povertygrass, broomsedge, cinquefoil, and sheep sorrel grow in idle areas.

Typical profile of a Berrien fine sandy loam (cultivated):

0 to 7 inches, dark-brown fine sandy loam; strong, medium, granular structure; friable when moist; pH 6.2; abrupt, smooth lower boundary.
7 to 9 inches, yellowish-brown very fine sandy loam; moderate, coarse, subangular blocky structure; friable when moist; pH 6.0; clear, smooth lower boundary.
9 to 20 inches, yellowish-brown very fine sandy loam; moderate, medium, subangular blocky structure; friable when moist; pH 6.0; diffuse, smooth lower boundary.
20 to 28 inches, dark yellowish-brown very fine sandy loam with common, coarse, prominent mottles of reddish brown and olive brown; moderate, medium, subangular blocky structure; friable to firm when moist; pH 5.8; clear, smooth lower boundary.
28 to 34 inches, variegated dark reddish-brown and dark yellowish-brown fine sandy loam; strong, coarse, blocky structure; hard when dry, firm when moist, and nonsticky whe wet; pH 5.8; clear, wavy lower boundary.
34 to 40 inches, dark-brown loamy sand; single grain (structureless); pH 6.0; abrupt, wavy lower boundary.
40 to 60 inches+, gray sandy clay; massive (structureless); very hard when dry, plastic when wet; calcareous.

In forested areas the surface is covered with leaf litter from mixed hardwoods. In these areas there is a layer of leaf mold about one-half inch thick and a clear, smooth boundary between the leaf mold and the mineral soil.

Berrien fine sandy loam, 0 to 2 percent slopes (BcA).—The profile of this soil resembles the profile described for the series. In most places, however, the surface layer is 1 to 3 inches thicker. Although the soil is level to nearly level, moisture infiltrates rapidly and there is little ponding of surface water. Internal drainage is moderate.

This soil is suited to vegetables and fruits. It is too droughty for high yields of small grains and permanent pasture. In spring the soil remains wet long enough to delay the planting of crops.

This soil needs careful management. Maintain good tilth by adding organic matter often; plow only when the soil contains plenty of moisture and after the danger of freezing has passed in spring.

Because of its moderate internal drainage, this soil is in capability unit IIw–1.

Berrien fine sandy loam, 2 to 8 percent slopes (BcB).—The profile of this soil is the same as the profile described for the series. The soil has uniform slopes that are generally less than 500 feet long. Surface drainage is good, and internal drainage is moderate.

This soil is suited to vineyards and fruit trees. It is too droughty for high yields of small grains and permanent pasture.

The soil needs careful management. Maintain good tilth by adding organic matter often; plow only when the soil contains plenty of moisture and after the danger of freezing has passed in spring.

Because of the risk of erosion and the moderate internal drainage, this soil is in capability unit IIew–2.

Berrien fine sandy loam, 2 to 8 percent slopes, severely eroded (BcB3).—The profile of this soil resembles the profile described for the series, but the surface layer is lighter colored and is less than 4 inches thick. The soil also contains less organic matter and is shallower. Where the soil has been cultivated, yellowish-brown sand is mixed with the surface soil.

This soil is suited to vegetables and fruits. It is too droughty for high yields of small grains and permanent pasture. The soil layers over the pan are thin. In spring they remain wet long enough to delay the planting of crops.

This soil needs careful management. Maintain good tilth by adding organic matter often; plow only when the soil contains plenty of moisture and after the danger of freezing has passed in spring. Divert surface water from adjoining higher areas.

Because of the effects of erosion and the moderate internal drainage, this soil is in capability unit IIIew–2.

Berrien fine sandy loam, 8 to 15 percent slopes (BcC).—The profile of this soil resembles the profile described for the series, but the surface soil is only 6 inches thick. The slopes are uniform and are generally less than 300 feet long. Surface drainage is good, and internal drainage is moderate.

This soil is suited to vegetables and fruits. It is too droughty for high yields of small grains and permanent pasture.

This soil needs careful management. Maintain good tilth by adding organic matter often; plow only when there is plenty of moisture in the soil and after the danger of freezing has passed in spring.

Because of the risk of erosion and the moderate internal drainage, this soil is in capability unit IIIew–2.

Berrien fine sandy loam, 8 to 15 percent slopes, severely eroded (BcC3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is less than 4 inches thick. In addition, the soil contains less organic matter and is shallower above the pan layer. Where the soil has been cultivated, part of the yellowish-brown sand from the subsoil has been mixed with the surface soil.

This soil is best suited to grasses and legumes. Choose hay mixtures that tolerate short droughts and moderate internal drainage. The soil is too droughty for high yields of permanent pasture.

Because of the effects of erosion and the moderate internal drainage this soil is in capability unit IVew–1.

Berrien fine sandy loam, 15 to 25 percent slopes (BcD).—The profile of this soil resembles the profile described for the series, but the surface layer is only 6 inches thick. The soil has uniform slopes that are mostly less than 200 feet long. Surface drainage is good to excessive, and internal drainage is moderate.

This soil is suited to grasses and legumes. Choose hay mixtures that tolerate short droughts and moderate internal drainage. The soil is too droughty for high yields of permanent pasture.

Because of the risk of erosion and the moderate internal drainage, this soil is in capability unit IVew–1.

Berrien fine sandy loam, 15 to 25 percent slopes, severely eroded (BcD3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is only 5 inches thick. In addition, the soil contains less organic matter and is shallower above the pan layer. Where the soil has been cultivated, part of the yellowish-brown sand in the subsoil has been mixed with the surface soil.

This soil is suitable as woodland. Because of the effects of erosion, it is in capability unit VIIe–2.

Birdsall Series

The Birdsall soils are very poorly drained to poorly drained and are silty and deep. They are inextensive and occur in small, level to gently sloping areas. Their parent material was lacustrine deposits of glacial origin. It consisted of stratified silt and clay, mixed with some sand, laid down in still, or slack, water.

Where they occur in the same fields with better drained soils that are cultivated, these wet soils present a management problem. They are darker than the better drained soils and can be identified easily by their very dark grayish-brown to very dark gray surface soil. The Birdsall soils are slowly permeable to air and water.

The Birdsall soils are in the same catena as the moderately well drained Williamson and Collamer soils and the somewhat poorly drained to poorly drained Wallington soils.

Originally, willow, aspen, and other bog plants grew on these soils. This vegetation was replaced largely by a white or black ash-red maple type of swamp forest. Aspen, willow, and sedges still grow in idle areas.

Typical profile of a Birdsall silt loam:

0 to 10 inches, very dark grayish-brown silt loam; moderate, fine, granular structure; friable when moist; pH 5.4; diffuse, smooth lower boundary.

10 to 18 inches, yellowish-brown silt loam with many, fine, distinct mottles of grayish brown; moderate, medium, granular structure; friable when moist; pH 5.4; clear, smooth lower boundary.

18 to 26 inches, yellowish-brown silty clay loam with common, coarse, distinct mottles of grayish brown; moderate, medium, subangular blocky structure; hard when dry, firm when moist, and sticky when wet; pH 6.0; gradual, smooth lower boundary.

26 to 36 inches, dark grayish-brown silty clay loam with common, medium, distinct mottles of yellowish brown; weak, medium, subangular blocky structure; hard when dry, firm when moist, and nonsticky when wet; pH 6.4.

The color of the surface soil ranges from very dark grayish brown to very dark gray. The color of the subsoil ranges from yellowish brown through grayish brown to gray.

Birdsall silt loam, 0 to 2 percent slopes (BdA).—The profile of this soil is the same as the profile described for the series. Relief is level to nearly level. Surface and internal drainage are very poor. During wet seasons shallow water remains in the depressions for several weeks.

Included with this mapping unit are a few small areas of Lorain silty clay loam and Lorain clay, which are not mapped separately in this county. These included soils are very poorly drained, and the lower part of the profile is calcareous.

This soil, unless improved by drainage, is best suited to permanent sod or woodland. With adequate artificial drainage, it can be used in a rotation that includes row crops.

Because of the severe limitation of wetness, this soil is in capability unit IVw–1.

Birdsall silt loam, 2 to 4 percent slopes (BdB).—The profile of this soil resembles the profile described for the series, but the surface layer is only 8 inches thick. Relief is gently sloping. Surface drainage is moderate, and internal drainage is poor.

This soil, unless improved by drainage, is best suited to permanent pasture and woodland. With adequate artificial drainage, it can be used in a rotation that includes row crops. Keep the natural drainageways open. Divert surface water from adjoining higher areas into suitable waterways.

Because of the severe limitation of wetness, this soil is in capability unit IVw–1.

Canadice Series

The Canadice series consists of deep, poorly drained silty soils that have a subsoil of silty clay loam or silty clay. The soils have a strong, well-developed structure. They occur in old glacial lakebeds. The parent material was laid down in still, or slack, water. It contains sediments weathered from bedrock of acid shale in addition to limestone material carried by glaciers and deposited in the lakes by streams. This material was laid down in alternate layers of silt and clay.

Because they are high in silt, these soils dry out slowly in spring and become wet early in fall. Below a depth of 8 inches, the layers of silty clay loam and silty clay are slowly permeable to air and water.

The Canadice soils are in the same catena as the moderately well drained Caneadea and the very poorly drained to poorly drained Birdsall soils.

The native vegetation consisted of a beech-red maple type of forest. Now, wild crabapple, aspen, sumac, goldenrod, velvetgrass, and povertygrass grow in idle areas.

Typical profile of a Canadice silt loam (cultivated):

0 to 8 inches, brown to dark-brown silt loam; moderate, medium, granular structure; friable when moist; pH 5.6; abrupt, smooth lower boundary.

8 to 14 inches, yellowish-brown silty clay loam with common, medium, distinct mottles of grayish brown and dark brown; strong, thick, platy structure; friable when moist; pH 5.4; clear, smooth lower boundary.

14 to 24 inches, silty clay loam with a prominent coating of gray clay on peds; interiors are light olive brown with many, fine, distinct mottles of dark brown to strong brown; strong, medium, blocky structure; firm when moist; pH 5.8; clear, smooth lower boundary.

24 to 30 inches, silty clay with a prominent coating of gray clay on peds; olive-brown interiors; strong, coarse, blocky structure; firm when moist, hard when dry, and plastic when wet; pH 6.5; diffuse, wavy lower boundary.

30 to 38 inches, silty clay with a gray coating on peds; olive-brown interiors; strong, very coarse blocky structure; hard when dry, firm when moist, and plastic when wet; pH 7.2; diffuse, wavy lower boundary.

38 to 48 inches+, olive-brown silty clay; strong, very coarse, blocky structure; hard when dry, firm when moist, and plastic when wet; soil material contains free lime and effervesces with dilute hydrochloric acid.

In forested sites the surface is covered with leaf litter from mixed hardwoods. The layer of leaf mold is more than one-half inch thick, and the boundary between it and the mineral soil is abrupt and distinct.

The depth to the second horizon, which is mottled and poorly aerated, is between 6 and 12 inches. The color of the surface soil ranges from brown, on the stronger slopes, to dark grayish brown, in the level sites.

Canadice silt loam, 0 to 2 percent slopes (CaA).—The profile of this soil resembles the profile described for the series. Relief is level to nearly level, and surface and internal drainage are poor. During wet periods water remains in the depressions for a long time.

This soil is suited to small grains, grasses, and legumes. Choose hay and pasture mixtures that tolerate poor drainage. Maintain good tilth by plowing early in fall so that the plow layer will be frozen during winter. Cultivate only when the soil contains the proper amount of moisture. Keep the natural drainageways open, and divert surface water from adjoining higher areas into suitable waterways.

Because of poor drainage, this soil is in capability unit IVw–1.

Canadice silt loam, 2 to 8 percent slopes (CaB).—The profile of this soil is the same as the profile described for the series. The slopes are uniform and are 100 to 300 feet long. Surface drainage is moderate, and internal drainage is poor.

This soil is suited to corn, small grains, grasses, and legumes. Choose hay and pasture mixtures that tolerate poor internal drainage. Maintain good tilth by plowing early in fall so that the plow layer will be frozen during winter. Cultivate only when the soil contains the proper amount of moisture. Keep the natural drainageways open. Divert surface water from adjoining higher areas into suitable waterways.

Because of the poor internal drainage and the risk of erosion, this soil is in capability unit IVw–1.

Canadice silt loam, 2 to 8 percent slopes, severely eroded (CaB3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is less than 5 inches thick. In addition, the soil contains less organic matter and is shallower. Where the soil has been cultivated, part of the subsoil of yellowish-brown silty clay loam has been mixed with the surface soil.

This soil is best suited to grasses and legumes. Choose hay and pasture mixtures that tolerate very poor internal drainage. Divert surface water into suitable drainageways.

Because of the effects of erosion and the poor internal drainage, this soil is in capability unit VIew–1.

Caneadea Series

The Caneadea series consists of deep, moderately well drained, silty soils on old glacial lakebeds. The parent material was laid down in still, or slack, water. It contains sediments weathered from the bedrock of acid shale. It also contains limestone material carried by glaciers and later deposited in the lakes by streams. This material was laid down in alternate layers of silt and clay.

Because they are high in silt, these soils dry out slowly in spring. Below a depth of 18 inches, the silty clay loam is slowly permeable to air and water.

The Caneadea soils are in the same catena as the poorly drained Canadice and the very poorly drained to poorly drained Birdsall soils.

The native vegetation consisted of a maple-beech type of forest. Locust, wild crabapple, sumac, walnut, blackberry, Canada bluegrass, and red fescue now grow in idle areas.

Typical profile of a Caneadea silt loam (cultivated):

0 to 7 inches, brown to dark-brown silt loam; moderate, fine, granular structure; friable when moist; pH 5.4; abrupt, smooth lower boundary.

7 to 13 inches, dark yellowish-brown, heavy silt loam with a few, fine, faint mottles of very dark grayish brown; weak, thin, platy structure that breaks to moderate, medium, subangular blocky structure; friable when moist, slightly sticky when wet; pH 6.0; clear, wavy lower boundary.

13 to 18 inches, dark yellowish-brown, heavy silt loam; strong, medium, blocky structure; hard when dry, firm when moist, and slightly sticky when wet; pH 6.2; diffuse, wavy lower boundary.

18 to 26 inches, very dark grayish-brown silty clay loam; strong, coarse, blocky structure; hard when dry, firm when moist, and sticky when wet; pH 6.8; gradual, smooth lower boundary.

26 to 36 inches, olive-brown silty clay loam; strong, coarse, blocky structure; hard when dry, very firm when moist, and sticky when wet; pH 7.2; clear, smooth lower boundary.

36 to 48 inches+, olive-brown silty clay loam with common, medium, distinct mottles of grayish brown and yellowish brown; strong, coarse, blocky structure; hard when dry, very firm when moist, and plastic when wet; effervesces with dilute hydrochloric acid.

The depth to the calcareous horizon is between 3 and 5 feet.

Caneadea silt loam, 0 to 2 percent slopes (CbA).—The profile of this soil resembles the profile described for the series. The mottled, poorly aerated layer, however, is nearer the surface, or at a depth of 26 inches. This soil is level to nearly level. Surface drainage is poor, and internal drainage is moderate. During wet periods shallow water remains in the depressions for a short time.

This soil is suited to corn, small grains, grasses, and legumes. Choose hay and pasture mixtures that tolerate moderate internal drainage. Keep the natural drainageways open. Divert surface water from adjoining higher areas into suitable waterways.

Because of poor drainage, this soil is in capability unit IIIw–5.

Caneadea silt loam, 2 to 8 percent slopes (CbB).—The profile of this soil is the same as the profile described for the series. The soil has uniform slopes that are between 100 and 400 feet long. Surface drainage is good, and internal drainage is moderate.

This soil is suited to corn, small grains, grasses, and legumes. Choose hay and pasture mixtures that tolerate moderate internal drainage. Divert surface water into suitable drainageways.

Because of the moderate internal drainage and the risk of erosion, this soil is in capability unit IIIwe–1.

Caneadea silt loam, 2 to 8 percent slopes, severely eroded (CbB3).—The surface layer of this soil is lighter colored than that of the profile described for the series

and is less than 5 inches thick. The soil also contains less organic matter and is shallower. Where the soil has been cultivated, part of the subsoil of dark yellowish-brown, heavy silt loam has been mixed with the surface soil.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate somewhat poor internal drainage. Divert surface water into suitable waterways.

Because of the effects of erosion and the restricted drainage, this soil is in capability unit VIew–1.

Caneadea silt loam, 8 to 15 percent slopes (CbC).—The profile of this soil resembles the profile described for the series. The soil has uniform slopes that are between 100 and 300 feet long. Surface drainage is good, and internal drainage is moderate.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate moderate internal drainage. Divert surface water into suitable waterways.

Because of the risk of erosion and the somewhat restricted internal drainage, this soil is in capability unit IVew–3.

Caneadea silt loam, 8 to 15 percent slopes, severely eroded (CbC3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is less than 5 inches thick. The soil also contains less organic matter and is shallower. Where the soil has been cultivated, part of the subsoil of dark yellowish-brown, heavy silt loam has been mixed with the surface soil.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate somewhat poor internal drainage. Divert surface water into suitable waterways.

Because of the effects of erosion and the restricted drainage, this soil is in capability unit VIew–1.

Caneadea silt loam, 15 to 25 percent slopes (CbD).—The profile of this soil resembles the profile described for the series. The boundaries between the upper horizons, however, are more diffuse and irregular. This has been caused by the movement of soil material down the slopes, which are between 100 and 300 feet long. Surface drainage is excessive, and internal drainage is moderate.

On the pastures, trampling by livestock has produced miniature terraces, or "catsteps." These catsteps are mainly on the contour. They serve as paths for livestock that graze on the strong slopes.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate moderate internal drainage. Divert surface water into suitable waterways.

Because of the risk of erosion and the moderate internal drainage, this soil is in capability unit IVew–3.

Caneadea silt loam, 15 to 25 percent slopes, severely eroded (CbD3).—The profile of this soil resembles the profile described for the series, but the surface layer contains less organic matter and is shallower. Where the soil has been cultivated, part of the subsoil of dark yellowish-brown, heavy silt loam has been mixed with the surface soil.

The boundaries of the upper horizons are more diffuse and irregular than those of the typical profile. This has resulted from the movement of soil material down the slopes. On cleared areas, there is an occasional mass movement, or slipping, of soil.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate somewhat poor internal drainage. Divert surface water into suitable waterways.

Because of the effects of erosion and the restricted internal drainage, this soil is in capability unit VIew–1.

Chagrin Series

The soils of the Chagrin series are deep and well drained. They are on the flood plains of streams and on alluvial fans at the mouths of tributary streams. The parent material consisted of sediments of sand, silt, and gravel that washed down from the glaciated upland. It has not been in place long enough for a well-developed soil profile to form.

The Chagrin soils are in the same catena as the moderately well drained Lobdell soils, the somewhat poorly drained to poorly drained Wayland soils, and the very poorly drained Sloan soils.

Maple, sycamore, butternut, wild crabapple, Canada bluegrass, and whiteclover grow in wooded and idle areas.

In Erie County there are three soil types of the Chagrin series—fine sandy loam, silt loam, and very gravelly loam. In addition, two high bottom phases of the silt loam type are mapped. The typical silt loam occurs on first bottoms.

Typical profile of a Chagrin fine sandy loam (cultivated):

0 to 14 inches, dark-brown fine sandy loam; weak, medium, granular structure; friable when moist; pH 6.4; diffuse, wavy lower boundary.
14 to 24 inches, dark yellowish-brown fine sandy loam; weak, medium, granular structure; friable when moist; pH 6.6; diffuse, wavy lower boundary.
24 to 38 inches+, dark yellowish-brown fine sandy loam; weak, medium, granular structure; friable when moist; pH 6.2.

The amounts of sand, silt, and gravel vary throughout the profile.

Chagrin fine sandy loam, 0 to 3 percent slopes (CcA).—The profile of this soil is the same as the profile described for the series. The areas are level to nearly level and are subject to occasional flooding.

This soil can be used for crops suited to the local climate. Protect the soil with a cover of plants during the winter and early in spring when the areas are most likely to be flooded.

There are no serious limitations in the use of this soil; it is in capability unit I–3.

Chagrin fine sandy loam, 0 to 3 percent slopes, severely eroded (CcA3).—The surface layer of this soil is not so thick as that of the profile described for the series. Erosion caused by floodwaters has gouged and roughened the areas. After streams overflow, water remains on the surface for short periods.

This soil is best suited to grasses and legumes. Choose hay and pasture mixtures that tolerate flooding for short periods.

Because of erosion caused by frequent flooding, this soil is in capability unit VIe–2.

Chagrin silt loam, 0 to 3 percent slopes (CdA).—Except that its surface layer is finer textured and less permeable, this soil has a profile like that described for the series. The parent material consisted of sediments deposited in slowly moving water. The areas are level to nearly level and are subject to occasional flooding. After the streams overflow, shallow water remains on the surface for short periods.

This soil can be used for crops suited to the local climate. Protect the soil with a cover of plants during the winter and early in spring when the areas are most likely to be flooded.

There are no serious limitations in the use of this soil; it is in capability unit I–3.

Chagrin silt loam, high bottom, 0 to 3 percent slopes (CeA).—This soil is level to nearly level and occurs at slightly higher elevations than the soils on typical flood plains. It is flooded occasionally by streams, but flooding occurs no oftener than once in 4 to 6 years. This soil is intermediate in age and in profile development between the soils formed on recent flood plains and those formed on the older stream terraces. Like the other high bottom soil of the series, it has more variation in color between the surface layer and the subsoil than Chagrin silt loam, 0 to 3 percent slopes.

Typical profile:

0 to 9 inches, dark-brown to brown silt loam; weak, medium, granular structure; friable when moist; pH 6.0; clear, smooth lower boundary.
9 to 20 inches, yellowish-brown silt loam; weak, medium, granular structure; friable when moist; pH 5.8; diffuse, wavy lower boundary.
20 to 36 inches+, yellowish-brown silt loam; weak, medium, granular structure; friable to firm when moist; pH 5.8.

This soil can be used for crops suited to the local climate. It has no serious limitations in use and is in capability unit I–3.

Chagrin silt loam, high bottom, 3 to 6 percent slopes (CeB).—The profile of this soil is similar to the profile described for Chagrin silt loam, high bottom, 0 to 3 percent slopes. This soil has uniform slopes and it occurs slightly above the normal flood plains. It is flooded occasionally by streams, but flooding occurs no oftener than once in 4 to 6 years.

This soil can be used for crops suited to the local climate. Control erosion by tilling on the contour.

Because of the risk of erosion, this soil is in capability unit IIe–2.

Chagrin very gravelly loam, fan, 0 to 6 percent slopes (Cf).—Except for being very gravelly, the profile of this soil resembles the profile described for the series. This soil is level to gently sloping and occurs on alluvial fans at the mouths of tributary streams. It has formed from material derived from acid shale bedrock mixed with some sediments of sandstone and granite of glacial origin. The coarse-textured material is deposited where the streambeds have less slope and the water flows more slowly. This occurs at the point where the streams leave the upland and enter the level plains or terraces.

The degree of erosion varies. Material is deposited and removed alternately, depending on the volume of water in the stream.

This soil is used for crops suited to the local climate. Divert surface water into suitable waterways. Cultivate on the contour on the gentle slopes that are used for tilled crops.

Because of the risk of erosion and drought, this soil is in capability unit IIIe–2.

Collamer Series

The Collamer series is made up of deep, moderately well drained soils of the lake plain. The soils are important for the growing of vegetables and fruits.

The parent material was made up of lacustrine deposits derived from acid shale bedrock and from sandstone and limestone of glacial origin. It consisted of layers of silt and sand and of layers of clay, deposited in areas covered by still, or slack, water.

In general, the upper layers of these soils are friable when moist. A poorly aerated, mottled layer occurs at depths of 25 to 30 inches, particularly in the Collamer silt loams. This layer tends to be firmer in the fine sandy loams than in the silt loams.

These soils are in the same catena as the somewhat poorly drained to poorly drained Wallington soils and the poorly drained to very poorly drained Birdsall soils.

The native vegetation was a maple-beech-tuliptree type of forest. Locust, sassafras, aspen, sumac, sheep sorrel, cinquefoil, and broomsedge now grow in idle areas.

In Erie County the Collamer soils occur with the Williamson soils in a complex pattern. Because it was difficult to separate the two series in mapping, they have been mapped together as Williamson and Collamer soils.

Typical description of a Collamer fine sandy loam (cultivated):

0 to 8 inches, dark-brown fine sandy loam; weak, medium to fine, granular structure; friable when moist; pH 5.0; clear, smooth lower boundary.
8 to 22 inches, yellowish-brown silt loam; weak, medium, subangular blocky structure; friable when moist; pH 5.6; clear, smooth lower boundary.
22 to 30 inches, brown to dark-brown silt loam with common, medium, distinct mottles of strong brown and light brownish gray; moderate, coarse, subangular blocky structure; hard when dry, slightly firm when moist, and nonsticky when wet; pH 5.8; clear, smooth lower boundary.
30 to 48 inches+, dark grayish-brown loam or silt loam; weak, medium, granular structure; slightly firm when moist, nonsticky when wet; pH 5.6.

In the silt loams the soil material, at depths between 22 and 30 inches, is slightly hard when dry, friable when moist, and nonsticky when wet.

Conotton Series

The Conotton series consists of deep, well-drained, moderately coarse textured to medium textured soils on beach ridges. The soils can be cultivated intensively for deep-rooted crops and are among the best on the lake plain for growing vegetables and fruits (fig. 4). The parent material was made up of alternate layers of sand and gravel mixed with some silt and clay. This material was derived from acid shale bedrock and from sandstone and granite of glacial origin. It was sorted and deposited by wave action. The sandier soils have moderately rapid permeability and are subject to leaching of plant nutrients.

The Conotton soils are in the same catena as the somewhat poorly drained to poorly drained Fredon soils and the very poorly drained Halsey soils.

The native vegetation consisted of a chestnut-oak type of forest. Locust, sassafras, sumac, cinquefoil, little bluestem, and povertygrass now grow in idle areas.

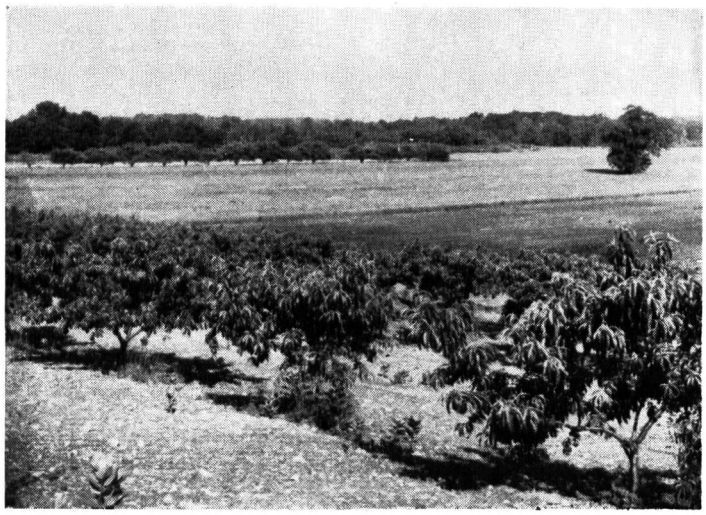

Figure 4.—**Peach orchard on a Conotton gravelly loam of the beach ridges. An area of Rimer fine sandy loam is in the background. This landscape is typical of the lake plain.**

In Erie County there are three soil types of the Conotton series—gravelly loam, gravelly sandy loam, and coarse sandy loam.

Typical profile of a Conotton gravelly loam (cultivated):

0 to 8 inches, dark-brown gravelly loam; weak, fine, granular structure; friable when moist; pH 6.0; gradual, wavy lower boundary.

8 to 11 inches, brown loam; weak, medium, subangular blocky structure; slightly hard when dry, friable when moist, and nonsticky when wet; pH 6.0; diffuse, broken lower boundary.

11 to 18 inches, reddish-brown coarse sandy loam; weak, medium, subangular blocky structure; slightly hard when dry, very friable when moist, and nonsticky when wet; nearly all the grains of sand are coated with clay, and the clay forms bridges between the grains; pH 5.8 to 6.0; clear, wavy lower boundary.

18 to 24 inches, dark-brown loamy coarse sand; weak, medium, subangular blocky structure; friable when moist; many of the grains of sand are partly coated with a thin film of clay, and clay bridges between the grains are common; pH 6.0; abrupt, wavy lower boundary.

24 to 26 inches, strong-brown loamy fine sand; moderate, medium, subangular blocky structure; slightly hard when dry, very friable when moist, and nonsticky when wet; many of the grains of sand are coated with a thin film of clay; pH 6.0; abrupt, lower boundary.

26 to 56 inches+, brown loamy fine sand and gravel; stratified; structureless; friable when moist; pH 6.2.

The amount of gravel varies throughout the profile.

Conotton gravelly loam, 0 to 3 percent slopes (ChA).—The surface layer of this soil is generally about 10 inches thick. Otherwise, the profile is similar to the profile described for the series. The areas are level to nearly level. Even though the relief is level, water does not remain ponded on this permeable soil.

This soil can be cultivated intensively for deep-rooted crops. Where the climate is favorable, the soil is suited to orchards, vineyards, and early maturing vegetables.

There are no serious restrictions in the use of this soil. It is in capability unit I–1.

Conotton gravelly loam, 3 to 8 percent slopes (ChB).—The profile of this soil is the same as the profile described for the series. The areas are gently sloping. In many places the slopes are in a pattern consisting of a series of parallel ridges that give an irregular, corrugated appearance to the landscape.

This soil is suited to the deep-rooted crops common to this area. Where the climate is favorable, the soil is also suited to orchards, vineyards, and early maturing vegetables. Replenish the supply of organic matter often. Cultivate on the contour to control erosion.

Because of the risk of erosion, this soil is in capability unit IIe–1.

Conotton gravelly loam, 3 to 8 percent slopes, severely eroded (ChB3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is less than 6 inches thick. The soil also contains less organic matter, and, where it has been cultivated, part of the brown loam from the subsoil has been mixed with the surface soil.

Where the climate is favorable, this soil is suited to orchards, vineyards, and early maturing vegetables. It is also suited to the cultivated crops commonly grown. Replenish the supply of organic matter often. Divert surface water from the adjoining higher areas into suitable waterways. Cultivate on the contour to control erosion.

Because of the effects of erosion, this soil is in capability unit IIIe–1.

Conotton gravelly loam, 8 to 15 percent slopes (ChC).—The surface layer of this soil is less than 7 inches thick. Otherwise, the profile resembles the profile described for the series. This soil has uniform slopes, most of which are less than 200 feet long. The lateral movement of ground water lowers the level of the water table; this makes the soil droughty in dry seasons.

Where the climate is favorable, this soil is suited to orchards, vineyards, and early maturing vegetables. It is also suited to the cultivated crops commonly grown. It is somewhat droughty for highest yields of small grains and permanent pasture. Replenish the supply of organic matter often. Use contour stripcropping to control erosion and to increase the amount of moisture in the subsoil.

Because of the risk of erosion, this soil is in capability unit IIIe–1.

Conotton gravelly loam, 8 to 15 percent slopes, severely eroded (ChC3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is less than 5 inches thick. The soil also contains less organic matter and is shallower. Where the soil has been cultivated, part of the brown loam from the subsoil has been mixed with the surface soil.

This soil is suited to limited cultivation, in addition to use for growing grasses and legumes. It can be used for apple orchards that have a permanent cover of sod. Choose hay and grass mixtures that will grow on somewhat droughty soils.

Because of the effects of erosion, this soil is in capability unit IVe–1.

Conotton gravelly sandy loam, 3 to 8 percent slopes (CkB).—The surface layer of this soil contains more sand and is coarser textured than that of the profile described for the series. The soil is gently sloping and is on a series of parallel ridges that give an irregular, corrugated appearance to the landscape.

This soil is suited to cultivated crops. Where the climate is favorable, the soil is also suited to orchards, vineyards, and early maturing vegetables. Use a rotation that will replenish the supply of organic matter. Cultivate on the contour to control erosion.

Because of the risk of erosion, this soil is in capability unit IIe–2.

Conotton gravelly sandy loam, 3 to 8 percent slopes, severely eroded (CkB3).—The surface layer of this soil contains more sand and is lighter colored than that of the profile described for the series. It is less than 6 inches thick. The soil also contains less organic matter. If the soil has been cultivated, part of the brown loam from the subsoil has been mixed with the surface soil.

This soil is suitable for the cultivated crops common to the area. Where the climate is favorable, the soil is suited to orchards, vineyards, and early maturing vegetables. Use a rotation that will replenish the supply of organic matter. Divert surface water from adjoining higher areas into suitable waterways. To control erosion, cultivate on the contour.

Because of the effects of erosion, this soil is in capability unit IIIe–2.

Conotton gravelly sandy loam, 8 to 15 percent slopes (CkC).—The surface layer of this soil contains more sand and is coarser textured than that of the profile described for the series. Also, it is less than 7 inches thick. The soil has uniform slopes, most of which are less than 200 feet long. Lateral movement of ground water lowers the level of the water table; this makes the soil droughty in dry seasons.

Where the climate is favorable, this soil is suited to orchards, vineyards, and early maturing vegetables. It is also suitable for the cultivated crops common to the area. Shallow-rooted pasture plants grown on this soil produce low yields during dry seasons. Use a rotation that will replenish the supply of organic matter. Use contour stripcropping to control erosion and to increase the amount of moisture in the subsoil.

Because of the risk of erosion, this soil is in capability unit IIIe–2.

Conotton gravelly sandy loam, 8 to 15 percent slopes, severely eroded (CkC3).—The profile of this soil resembles the profile described for the series, but the surface layer contains more sand, is lighter colored, and is less than 5 inches thick. The soil also contains less organic matter and is shallower. Where the soil has been cultivated, part of the brown loam from the subsoil has been mixed with the surface soil.

This soil is suited to grasses and legumes and to apple orchards that have a permanent cover of sod. Choose hay and grass mixtures that will grow on somewhat droughty soils.

Because of the effects of erosion, this soil is in capability unit VIe–1.

Conotton gravelly sandy loam, 15 to 25 percent slopes (CkD).—The surface layer of this soil contains more sand and is coarser textured than that of the profile described for the series. Also, it is less than 6 inches thick. This soil has uniform slopes, most of which are less than 200 feet long. Lateral movement of ground water lowers the level of the water table; this makes the soil droughty.

This soil is suited to limited cultivation, in addition to use for growing grasses and legumes. It also can be used for apple orchards that have a permanent cover of sod. Choose hay and grass mixtures that will grow on somewhat droughty soils.

Because of the risk of erosion, this soil is in capability unit IVe–1.

Conotton gravelly sandy loam, 15 to 25 percent slopes, severely eroded (CkD3).—The profile of this soil resembles the profile described for the series, but the surface layer contains more sand, is lighter colored, and is less than 4 inches thick. This soil also contains less organic matter and is shallower. Where the soil has been cultivated, part of the brown loam from the subsoil has been mixed with the surface soil.

On the slopes that face south or west, this soil can be used to grow pine trees. On the slopes that face north or east, it can be used to grow locust trees.

Because of the effects of erosion, this soil is in capability unit VIIe–3.

Conotton coarse sandy loam, 0 to 8 percent slopes (CgB).—This soil has a surface layer of coarse sandy loam. The areas are level to gently sloping. In many places the slopes occur in a pattern consisting of a series of parallel ridges that give an irregular, corrugated appearance to the landscape.

Typical profile in a cultivated site:

0 to 12 inches, dark-brown coarse sandy loam; weak, medium, granular structure; friable when moist; pH 5.4; abrupt, smooth lower boundary.

12 to 30 inches, dark-brown coarse sandy loam; single grain (structureless); friable when moist; pH 5.2; diffuse, wavy lower boundary.

30 to 60 inches, dark-brown coarse sand and fine gravel; single grain (structureless); friable when moist; pH 5.0; diffuse, wavy lower boundary.

60 to 72 inches+, dark-brown coarse sand and gravel of mixed size; single grain (structureless); friable when moist; pH 5.0.

Where the climate is favorable, this soil is suited to orchards, vineyards, and early maturing vegetables. It is also suited to the cultivated crops common to the area. Shallow-rooted pasture plants produce low yields during dry seasons.

This soil needs careful management. Replenish the supply of organic matter often. Maintain good tilth by plowing only when the soil contains plenty of moisture and after the danger of freezing has passed in spring. In sloping areas cultivate on the contour to decrease the amount of surface runoff.

Because of the risk of erosion, this soil is in capability unit IIe–2.

Conotton coarse sandy loam, 0 to 8 percent slopes, severely eroded (CgB3).—The surface layer of this soil is lighter colored than that of the profile described for Conotton coarse sandy loam, 0 to 8 percent slopes, and it is less than 6 inches thick. The soil also contains less organic matter; where it has been cultivated, part of the coarse, sandy material from the subsoil has been mixed with the surface soil.

Where the climate is favorable, this soil is suited to orchards, vineyards, and early maturing vegetables. It is also suited to the cultivated crops common to the area. Shallow-rooted pasture plants produce low yields during dry seasons.

The soil needs careful management. Replenish the supply of organic matter often. Maintain favorable tilth by plowing only when the soil contains plenty of moisture and after the danger of freezing has passed in spring. Cultivate on the contour to decrease the amount of surface runoff.

Because of the effects of erosion, this soil is in capability unit IIIe–2.

Conotton coarse sandy loam, 8 to 15 percent slopes (CgC).—This soil has a surface layer that is less than 8 inches thick. Otherwise, the profile resembles that of Conotton coarse sandy loam, 0 to 8 percent slopes. This soil has uniform slopes, most of which are less than 200 feet long. Lateral movement of ground water lowers the level of the water table; this makes the soil droughty in dry seasons.

Where the climate is favorable, this soil is suited to orchards, vineyards, and early maturing vegetables. It is also suited to the cultivated crops common to the area. Shallow-rooted pasture plants produce low yields during dry seasons.

The soil needs careful management. Replenish the supply of organic matter often. Maintain favorable tilth by plowing only when the soil contains plenty of moisture and after the danger of freezing has passed in spring. To conserve water, practice contour stripcropping; use a cropping system in which the soil is covered by sod at least half of the time.

Because of the risk of erosion, this soil is in capability unit IIIe–2.

Conotton coarse sandy loam, 8 to 15 percent slopes, severely eroded (CgC3).—The profile of this soil resembles the profile described for Conotton coarse sandy loam, 0 to 8 percent slopes, but the surface layer is less than 5 inches thick. The soil also contains less organic matter; where it has been cultivated, part of the coarse, sandy material from the subsoil has been mixed with the surface soil.

This soil is suited to grasses and legumes and to apple orchards that have a permanent cover of sod. Choose hay and grass mixtures that will grow on somewhat droughty soils.

Because of the effects of erosion, this soil is in capability unit VIe–1.

Conotton coarse sandy loam, 15 to 25 percent slopes (CgD).—The surface layer of this soil is less than 7 inches thick. Otherwise, the profile resembles that of Conotton coarse sandy loam, 0 to 8 percent slopes. The soil has uniform slopes, most of which are less than 200 feet long. Lateral movement of ground water lowers the level of the water table; this makes the soil droughty.

This soil is suited to limited cultivation in addition to use for growing grasses and legumes. It can be used for apple orchards that have a permanent cover of sod. Choose hay and grass mixtures that will grow on droughty soils.

Because of the risk of erosion, this soil is in capability unit IVe–1.

Conotton coarse sandy loam, 15 to 25 percent slopes, severely eroded (CgD3).—The profile of this soil resembles the profile described for Conotton coarse sandy loam, 0 to 8 percent slopes, but the surface layer is less than 5 inches thick. The soil also contains less organic matter; where it has been cultivated, part of the coarse, sandy material from the subsoil has been mixed with the surface soil.

This soil is suited to grasses and legumes and to apple orchards that have a permanent cover of sod. Choose hay and grass mixtures that will grow on somewhat droughty soils.

Because of the effects of erosion, this soil is in capability unit VIe–1.

Conotton Moderately Well Drained Variants

The Conotton variants differ from the other Conotton soils in being only moderately well drained instead of well drained. They occur in troughs or swales that lie between or at the bases of beach ridges. These are among the best soils of the lake plain for growing vegetables and fruits.

The parent material of the Conotton variants is made up of alternate layers of sand and gravel mixed with some silt and clay. This material was derived from acid shale bedrock and also from sandstone and granite of glacial origin. It was sorted and deposited by wave action. The soils have a firm, compact layer that is moderately permeable to air and water.

The native vegetation consisted of an oak-beech-maple type of forest. Wild crabapple, sumac, wildgrape, goldenrod, orchardgrass, and povertygrass now grow in idle areas.

Profile of a Conotton gravelly sandy loam, moderately well drained variant:

0 to 7 inches, dark-brown gravelly sandy loam; weak, coarse, granular structure; friable when moist; contains about 25 percent gravel; pH 5.6; abrupt, smooth lower boundary.
7 to 12 inches, reddish-brown coarse sandy loam; moderate, coarse, granular structure; friable when moist; pH 6.0; gradual, smooth lower boundary.
12 to 20 inches, yellowish-red coarse sandy loam; moderate, medium, subangular blocky structure; friable when moist; pH 6.0; clear, wavy lower boundary.
20 to 28 inches, dark-brown coarse sandy loam; moderate, thick, platy structure; friable when moist; pH 5.8; clear, wavy boundary.
28 to 33 inches, dark grayish-brown coarse sandy loam with common, fine, distinct mottles of light olive brown and strong brown; strong, coarse, subangular blocky structure; hard when dry, firm when moist; pH 5.6; clear, wavy lower boundary.
33 to 72 inches+, dark-brown, loamy, sandy gravel; stratified; single grain (structureless); friable when moist; pH 6.0; contains more than 45 percent gravel.

The percentage of gravel varies throughout the profile. The depth to the firm layer ranges from 20 to 36 inches.

Conotton gravelly sandy loam, moderately well drained variant, 0 to 3 percent slopes (CmA).—The profile of this soil is the same as the profile described for the Conotton variants. The soil is level to nearly level and has moderate internal drainage. During wet seasons water may remain on the surface for a short time.

This soil is suited to the crops commonly cultivated and to vegetables, vineyards, and apple orchards. The moderate internal drainage delays the growth of crops in spring. Divert surface water from adjoining higher areas into suitable waterways. Keep the natural drainageways open.

Because of the effects of the moderate internal drainage, this soil is in capability unit IIw–1.

Conotton gravelly sandy loam, moderately well drained variant, 3 to 8 percent slopes (CmB).—The surface layer of this soil is only 6 inches thick. Otherwise, the profile resembles the profile described for the Conotton variants. This soil has uniform slopes. Surface drainage is good, and internal drainage is moderate.

This soil is suited to deep-rooted cultivated crops, vegetables, orchards, and vineyards. Divert surface water from adjoining higher areas into suitable drainageways.

Because of the risk of erosion and the moderate internal drainage, this soil is in capability unit IIew-2.

Conotton gravelly sandy loam, moderately well drained variant, 3 to 8 percent slopes, severely eroded (CmB3).—The surface layer of this soil is lighter colored than that of the profile described for the Conotton variants and is only 4 or 5 inches thick. The soil also contains less organic matter and has a shallower root zone above the firm (pan) layer. Where the soil has been cultivated, part of the material from the yellowish-red subsoil has been mixed with the surface soil.

This soil is suitable for cultivated crops, vineyards, and orchards. Divert surface water from adjoining higher areas into suitable waterways.

Because of the effects of erosion and the moderate internal drainage, this soil is in capability unit IIIew-1.

Dalton Series

The Dalton series is made up of deep, somewhat poorly drained soils of the upland (fig. 5). The parent material consisted of silty material, 12 to 18 inches thick, and the underlying glacial till. The till is made up of material derived from bedrock of acid shale and sandstone mixed with some sediments of granite, sandstone, and limestone transported by glaciers. The soils are slightly acid to depths of 18 to 24 inches and are neutral to calcareous below those depths.

The soils have a firm, brittle, slowly permeable layer at depths of 12 to 24 inches. This layer restricts the movement of air and water and limits the penetration of roots. The soils tend to be droughty during the growing season.

The Dalton soils are in the same catena as the poorly drained Ellery soils and the very poorly drained Alden soils.

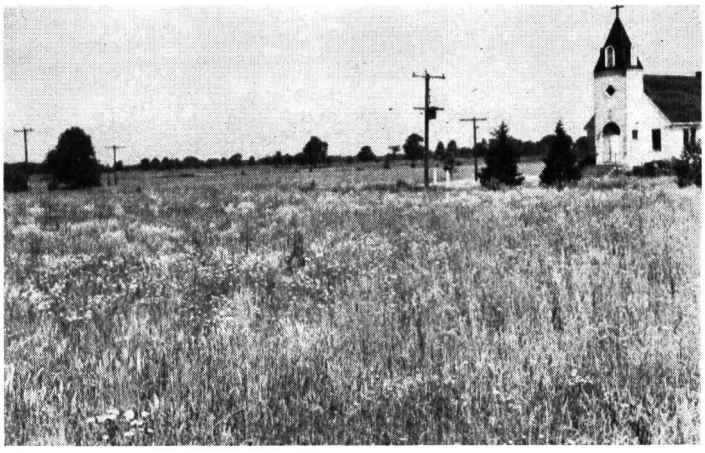

Figure 5.—**Typical landscape where a Dalton silt loam occurs.**

The native vegetation was a beech-maple type of forest. Goldenrod, hawthorn, wild crabapple, aspen, poverty-grass and velvetgrass now grow in idle areas. Areas that have never been cultivated contain mounds that are 4 to 8 feet in diameter and 1½ to 3 feet high. These mounds, known as cradle knolls, are covered with moss and ferns. The soil on the cradle knolls is moderately well drained.

Typical profile of Dalton silt loam, 2 to 8 percent slopes, moderately eroded (cultivated):

0 to 7 inches, very dark gray silt loam; weak, fine, granular structure; friable when moist; pH 6.6; abrupt, smooth lower boundary.
7 to 8 inches, grayish-brown silty clay loam; weak, fine, subangular blocky structure; friable when moist; pH 6.4; clear, wavy lower boundary.
8 to 18 inches, reddish-brown to yellowish-brown silt loam with a few concretions of iron; weak, fine prisms that break to weak, fine and medium, subangular blocky structural units coated with light brownish gray; firm when moist; pH 6.2; grandual, wavy lower boundary.
18 to 26 inches, yellowish-brown loam with streaks of gray; very coarse prisms that break to weak, thick, platy structural units coated with light olive brown; very firm when moist; pH 7.2+; abrupt, irregular lower boundary.
26 to 34 inches, light brownish-gray loam with streaks of gray; very coarse, prismatic structure; structural units thickly coated with light olive-brown silty clay loam; firm when moist; pH 7.2+.

In sites that have not been cultivated, there is a dark layer of organic matter at the surface. The boundary between this layer and the underlying mineral soil is abrupt and smooth.

Dalton silt loam, 0 to 2 percent slopes (DaA).—The profile of this soil resembles the profile described for the series, but the surface soil is darker and is 10 to 12 inches thick. Most of this soil is in depressions or in drainage divides. During wet seasons shallow water remains in the depressions. The soil warms up slowly in spring and becomes wet early in fall. Cradle knolls are common in areas that have never been cultivated.

This soil is suited to small grains, grasses, and legumes. It needs careful management. Choose hay and pasture mixtures that tolerate poor surface and internal drainage. Maintain good tilth by cultivating only when the soil contains the proper amount of moisture. If tilth is good, crops can make the best use of the shallow root zone. Divert surface water from adjoining higher areas into suitable waterways. Keep the natural drainageways open.

Because of poor drainage, this soil is in capability unit IIIw-1.

Dalton silt loam, 2 to 8 percent slopes (DaB).—The profile of this soil resembles the profile described for the series, but the surface layer is 9 to 10 inches thick. In areas that have not been cultivated, a dark layer of organic matter covers the surface of the soil. The boundary between this layer and the mineral soil is clear or abrupt. This soil has uniform slopes that are as much as 800 feet long. Most of the slopes are concave. Surface drainage is moderate, and internal drainage is somewhat poor. Cradle knolls are common in areas that have not been cultivated.

This soil is suited to small grains, grasses, and legumes. It needs careful management. Choose hay and pasture mixtures that tolerate restricted drainage. Maintain good tilth by cultivating only when the soil contains the proper amount of moisture. If tilth is good, crops can make the

best use of the shallow root zone. Divert surface water into suitable waterways. Keep the natural drainageways open.

Because of the risk of erosion and the restricted internal drainage, this soil is in capability unit IIIew–6.

Dalton silt loam, 2 to 8 percent slopes, moderately eroded (DaB2).—The profile of this soil is the same as the profile described for the series. Between one-fourth and three-fourths of the original surface layer has been lost through erosion. As the result of cultivation, the cradle knolls have been removed and the soil contains less organic matter than formerly.

This soil is suited to small grains, grasses, and legumes. It needs careful management. Choose hay and pasture mixtures that tolerate moderate surface drainage and poor internal drainage. Replenish the supply of organic matter often. Maintain good tilth by cultivating only when the soil contains the proper amount of moisture. If tilth is good, crops can make the best use of the shallow root zone. Divert surface water into suitable waterways. Keep the natural draingeways open.

Because of the risk of erosion and the restricted internal drainage, this soil is in capability unit IIIew–6.

Dune Sand

This miscellaneous land type consists of deep, loose, droughty, windblown sands. The sands were sorted from the lacustrine materials by wind and were blown into the shape of dunes. The dunes lack the characteristic crescent or oblong shape of active dunes because they have been partially stabilized by a stunted stand of broomsedge, little bluestem, switchgrass, and cinquefoil.

Typical profile:

0 to 15 inches, dark yellowish-brown loamy fine sand; single grain (structureless); loose when dry, friable when moist; pH 4.5; diffuse to gradual lower boundary.
15 to 40 inches+, yellowish-brown fine sand; single grain (structureless); loose when dry, friable when moist; pH 4.5.

Dune sand (Ds).—This miscellaneous land type occurs on the lake plain west of the city of Erie. It is inextensive and is of little importance for agriculture. The windward slopes are nearly level, and the leeward slopes are strong to steep. The soil material is weakly stratified.

Dune sand is suited to grasses and legumes. It is too droughty for good yields of permanent pasture. Choose hay mixtures that will require little moisture.

Because this soil is droughty and erodible, it is in capability unit VIIIs–1.

Ellery Series

The Ellery soils are deep and are poorly drained. The upper part of the profile is slightly acid to neutral, but free lime occurs at a depth of 36 inches.

These soils have formed on glacial till in the upland. The parent material was made up of materials derived from acid shale bedrock mixed with some sediments of sandstone, granite, and limestone of glacial origin. The soils are level to nearly level and occur at the bases of slopes. They are saturated by seepage water during most of the year. In places these soils lie along a seepage line that extends across the slope.

The Ellery soils are in the same catena as the very poorly drained Alden soils, the moderately well drained Langford soils, and the somewhat poorly drained Erie soils.

The native vegetation consisted of a white elm-black ash-red maple type of forest. Hemlock, aspen, willow, beech, goldenrod, barnyard grass, velvetgrass, and Canada bluegrass now grow on idle areas.

In Erie County the Ellery soil is mapped only in an undifferentiated group with the Alden soil.

Typical profile of Ellery silt loam:

0 to 6 inches, dark grayish-brown silt loam; moderate, medium, granular structure; friable when moist; pH 6.0; abrupt, smooth lower boundary.
6 to 10 inches, light yellowish-brown, heavy silt loam with common, medium, distinct mottles of grayish brown; weak, medium, blocky structure; firm when dry, friable when moist, and slightly plastic when wet; pH 6.5; gradual, smooth lower boundary.
10 to 18 inches, gray silty clay loam with common, coarse, distinct mottles of light olive brown; weak, medium to coarse, blocky structure; hard when dry, firm when moist, and slightly plastic when wet; pH 6.5; diffuse, irregular lower boundary.
18 to 36 inches, grayish-brown loam with a few, medium, distinct mottles of olive brown; weak, medium, subangular blocky structure; firm when moist, nonplastic when wet; pH 7.0; gradual, wavy lower boundary.
36 to 42 inches, olive-brown loam with a few, coarse, distinct mottles of light brownish gray; very coarse prisms that break to weak, medium, blocky structure; firm when moist, nonplastic when wet; effervesces with dilute hydrochloric acid.

Ellery and Alden silt loams, 0 to 4 percent slopes (EaB).—In this undifferentiated soil group the poorly drained Ellery soil makes up 75 percent of the total acreage. The very poorly drained Alden accounts for 25 percent.

The profile of the Ellery soil is the same as the profile described for the Ellery series. The Alden soil is like the Ellery soil except that its surface layer consists of very dark gray to black, heavy silt loam with a few, medium, faint mottles of gray. These soils have poor to very poor surface and internal drainage. Depth to the poorly aerated zone ranges from 1 inch in the Alden soil to 6 inches in the Ellery soil.

These soils are suited to grasses and legumes. Choose hay and pasture mixtures that tolerate restricted drainage. Keep the natural drainageways open.

Because of restricted drainage, these soils are in capability unit IVw–1.

Erie Series

The Erie series consists of deep, somewhat poorly drained soils of the upland. The soils are the most extensive in the county. The parent material was glacial till. The till consists of materials derived from acid shale bedrock mixed with some sediments of granite, limestone, and sandstone of glacial origin. Except for a small area near Colts Station, the till contains few stones and boulders. The soil is slightly acid to neutral to depths of 40 to 60 inches; it contains lime below these depths.

These soils are high in plant nutrients. They have a slowly permeable layer at depths of 12 to 18 inches. This layer restricts the movement of air and water and the penetration of roots. The subsoil puddles easily. The

soils tend to be droughty during the growing season.

The Erie soils are in the same catena as the moderately well drained Langford soils, the poorly drained Ellery soils, and the very poorly drained Alden soils.

The native vegetation consisted of a beech-maple type of forest. Goldenrod, hawthorn, wild crabapple, aspen, povertygrass, and velvetgrass now grow in idle areas. Areas that have never been cultivated have mounds, or cradle knolls, 4 to 8 feet in diameter and 1½ to 3 feet high. Here, the soil is moderately well drained and has a cover of moss and ferns (fig. 6).

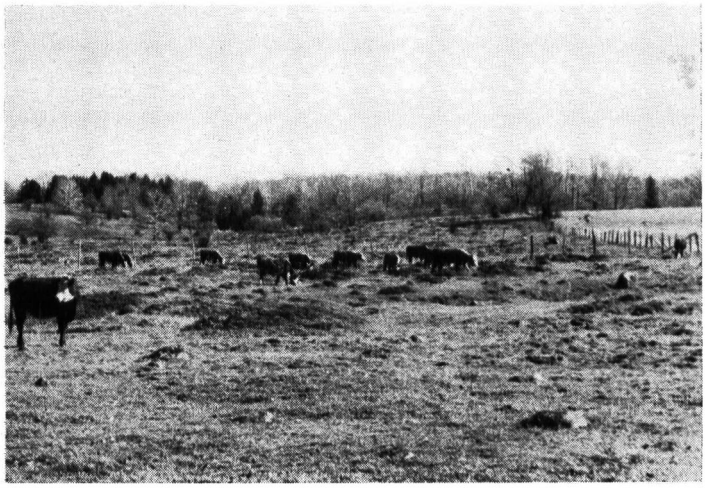

Figure 6.—**Mounds, called cradle knolls, occur in this pasture in an area of Erie silt loam that has never been cultivated.**

Typical profile of a moderately eroded Erie silt loam (cultivated):

0 to 6 inches, brown to yellowish-brown silt loam; weak, medium, granular or thick platy structure; friable when moist; pH 5.2; clear, smooth lower boundary.

6 to 13 inches, brown to light brownish-gray, heavy silt loam with common, coarse, distinct mottles of yellowish red; weak, medium, subangular blocky structure; friable when moist, moderately plastic when wet; pH 5.0; clear, wavy lower boundary.

13 to 22 inches, light grayish-brown silty clay loam with common, coarse, prominent mottles of strong brown and gray; weak, medium, blocky structure; hard when dry, firm when moist, and moderately plastic when wet; pH 5.0; clear, wavy lower boundary.

22 to 31 inches, yellowish-brown loam with many, medium, distinct mottles of gray and strong brown; very coarse prisms that break to moderate, medium, blocky structure; firm when moist, nonplastic when wet; pH 5.6; clear, wavy lower boundary.

31 to 43 inches, light brownish-gray clay loam with common, medium, distinct mottles of yellowish brown; very coarse prisms that break to weak, medium, blocky and, in places, platy structure; hard when dry, firm when moist, and slightly plastic when wet; pH 6.3; gradual, wavy lower boundary.

43 to 64 inches+, grayish-brown to olive gravelly silt loam; weak, medium, blocky to platy structure; firm when moist, slightly plastic when wet; pH 6.8 in upper part of layer, but becomes alkaline at increasing depths; free lime occurs at a depth of 60 inches.

In areas that have never been cultivated, a dark layer of organic matter covers the surface of the soil. The boundary between this layer and the underlying mineral soil is clear to abrupt. The Erie soils vary in their position on the landscape, in the amount of silt in their profiles, in the depth to lime, and in the amount of material derived from acid shale bedrock. In the southern part of the county, the soils have formed on old glacial till; they contain more sediments weathered from shale and have a distinct drainage pattern. Lime occurs at a depth of about 60 inches. In the northern part of the county, the soils have formed on more recent glacial till; they contain less shale material and have a poorly developed drainage pattern. Lime occurs at a depth of about 40 inches.

Erie silt loam, 0 to 3 percent slopes (EbA).—The profile of this soil resembles the profile described for the series, but the surface layer is slightly thicker, extending to a depth of 7 or 8 inches. In addition, the slowly permeable layer (fragipan) is nearer the surface it begins at depths of 10 to 12 inches.

This soil occurs in depressions or at the bases of the steeper slopes. Seepage water from higher lying areas has resulted in a high water table. During wet seasons shallow water remains in the depressions. The soil warms up slowly in spring and becomes wet early in fall. Cradle knolls are common in areas where the soils have never been cultivated.

This soil is suited to small grains, grasses, and legumes. Where the climate is favorable, the soil can be used for vineyards. Corn and cabbage are grown, but the soil is often too wet for these crops to be harvested.

This soil needs careful management. Choose hay and pasture mixtures that tolerate poor surface drainage and somewhat poor internal drainage. Replenish the supply of organic matter often. Maintain favorable tilth by cultivating only when the soil contains the proper amount of moisture. If tilth is good, crops can make the best use of the shallow root zone. Divert surface water from the adjoining higher areas into suitable waterways. Keep the natural drainageways open.

Because of restricted drainage, this soil is in capability unit IIIw–1.

Erie silt loam, 3 to 8 percent slopes (EbB).—The profile of this soil resembles the profile described for the series, but the surface layer is slightly thicker, extending to a depth of 7 or 8 inches. In areas that have not been cultivated, a dark layer of organic matter covers the surface of the soil. The boundary between this layer and the underlying mineral soil is clear to abrupt.

This soil has uniform slopes, some of which are as much as 1,000 feet long. Many of the slopes are concave. Surface drainage is moderate, and internal drainage is somewhat poor. Cradle knolls are common in areas where the soils have never been cultivated.

This soil is suited to small grains, grasses, and legumes. Where the climate is favorable, the soil is suitable for vineyards. Corn and cabbage can be grown; they are less likely to be damaged by excessive moisture than if they were grown on Erie silt loam, 0 to 3 percent slopes.

This soil needs careful management. Choose hay and pasture mixtures that tolerate somewhat poor internal drainage. Replenish the supply of organic matter often. Maintain favorable tilth by cultivating only when the soil contains the proper amount of moisture. If tilth is good, crops can make the best use of the shallow root zone. Keep the natural drainageways open. Divert surface water into suitable waterways.

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Because of the risk of erosion and the restricted internal drainage, this soil is in capability unit IIIew–6.

Erie silt loam, 3 to 8 percent slopes, moderately eroded (EbB2).—The profile of this soil is the same as the one described for the series. Between one-fourth and three-fourths of the original surface layer has been lost through erosion. As the result of cultivation, the cradle knolls have been removed and the soil contains less organic matter than formerly.

This soil, the most extensive of the Erie series, is suited to small grains, grasses, and legumes. Where the climate is favorable, the soil is also suitable for vineyards. Corn and cabbage can be grown; they are less likely to be damaged by excessive moisture than if they were grown on Erie silt loam, 0 to 3 percent slopes.

This soil needs careful management. Choose hay and pasture mixtures that tolerate somewhat poor internal drainage. Replenish the supply of organic matter often. Maintain favorable tilth by cultivating only when the soil contains the proper amount of moisture. If tilth is good, crops can make the best use of the shallow root zone. Divert surface water into suitable waterways. Keep the natural drainageways open.

Because of the effects of erosion and the restricted internal drainage, this soil is in capability unit IIIew–6.

Erie silt loam, 3 to 8 percent slopes, severely eroded (EbB3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is less than 5 inches thick. In addition, this soil contains less organic matter, and, because the root zone is shallower, it is more poorly drained. Where the soil has been cultivated, part of the material from the light brownish-gray subsoil has been mixed with the surface soil.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate poor internal drainage. Divert surface water into suitable waterways. Keep the natural drainageways open.

Because of the effects of erosion and the restricted internal drainage, this soil is in capability unit VIew–2.

Erie silt loam, 8 to 15 percent slopes (EbC).—The profile of this soil resembles the profile described for the series. In areas that have not been cultivated, however, a dark layer of organic matter covers the surface of the soil. The boundary between this layer and the underlying mineral soil is clear to abrupt. This soil has uniform slopes, some of which are as much as 500 feet long. Surface drainage is good, and internal drainage is somewhat poor. Cradle knolls are common in areas that have never been cultivated.

This soil is suited to small grains, grasses, and legumes. Where the climate is favorable, the soil is also suitable for vineyards. Corn or cabbage can be grown in long rotations in which a sod crop covers the soil at least half the time. Choose hay and pasture mixtures that tolerate poor internal drainage. Divert surface water into suitable waterways.

Because of the risk of erosion and the restricted internal drainage, this soil is in capability unit IIIew–6.

Erie silt loam, 8 to 15 percent slopes, moderately eroded (EbC2).—The profile of this soil resembles the profile described for the series, but the surface layer is only 3 to 5 inches thick. As the result of cultivation, the cradle knolls have been removed and the soil contains less organic matter than formerly.

This soil is suited to small grains, grasses, and legumes. Where the climate is favorable, the soil is also suitable for vineyards. Corn and cabbage can be grown in long rotations in which a sod crop covers the soil at least half the time. Choose hay and pasture mixtures that tolerate somewhat poor internal drainage. Divert surface water into suitable waterways.

Because of the effects of erosion and the restricted internal drainage, this soil is in capability unit IIIew–6.

Erie silt loam, 8 to 15 percent slopes, severely eroded (EbC3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is less than 5 inches thick. As the result of cultivation, material from the light brownish-gray subsoil has been mixed with the surface soil. Also, the cradle knolls have been removed and the soil contains less organic matter than formerly. This soil is more poorly drained than the uneroded Erie soils because it has a shallower root zone above the fragipan.

This soil is suited to permanent grasses and legumes. Choose pasture mixtures that tolerate poor internal drainage. Divert surface water into suitable waterways.

Because of the effects of erosion and the restricted internal drainage, this soil is in capability unit VIew–2.

Erie silt loam, 15 to 25 percent slopes (EbD).—The profile of this soil resembles the profile described for the series. In areas that have not been cultivated, however, a dark layer of organic matter covers the surface of the soil. The boundary between this layer and the underlying mineral soil is clear to abrupt. This soil has uniform slopes, some of which are as much as 400 feet long. Surface drainage is good to excessive, but internal drainage is poor. Cradle knolls are less common than on the less sloping Erie soils.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate somewhat poor internal drainage. Divert surface water into suitable waterways.

Because of the risk of erosion and the restricted internal drainage, this soil is in capability unit VIew–2.

Erie silt loam, 15 to 25 percent slopes, moderately eroded (EbD2).—The profile of this soil resembles the profile described for the series, but the surface layer is only 3 to 5 inches thick. As the result of cultivation, the cradle knolls have been removed and the soil contains less organic matter than formerly.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate somewhat poor internal drainage. Divert surface water into suitable waterways.

Because of the effects of erosion and the restricted internal drainage, this soil is in capabality unit VIew–2.

Erie silt loam, 15 to 25 percent slopes, severely eroded (EbD3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is less than 5 inches thick. As the result of cultivation, material from the light brownish-gray subsoil has been mixed with the surface soil. Also, the cradle knolls have been removed and the soil contains less organic matter than formerly. This soil is more poorly drained than the uneroded Erie soils because it has a shallower root zone above the fragipan.

This soil can be used to grow permanent grasses and legumes. Choose pasture mixtures that tolerate poor internal drainage. Divert surface water into suitable waterways.

Because of the effects of erosion, this soil is in capability unit VIIe–5.

Escarpments

Escarpments (Ec).—This miscellaneous land type occurs on steep slopes that have formed as the result of stream cutting or lakeshore erosion. The areas are on the lake plain and on terraces.

In general, the slopes range from 30 to 60 percent and are between 50 and 200 feet long. The degree of erosion varies. The tops of the escarpments have a cover of soil, but, at the bases of eroded slopes, there are outcrops of rocks. In some places the soil material is underlain by quicksand. On most of the escarpments, the soil material resembles that of either the Berrien, Caneadea, Conotton, Ottawa, Platea, Wallington, or Williamson and Collamer soils.

Some of the escarpments are suitable for the growing of trees. Because of the steep slopes and the effects of erosion, this mapping unit is in capability unit VIIe–2.

Fredon Series

The Fredon series consists of deep, somewhat poorly drained to poorly drained soils. The soils are on flats and in depressions of the gravelly beach ridges of the lake plain and are also on gravelly outwash terraces along stream valleys in the upland. The parent material consisted of alternate layers of sand, silt, and gravel mixed with some clay. It was derived from acid shale bedrock and sediments of sandstone and granite of glacial origin. This material was sorted and deposited by water.

These soils are porous and are moderately permeable to a depth of about 20 inches. Below this depth is a slowly permeable layer that restricts the movement of air and moisture and limits the penetration of roots.

The Fredon soils are in the same catena as the well drained Conotton and Howard soils, the moderately well drained Phelps soils, and the very poorly drained Halsey soils.

The native vegetation consisted of a beech-maple-hemlock type of forest. Red oak, red maple, aspen, wild crabapple, sumac, wildgrape, goldenrod, and Canada bluegrass now grow in idle areas.

Typical profile of a Fredon loam (cultivated):

0 to 10 inches, very dark brown to dark yellowish-brown loam; moderate, medium, granular structure; friable when moist; pH 5.8; clear, smooth lower boundary.
10 to 20 inches, dark-brown silt loam; weak, medium, subangular blocky structure; friable when moist, slightly sticky when wet; pH 6.0; clear, smooth lower boundary.
20 to 28 inches, yellowish-brown silt loam with many, coarse, distinct mottles of grayish brown; moderate, thin, platy structure; hard when dry, firm when moist; pH 5.8; gradual, wavy lower boundary.
28 to 35 inches, grayish-brown silt loam with many, fine, distinct mottles of yellowish brown; moderate, medium, subangular blocky structure; loose when dry, friable when moist; pH 6.0; clear, smooth lower boundary.
35 to 48 inches+, yellowish-brown stratified sand and gravel; single grain (structureless); pH 6.2.

Below a depth of 36 inches, the reaction of the soil ranges from slightly acid to calcareous. The depth to the slowly permeable layer ranges from 18 to 26 inches.

Fredon loam, 0 to 3 percent slopes (FoA).—The profile of this soil resembles the profile described for the series, but the slowly permeable layer begins at a depth of 18 instead of 20 inches. This soil has poor surface drainage and somewhat poor internal drainage. During wet seasons shallow water remains in depressions for short periods.

This soil is suited to late-maturing vegetables and to corn, small grains, grasses, and legumes. Where the climate is favorable, the soil is suitable for vineyards. Choose hay and pasture mixtures that tolerate restricted drainage. Divert surface water from adjoining higher areas into suitable waterways. Keep the natural drainageways open.

Because of the restricted drainage, this soil is in capability unit IIIw–5.

Fredon loam, 3 to 8 percent slopes (FoB).—This soil has the same profile as that described for the series. It has uniform slopes. Surface drainage is good, and internal drainage is somewhat poor.

This soil is suited to late-maturing vegetables and to corn, small grains, grasses, and legumes. Where the climate is favorable, the soil is suitable for vineyards. Choose hay and pasture mixtures that tolerate restricted internal drainage. Divert surface water into suitable waterways.

Because of the risk of erosion and the somewhat poor internal drainage, this soil is in capability unit IIIew–4.

Fresh Water Marsh

Fresh water marsh (Fm).—This miscellaneous land type occurs in shallow lagoons on the bay side of Presque Isle. The soil material consists of 6 to 12 inches of partly decomposed organic material that is underlain by deep lacustrine sand and gravel. The surface is covered by 1 to 3 feet of water. The water level fluctuates seasonally and is especially high following storms.

The areas support a luxuriant growth of cattails and are suitable as habitats for wildlife. Because of the effects of standing water, this mapping unit is in capability unit VIIIw–1.

Halsey Series

The Halsey soils are deep and are very poorly drained. They occur in depressions on the gravelly beach ridges along the lake plain and also on gravelly outwash terraces along stream valleys in the upland. The parent material consisted of alternate layers of sand, silt, and gravel mixed with some clay. It was derived from acid shale bedrock and sediments of sandstone and granite of glacial origin. This material was sorted and deposited by water.

A layer of very dark grayish-brown silty clay loam occurs at depths of 10 to 15 inches. This material is slowly permeable to air and water and limits the penetration of roots. The soil has a high water table.

These soils are in the same catena as the well drained Conotton and Howard soils, the moderately well drained

Phelps soils, and the somewhat poorly drained Fredon soils.

The native vegetation consisted of a tamarack-hemlock type of forest. Alders and sedges now grow in idle areas.

In Erie County only one soil of the Halsey series, Halsey loam, 0 to 3 percent slopes, has been mapped.

Typical profile of Halsey loam, 0 to 3 percent slopes:

0 to 7 inches, very dark grayish-brown loam; moderate, fine, granular structure; friable when moist; pH 5.8; gradual, smooth lower boundary.

7 to 12 inches, dark-brown silt loam with many, medium, distinct mottles of strong brown; moderate, coarse, granular structure; friable when moist; pH 6.0; clear, smooth lower boundary.

12 to 15 inches, very dark grayish-brown silty clay loam with many, medium, distinct mottles of gray and dark reddish brown; strong, medium, ganular structure; friable when moist, slightly sticky when wet; pH 5.8; abrupt, smooth lower boundary.

15 to 25 inches, grayish-brown silt loam with many, coarse, distinct mottles of dark brown; moderate, medium, subangular blocky structure; friable when moist, slightly sticky when wet; pH 6.2; gradual, smooth lower boundary.

25 to 30 inches, yellowish-brown loam with many, coarse, distinct mottles of gray; weak, medium, subangular blocky structure; friable when moist, slightly sticky when wet; pH 6.6; gradual, smooth lower boundary.

30 to 42 inches+, variegated brownish-yellow and dark yellowish-brown, stratified loamy sand to sandy loam; single grain (structureless) to weak, medium, subangular blocky structure; friable when moist; pH 7.0.

Many of the depressions contain colluvial material that has washed down from adjoining sloping soils. As a result, there are variations in the depth and texture of the surface soil.

Halsey loam, 0 to 3 percent slopes (HaA).—The profile of this soil is the same as the one described for the series. The areas are level to nearly level and have very poor surface and internal drainage. During wet seasons water remains ponded in the depressions. Because of the high water table, the soil does not dry out until late in spring.

This soil is suited to small grains, grasses, and legumes. Choose hay and pasture mixtures that tolerate restricted drainage. Divert surface water from adjoining higher areas into suitable waterways. Keep the natural drainageways open.

Because of restricted drainage, this soil is in capability unit IIIw-3.

Howard Series

The Howard series is made up of deep, well-drained soils. These soils occur on the gravelly outwash terraces and on kames along the stream valleys of the upland (fig. (7). They are permeable to air and water.

The parent material consisted of alternate layers of sand and gravel mixed with some silt and clay. It was derived from acid shale bedrock and sediments of granite, sandstone, and limestone of glacial origin. This material was sorted and deposited by melt water from the front of retreating glaciers. A hard, porous, lime-cemented horizon, locally called fossil rock, begins at depths of 3½ to 8 feet.

These soils are in the same catena as the moderately well drained Phelps soils, the somewhat poorly drained to poorly drained Fredon soils, and the very poorly drained Halsey soils.

Figure 7.—**Landscape typical of a Howard gravelly silt loam.**

The native vegetation consisted of white pine and white pine-chestnut types of forest. Sumac, maple, wild crabapple, cinquefoil, povertygrass, little bluestem, and broomsedge now grow in idle areas.

Typical profile of a Howard gravelly silt loam (cultivated):

0 to 6 inches, brown to dark-brown gravelly silt loam; moderate, fine, granular structure; friable when moist; pH 6.0; abrupt, smooth lower boundary.

6 to 9 inches, dark yellowish-brown gravelly silt loam; weak, thin, platy structure that breaks to moderate, fine, granular; friable when moist; pH 5.8; gradual, smooth lower boundary.

9 to 15 inches, reddish-brown, stratified gravelly loam or light clay loam; strong, medium, subangular blocky structure; friable when moist, slightly sticky when wet; sand grains coated with clay that also forms bridges between the grains; pH 4.8; diffuse, wavy lower boundary.

15 to 22 inches, reddish-brown, stratified gravelly loam; weak, medium, subangular blocky structure; friable when moist; on most sand grains, clay forms thin films and bridges between the grains; pH 5.6; clear, wavy lower boundary.

22 to 42 inches, dark reddish-brown, stratified loamy silt, sand, and gravel; single grain (structureless); firm when moist; pH 6.6; clear, distinct lower boundary.

42 to 70 inches, grayish-brown mixed gravel; 25 percent fine gravel and 75 percent coarse gravel; massive (structureless); hard, cemented; calcareous, effervesces violently with dilute hydrocholric acid; clear, distinct lower boundary.

70 to 144 inches+, grayish-brown mixed gravel partly coated with lime; 25 percent fine gravel, 75 percent coarse gravel; single grain (structureless); loose when moist.

Howard gravelly silt loam, 0 to 3 percent slopes (HbA).—The surface layer of this soil is thicker and a darker brown than that of the profile described for the series. In most places it is 9 inches thick. The soil is level to nearly level and has poor surface drainage. Because water percolates readily through the profile, surface water remains ponded for only short periods.

This soil can be used for crops suited to the climate. It can be cultivated intensively.

There are no important restrictions in the use of this soil; it is in capability unit I-1.

Howard gravelly silt loam, 3 to 8 percent slopes (HbB).—The profile of this soil is the same as the profile described for the series. On many of the slopes, there is a complex pattern of depressions and knolls. Surface

drainage is poor, but, because water percolates readily through the profile, surface water does not remain ponded.

This soil is suited to potatoes, corn, small grains, grasses, and legumes. Cultivate on the contour to control erosion.

Because of the risk of erosion, this soil is in capability unit IIe–1.

Howard gravelly silt loam, 3 to 8 percent slopes, severely eroded (HbB3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is less than 5 inches thick. Also, this soil contains less organic matter, and, where it has been cultivated, material from the dark yellowish-brown subsoil has been mixed with the surface soil.

This soil is suited to potatoes, corn, small grains, grasses and legumes. Cultivate in contour strips. Divert surface water into suitable waterways.

Because of the effects of erosion, this soil is in capability unit IIIe–1.

Howard gravelly silt loam, 8 to 15 percent slopes (HbC).—The profile of this soil resembles the profile described for the series. The soil has irregular slopes, most of which are less than 200 feet long. Lateral movement of ground water lowers the level of the water table; this makes the soil droughty in dry seasons.

This soil is suited to corn, small grains, grasses, and legumes. Use rotations in which a sod crop is grown for at least half the time. Cultivate in contour strips.

Because of the risk of erosion, this soil is in capability unit IIIe–1.

Howard gravelly silt loam, 8 to 15 percent slopes, severely eroded (HbC3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is less than 5 inches thick. Also, this soil contains less organic matter and, where it has been cultivated, material from the dark yellowish-brown subsoil has been mixed with the surface soil.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate somewhat droughty conditions.

Because of the effects of erosion, this soil is in capability unit VIe–1.

Howard gravelly silt loam, 15 to 25 percent slopes (HbD).—The surface layer of this soil is less than 6 inches thick. Otherwise, the profile resembles the profile described for the series. This soil occurs on kames or large knolls that have a complex pattern of slopes. Rapid movement of ground water lowers the level of the water table; this makes the soil droughty.

This soil is suited to limited cultivation; it can be used for corn, small grains, grasses, and legumes. Use a long rotation in which a sod crop is grown most of the time.

Because of the risk of erosion, this soil is in capability unit IVe–1.

Howard gravelly silt loam, 15 to 25 percent slopes, severely eroded (HbD3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is less than 4 inches thick. Also, this soil contains less organic matter and, where it has been cultivated, material from the dark yellowish-brown subsoil has been mixed with the surface soil.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate somewhat droughty conditions.

Because of the effects of erosion, this soil is in capability unit VIe–1.

Howard gravelly silt loam, 25 to 40 percent slopes (HbE).—The surface layer of this soil is less than 5 inches thick. Otherwise, the profile resembles the profile described for the series. This soil occurs on kames or large knolls that have a complex pattern of slopes. Excessive lateral movement of ground water lowers the level of the water table; this tends to make the soil somewhat droughty.

This soil is suited to trees and to native grasses and legumes. Because of the risk of erosion, it is in capability unit VIIe–3.

Howard gravelly silt loam, 25 to 40 percent slopes, severely eroded (HbE3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is less than 4 inches thick. Also, this soil contains less organic matter; where it has been cultivated, material from the dark yellowish-brown subsoil has been mixed with the surface soil.

This soil is suitable for trees. The drier slopes that face south and west can be used for pine, and the slopes that face north and east can be used for locust.

Because of the effects of erosion, this soil is in capability unit VIIe–3.

Langford Series

The Langford series is made up of deep, moderately well drained soils of the upland. These soils occur on convex ridgetops and on sidehills. Consequently, they have favorable internal drainage and are valuable for agriculture. The parent material consisted of glacial till derived from acid shale bedrock mixed with sediments of granite, sandstone, and limestone of glacial origin. The till is slightly acid to neutral at depths of 48 to 72 inches. The soils have a slowly permeable, firm or hard layer (fragipan) at depths of 26 to 36 inches.

These soils are in the same catena as the somewhat poorly drained Erie soils, the poorly drained Ellery soils, and the very poorly drained Alden soils.

The native vegetation was a sugar maple-beech-red maple type of forest. Wild cherry, wild crabapple, hawthorn, sumac, blackberry, cinquefoil, and povertygrass now grow in idle areas. Areas that have never been cultivated contain mounds, or cradle knolls, 3 to 6 feet in diameter and 1 to 3 feet high. The cradle knolls are covered with moss and ferns.

Typical profile of a Langford silt loam (noneroded):

0 to 9 inches, dark yellowish-brown silt loam; weak, fine, granular structure with some weak, platy structure at depths between 7 and 9 inches; friable when moist; pH 5.0; clear, wavy lower boundary.

9 to 18 inches, dark yellowish-brown silt loam; weak, fine to medium, subangular blocky structure with some weak, platy structure; friable when moist; pH 5.2; clear, wavy lower boundary.

18 to 24 inches, brown to yellowish-brown loam; weak, medium, subangular blocky structure; friable when moist; pH 5.2; clear, wavy lower boundary.

24 to 30 inches, grayish-brown loam to very fine sandy loam with many, coarse, distinct mottles of pale brown and yellowish red; weak, medium, subangular blocky structure;

slightly firm when moist, nonplastic when wet; pH 5.2; clear, wavy lower boundary.

30 to 34 inches, yellowish-brown fine sandy loam with many, coarse, distinct mottles of light brownish gray and strong brown; weak, medium, platy structure to massive (structureless); hard when dry, firm when moist, and nonplastic when wet; pH 5.6; clear, irregular lower boundary.

34 to 44 inches, dark-brown loam with a few, coarse, distinct mottles of gray and strong brown; very coarse prisms that break to moderate, thick, platy structure; hard when dry, very firm when moist, and slightly plastic when wet; pH 5.8; gradual, wavy lower boundary.

44 to 54 inches, grayish-brown to light-olive gravelly silty clay loam with a few, coarse, faint mottles of gray and yellowish brown; weak, medium, blocky structure; hard when dry, very firm when moist, and plastic when wet; pH 7.0; gradual, wavy lower boundary.

54 to 70 inches+, light olive-brown silty clay loam; strong, medium, blocky structure to massive (structureless); hard when dry, very firm when moist, and plastic to slightly plastic when wet; pH 6.8.

The Langford soils vary in depth to the firm fragipan and to the slightly acid to neutral layer. In some places outwash gravel that overlies the glacial till extends to depths of 24 to 30 inches. This occurs at the point where glacial till of the upland comes in contact with the outwash terraces.

Langford silt loam, 0 to 8 percent slopes (LaB).—The profile of this soil is the same as the profile described for the series (fig. 8). This soil has uniform, convex slopes. The areas are small, and most of the slopes are less than 100 feet long. Surface drainage is good, and internal drainage is moderate. Cradle knolls are common.

Figure 8.—**Profile of Langford silt loam, 0 to 8 percent slopes. A weakly developed fragipan occurs between depths of 21 and 28 inches.**

This soil is suited to late-maturing vegetables and to corn, small grains, grasses, and legumes. Where the climate is favorable, the soil is also suitable for vineyards. Cultivate on the contour to control erosion.

Because of the risk of erosion and the moderate internal drainage, this soil is in capability unit IIew–1.

Langford silt loam, 0 to 8 percent slopes, moderately eroded (LaB2).—The profile of this soil resembles the profile described for the series, but the surface layer is only 7 inches thick. As the result of cultivation, the cradle knolls have been removed and the soil contains less organic matter than formerly.

This soil is suited to late-maturing vegetables and to corn, small grains, grasses, and legumes. Where the climate is favorable, the soil is also suitable for vineyards. Cultivate on the contour to control erosion.

Because of the effects of erosion and the moderate internal drainage, this soil is in capability unit IIew–1.

Langford silt loam, 0 to 8 percent slopes, severely eroded (LaB3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is less than 4 inches thick. The soil contains less organic matter, and, where it has been cultivated, some of the material from the dark yellowish-brown subsoil has been mixed with the surface soil.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate somewhat poor internal drainage. Divert surface water into suitable waterways.

Because of the effects of erosion and the somewhat poor internal drainage, this soil is in capability unit IVew–2.

Langford silt loam, 8 to 15 percent slopes (LaC).—The profile of this soil resembles the profile described for the series, but the surface layer is less than 7 inches thick. The soil has long slopes, most of which are convex. Many of the slopes are more than 300 feet long. Surface drainage is good, and internal drainage is moderate. Cradle knolls are common.

This soil is suited to late-maturing vegetables, corn, small grains, grasses, and legumes. Where the climate is favorable, the soil is suitable for vineyards.

Plant clean-cultivated crops in contour strips; use a long rotation in which a sod crop covers the soil at least half the time. Divert surface water into suitable waterways.

Because of the risk of erosion and the moderate internal drainage, this soil is in capability unit IIIew–1.

Langford silt loam, 8 to 15 percent slopes, moderately eroded (LaC2).—The profile of this soil resembles the profile described for the series, but the surface layer is less than 6 inches thick. As the result of cultivation, the cradle knolls have been removed and the soil contains less organic matter than formerly.

This soil is suited to late-maturing vegetables and to corn, small grains, grasses, and legumes. Where the climate is favorable, the soil is also suitable for vineyards.

Plant clean-cultivated crops in contour strips; use a long rotation in which a sod crop covers the soil at least half the time. Divert surface water into suitable waterways.

Because of the effects of erosion and the moderate internal drainage, this soil is in capability unit IIIew–1.

Langford silt loam, 8 to 15 percent slopes, severely eroded (LaC3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is less than 4 inches thick. The soil contains less organic matter, and, where it has been cultivated, some of the dark yellowish-brown subsoil has been mixed with the surface soil.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate somewhat poor internal drainage. Divert surface water into suitable waterways.

Because of the effects of erosion and the somewhat poor internal drainage, this soil is in capability unit IVew–2.

Langford silt loam, 15 to 25 percent slopes (LaD).—The profile of this soil resembles the profile described for the series, but the surface layer is less than 6 inches thick. This soil has long slopes, most of which are convex. Many of the slopes are more than 400 feet long. Surface drainage is good, and internal drainage is moderate. Cradle knolls are common.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate moderate internal drainage. Divert surface water into suitable waterways.

Because of the risk of erosion and the moderate internal drainage, this soil is in capability unit IVew–2.

Langford silt loam, 15 to 25 percent slopes, moderately eroded (LaD2).—The profile of this soil resembles the profile described for the series, but the surface layer is less than 5 inches thick. As the result of cultivation, the cradle knolls have been removed and the soil contains less organic matter than formerly.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate moderate internal drainage. Divert surface water into suitable waterways.

Because of the effects of erosion and the moderate internal drainage, this soil is in capability unit IVew–2.

Langford silt loam, 15 to 25 percent slopes, severely eroded (LaD3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is less than 4 inches thick. The soil contains less organic matter, and, where it has been cultivated, some of the dark yellowish-brown subsoil has been mixed with the surface soil.

This soil is suitable for trees. Because of the effects of erosion, it is in capability unit VIIe–4.

Langford and Erie Soils

About 75 percent of the acreage in these undifferentiated soil groups consists of moderately well drained Langford soils, and about 25 percent is made up of somewhat poorly drained Erie soils. The soils are on the steep lower slopes of stream valleys. Most of the slopes are more than 500 feet long; they are fairly uniform but become steeper downslope. The Erie soils occur on narrow beaches and seepage spots in which ground water is close to the surface.

Langford and Erie silt loams, 25 to 50 percent slopes (LbE).—The profiles of these soils resemble the profiles described for the Langford and Erie series. Because some of the soil has sloughed or washed down the steep slopes, however, the surface layers are not so thick and the different soil layers are not so distinct.

These soils have good to excessive surface drainage. Internal drainage ranges from moderately good to somewhat poor. On steep slopes adjacent to streams, weathered shale occurs at shallow depths.

These soils are suited to permanent grasses and legumes. Choose pasture mixtures that tolerate moderately good to somewhat poor internal drainage.

Because of the risk of erosion, this mapping unit is in capability unit VIIe–5.

Langford and Erie silt loams, 25 to 50 percent slopes, severely eroded (LbE3).—The profiles of these soils are similar to those described for the Langford and Erie series, except that these soils are more eroded. More than three-fourths of the original surface layer has been lost, and the soils contain less organic matter than formerly. Also, the depth of the root zone has decreased; internal drainage is somewhat poor to poor.

These soils are suitable for trees. Because of the effects of erosion, this mapping unit is in capability unit VIIe–4.

Lobdell Series

The Lobdell series consists of deep, moderately well drained soils of the bottom land. The soils are on first bottoms or on high bottoms on the flood plains of streams.

The parent material of sand, silt, and gravel was washed down from the upland and redeposited on the flood plain by streams. This material was made up of material weathered from acid shale bedrock mixed with sediments of sandstone, granite, and limestone of glacial origin. The soils are too young for a well-developed profile to have formed.

A firm, slowly permeable layer begins at depths of 18 to 36 inches in these soils. At depths below 18 inches, the soils are often saturated with water for long periods.

These soils are in the same catena as the well-drained Chagrin soils, the somewhat poorly drained to poorly drained Wayland soils, and the very poorly drained Sloan soils.

Beech, sugar maple, wild crabapple, Canada bluegrass, and whiteclover grow in wooded and idle areas.

In Erie County normal (first bottom) phases and high bottom phases of the Lobdell soils have been mapped.

Typical profile of a Lobdell silt loam (cultivated):

0 to 12 inches, dark-brown silt loam; weak, medium, granular structure; friable when moist; pH 6.2; diffuse, wavy lower boundary.

12 to 18 inches, dark yellowish-brown silt loam; weak, medium, granular structure; friable when moist; pH 6.6; diffuse, wavy lower boundary.

18 to 30 inches, dark yellowish-brown silt loam; weak, medium, granular structure; friable when moist; pH 6.8; clear, smooth lower boundary.

30 to 36 inches+, dark grayish-brown loam with common, medium, distinct mottles of gray and brownish yellow; weak, medium, granular structure; firm when moist; pH 7.0.

These soils vary in the amounts of sand, silt, and gravel that occur throughout the profile. They also vary in the depth to the firm, slowly permeable layer.

Lobdell silt loam, 0 to 3 percent slopes (LcA).—The profile of this soil is the same as the profile described for the series. The soil is level to nearly level and is on first bottoms that are subject to flooding. After the soil has

been flooded, shallow water remains on the surface for a short time.

This soil is suited to corn, small grains, grasses, and legumes. Choose hay and pasture mixtures that tolerate poor surface drainage and moderate internal drainage. Keep the natural drainageways open. During winter and early in spring, when flooding is most prevalent, protect the soil with a cover of plants.

Because of moderate internal drainage, this soil is in capability unit IIw–2.

Lobdell silt loam, 0 to 3 percent slopes, severely eroded (LcA3).—The profile of this soil resembles the profile described for the series, but the surface soil is not so thick and the slowly permeable layer begins at shallower depths. Erosion caused by floodwaters has gouged and roughened the surface. After the soil has been flooded, the depressions remain ponded.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate poor surface drainage and moderate internal drainage. Keep the natural drainageways open.

Because of frequent flooding and the effects of erosion, this soil is in capability unit VIe–2.

Lobdell silt loam, high bottom, 0 to 3 percent slopes (LdA).—The profile of this soil resembles the profile described for the series. There is more variation, however, between the color of the surface soil and that of the subsoil. The soil material, at depths between 12 and 18 inches, is yellowish brown and has moderate, medium, granular structure.

This level to nearly level soil is at slightly higher elevations than the soils on the normal flood plain. At most, it is flooded by streams only once in 4 to 6 years. It is intermediate in age and in degree of profile development between the soils of the recent flood plain and those on the older stream terraces.

This soil is suited to corn, small grains, grasses, and legumes. Choose hay and pasture mixtures that tolerate moderate internal drainage.

Because of its moderate internal drainage, this soil is in capability unit IIw–2.

Lobdell silt loam, high bottom, 3 to 6 percent slopes (LdB).—The profile of this soil resembles the profile described for the series. At depths between 12 and 18 inches, however, the soil is yellowish brown and has moderate, medium, granular structure. This soil has uniform slopes and is at slightly higher elevations than the soils on the normal flood plain. Surface drainage is good. At most, the soil is flooded only once in 4 to 6 years.

This soil is suited to corn, small grains, grasses, and legumes. Choose hay and pasture mixtures that tolerate moderate internal drainage. Plant clean-cultivated crops in contour strips.

Because of the risk of erosion and the moderate internal drainage, this soil is in capability unit IIew–3.

Lordstown Series

The Lordstown series consists of shallow, droughty, acid soils of the upland. The soils are well drained. They occur on moderately sloping ridgetops and on the very steep sides of valleys. The parent material was derived from shallow glacial till containing relatively fine grained sandstone. Partly weathered shale or sandstone occurs at depths of 10 to 26 inches.

The Lordstown soils have profiles similar to the profile described for the Manlius series. These soils, however, contain more fragments of sandstone throughout. Also, the layer corresponding to the layer that occurs at depths below 24 inches in the Manlius soil is made up of sandstone and relatively coarse grained shale.

These soils are in the same catena as the well drained Wooster soils, the moderately well drained Mardin soils, the somewhat poorly drained to poorly drained Volusia soils, and the very poorly drained Alden soils.

The native vegetation was a chestnut-red oak type of forest. Wild cherry, beech, sumac, and broomsedge now grow in idle areas.

In Erie County the Lordstown soils are mapped only in undifferentiated soil groups with the Manlius soils. These are described under the Manlius series. The Lordstown soils make up 25 percent of the total acreage of these mapping units, and the Manlius soils make up 75 percent.

Made Land

Made land (Ma).—This miscellaneous land type consists of areas that have been filled artificially with earth and trash and then have been smoothed. Most of it occurs in and around urban areas. Some areas of Made land are along the lake front; others have been worked over extensively and are occupied by factories or railroad yards. This mapping unit varies too much in composition to be classified according to capability.

Mahoning Series

The Mahoning soils are deep and are moderately well drained to somewhat poorly drained. They occur on the low-lying plain in Conneaut Township in the southwestern part of the county. The soils occur on convex knolls and sidehills. Internal drainage is more favorable than that of soils in lower positions.

The parent material of these soils consisted of medium-textured glacial till containing a few rounded particles of gravel or shale. A layer of heavy silt loam that is slowly permeable to air and water begins at depths ranging from 18 to 28 inches. Free lime occurs at depths below 6 feet.

These soils are in the same catena as the somewhat poorly drained to poorly drained Trumbull soils and the very poorly drained Miner soils.

The native vegetation consisted of forests of beech, maple, and tulip-poplar. Red maple, ash, elm, aspen, sumac, hemlock, and goldenrod now grow in idle areas. Areas that have never been cultivated contain mounds, or cradle knolls, 3 to 6 feet in diameter and 1 to 3 feet high. The cradle knolls are covered with moss and ferns.

Typical profile of a moderately eroded Mahoning silt loam (cultivated):

0 to 7 inches, dark grayish-brown silt loam; moderate, fine, granular structure; friable when moist; pH 5.4; abrupt, smooth lower boundary.

7 to 11 inches, yellowish-brown, heavy silt loam; moderate, medium, granular structure; friable when moist, slightly sticky when wet; pH 5.8; diffuse, wavy lower boundary.

11 to 20 inches, dark yellowish-brown, heavy silt loam; moderate, medium, subangular blocky structure; friable when moist, sticky when wet; pH 5.6; clear, smooth lower boundary.
20 to 28 inches, dark yellowish-brown, heavy silt loam with common, coarse, distinct mottles of strong brown; soil particles prominently coated with gray silt; strong, coarse, blocky structure; hard when dry, firm when moist, and plastic when wet; pH 5.2; gradual, wavy lower boundary.
28 to 42 inches, dark grayish-brown loam with many, fine, distinct mottles of strong brown; massive (structureless); hard when dry, firm when moist, and slightly sticky when wet; pH 6.0; abrupt, wavy lower boundary.
42 to 72 inches+, gray, thinly laminated acid shale.

Mahoning silt loam, 3 to 8 percent slopes (MbB).—The profile of this soil resembles the profile described for the series, but the surface layer is 9 inches thick. There is a thin layer of organic matter on the surface. The boundary between this layer and the underlying mineral soil is clear and smooth.

The areas are small, and the soil has convex slopes, most of which are less than 100 feet long. Surface drainage is good, and internal drainage is moderately good to somewhat poor. Cradle knolls are common.

This soil is suited to corn, small grains, grasses, and legumes. Choose hay and pasture mixtures that tolerate moderately good to somewhat poor internal drainage. Plant clean-cultivated crops in contour strips; use a long rotation in which a sod crop covers the soil at least half the time. Divert surface water into suitable waterways.

Because of the limitations of internal drainage and the risk of erosion, this soil is in capability unit IIIwe–1.

Mahoning silt loam, 3 to 8 percent slopes, moderately eroded (MbB2).—The profile of this soil is the same as the profile described for the series. Much of this soil was once on cradle knolls, but, as the result of cultivation, the cradle knolls have been removed and the soil contains less organic matter than formerly.

This soil is suited to corn, small grains, grasses, and legumes. Choose hay and pasture mixtures that tolerate moderately good to somewhat poor internal drainage. Plant clean-cultivated crops in contour strips; use a long rotation in which a sod crop covers the soil at least half the time. Divert surface water into suitable waterways.

Because of the limitations of somewhat restricted internal drainage and the effects of erosion, this soil is in capability unit IIIwe–1.

Mahoning silt loam, 8 to 15 percent slopes (MbC).—The profile of this soil resembles the profile described for the series, but the surface layer is 9 inches thick. There is a thin layer of organic matter on the surface. The boundary between this layer and the underlying mineral soil is clear and smooth.

This soil has convex slopes, most of which are less than 200 feet long. Surface drainage is good, and internal drainage is moderately good. Cradle knolls are common.

This soil is suited to corn, small grains, grasses, and legumes. Choose hay and pasture mixtures that tolerate moderate internal drainage. Plant clean-cultivated crops in contour strips; use a long rotation in which a sod crop covers the soil at least half the time. Divert surface water into suitable waterways.

Because of the risk of erosion and the limitations caused by the somewhat restricted internal drainage, this soil is in capability unit IIIew–3.

Mahoning silt loam, 8 to 15 percent slopes, moderately eroded (MbC2).—The profile of this soil resembles the profile described for the series. As the result of cultivation, the cradle knolls have been removed and the soil contains less organic matter than formerly.

This soil is suited to corn, small grains, grasses, and legumes. Choose hay and pasture mixtures that tolerate moderately good to somewhat poor internal drainage. Plant clean-cultivated crops in contour strips; use a long rotation in which a sod crop covers the soil at least half the time. Divert surface water into suitable waterways.

Because of the somewhat restricted internal drainage and the effects of erosion, this soil is in capability unit IIIew–3.

Mahoning silt loam, 8 to 15 percent slopes, severely eroded (MbC3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is less than 5 inches thick. Also, the soil contains less organic matter, and, where it has been cultivated, part of the yellowish-brown subsoil has been mixed with the surface soil. This soil is somewhat poorly drained.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate somewhat poor internal drainage. Divert surface water into suitable waterways.

Because of the effects of erosion and the restricted internal drainage, this soil is in capability unit IVew–3.

Manlius Series

The Manlius series consists of shallow, droughty, acid soils of the upland. These soils are well drained and occur on moderately sloping ridgetops and on the very steep sides of valleys. The parent material was derived from shallow glacial till containing gray, acid shale. Partly weathered shale or sandstone occurs at depths of 10 to 26 inches.

These soils are in the same catena as the poorly drained Allis and Ellery soils and the very poorly drained Alden soils.

The native vegetation was a chestnut-red oak type of forest. Wild cherry, beech, sumac, and broomsedge now grow in idle areas.

In Erie County the Manlius soils are mapped only in undifferentiated soil groups with the Lordstown soils. The Manlius soils make up 75 percent of the total acreage of these mapping units, and the Lordstown soils make up 25 percent.

Typical profile of Manlius silt loam:

0 to 7 inches, light-brown silt loam; weak, fine, granular structure; friable when moist; pH 5.4; gradual, smooth lower boundary.
7 to 16 inches, yellowish-brown, shaly silt loam; weak, fine, granular structure; friable when moist; pH 5.0; gradual, smooth lower boundary.
16 to 24 inches, light yellowish-brown silt loam; very weak, fine, granular structure; friable when moist; pH 5.0; diffuse, irregular lower boundary.
24 to 28 inches+, gray, acid, thin-bedded shale formed from silty shale of the Devonian age.

In a few areas along Elk Creek, this soil has formed from calcareous shale. The soil layers are similar in thickness, texture, and color to those of the profile just described. The structure of the soil, however, is strong, moderate to coarse, granular to blocky. The pH ranges

from neutral in the surface layer to alkaline below depths of 7 to 16 inches.

Manlius and Lordstown soils, shallow, 8 to 25 percent slopes (McC).—The profile of the Manlius soil in this undifferentitated soil group is the same as the profile described for the Manlius series. The Lordstown soil is like the Manlius soil, but it contains more fragments of sandstone throughout. Also, below a depth of about 24 inches, the Lordstown soil is made up of sandstone and of relatively coarse grained shale.

These soils have uniform slopes, most of which are less than 300 feet long. Surface drainage is good to excessive.

The areas are suited to grasses and legumes. Choose hay and pasture mixtures that tolerate droughty soils. Divert surface water into suitable waterways.

Because of droughtiness, this mapping unit is in capability unit IVs–1.

Manlius and Lordstown soils, shallow, 25 to 80 percent slopes (McE).—The profiles of these soils resemble the profiles of the less strongly sloping Manlius and Lordstown soils. Partly weathered shale is closer to the surface, however, or at depths of 10 to 18 inches. The soils have uniform slopes, most of which are more than 300 feet long. Surface drainage is excessive.

These soils can be used for trees. Because of the risk of erosion, this mapping unit is in capability unit VIIe–4.

Mardin Series

The Mardin soils are deep and moderately well drained. They occupy upland positions and have more favorable internal drainage than soils in lower areas. Consequently, these soils are valuable for agriculture.

The parent material was glacial till consisting of material weathered from acid shale bedrock mixed with sediments of sandstone and granite. The till has weathered considerably and is leached of lime. A slowly permeable, firm to hard layer begins at depths ranging from 20 to 36 inches. The soils have a well-developed pattern of drainageways.

These soils are in the same catena as the well-drained Wooster soils, the somewhat poorly drained to poorly drained Volusia soils, and the very poorly drained Alden soils.

The native vegetation was a sugar maple-birch-beech-maple type of forest. Wild cherry, red maple, aspen, wild crabapple, blackberry, and povertygrass now grow in idle areas.

Typical profile of a Mardin gravelly silt loam:

0 to 8 inches, brown to dark-brown gravelly silt loam; moderate, fine, granular structure; friable when moist; pH 5.4; abrupt, smooth lower boundary.

8 to 18 inches, yellowish-brown gravelly silt loam; moderate, medium, subangular blocky structure; friable when moist; pH 5.6; clear, wavy lower boundary.

18 to 24 inches, dark yellowish-brown gravelly loam with common, medium, distinct mottles of yellowish brown; strong, coarse, subangular blocky structure; friable when moist, nonplastic when wet; pH 5.0; gradual, wavy lower boundary.

24 to 30 inches, dark-brown gravelly loam with common, coarse, distinct mottles of dark yellowish brown and gray, and many stains of iron and manganese; strong, very coarse, subangular blocky structure; very hard when dry; pH 5.2; gradual, wavy lower boundary.

30 to 38 inches+, dark yellowish-brown to olive-brown flaggy loam; weak, coarse, subangular blocky structure; friable when moist, nonplastic when wet; pH 5.2.

Mardin gravelly silt loam, 3 to 8 percent slopes (MdB).— The profile of this soil is the same as the profile described for the series. This soil has uniform slopes, most of which are less than 200 feet long. Surface drainage is good, and internal drainage is moderate.

This soil is suited to corn, small grains, grasses, and legumes. Where the climate is favorable, the soil is also suitable for vineyards and orchards. Cultivate on the contour to control erosion.

Because of the risk of erosion and the moderate internal drainage, this soil is in capability unit IIew–1.

Mardin gravelly silt loam, 3 to 8 percent slopes, severely eroded (MdB3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is less than 4 inches thick. Also, this soil contains less organic matter and has a shallower root zone. Where the soil has been cultivated, part of the yellowish-brown subsoil has been mixed with the surface soil.

This soil is suited to corn, small grains, grasses, and legumes. Where the climate is favorable, the soil is suitable for vineyards.

Choose hay and pasture mixtures that tolerate somewhat poor internal drainage. Plant clean-cultivated crops in contour strips; use a long rotation in which a sod crop covers the soil at least half the time. Divert surface water into suitable waterways.

Because of the effects of erosion and the restricted internal drainage, this soil is in capability unit IIIew–1.

Mardin gravelly silt loam, 8 to 15 percent slopes (MdC).—The profile of this soil resembles the profile described for the series, but the surface layer is only 7 inches thick. This soil has uniform slopes, most of which are more than 300 feet long. Surface drainage is good, and internal drainage is moderate.

This soil is suited to corn, small grains, grasses, and legumes. Where the climate is favorable, the soil is also suitable for vineyards and orchards.

Plant clean-cultivated crops in contour strips; use a long rotation in which a sod crop covers the soil at least half the time. Divert surface water into suitable waterways.

Because of the risk of erosion and the moderate internal drainage, this soil is in capability unit IIIew–1.

Mardin gravelly silt loam, 8 to 15 percent slopes, severely eroded (MdC3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is less than 4 inches thick. Also, this soil contains less organic matter and has a shallower root zone. Where the soil has been cultivated, part of the yellowish-brown subsoil has been mixed with the surface soil.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate somewhat poor drainage. Divert surface water into suitable waterways.

Because of the effects of erosion and the restricted internal drainage, this soil is in capability unit IVew–2.

Mardin gravelly silt loam, 15 to 25 percent slopes (MdD).—The profile of this soil resembles the profile described for the series, but the surface layer is less than 6 inches thick. This soil has uniform slopes, most of which

are more than 300 feet long. Surface drainage is good to excessive, and internal drainage is moderate.

This soil is best suited to grasses and legumes. Choose hay and pasture mixtures that tolerate moderate internal drainage.

Because of the risk of erosion and the moderate internal drainage, this soil is in capability unit IVew–2.

Mardin gravelly silt loam, 15 to 25 percent slopes, severely eroded (MdD3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is less than 4 inches thick. Also, this soil contains less organic matter and has a shallower root zone. Where the soil has been cultivated, part of the yellowish-brown subsoil has been mixed with the surface layer.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate somewhat poor internal drainage. Divert surface water into suitable waterways.

Because of the effects of erosion and the restricted internal drainage, this soil is in capability unit VIew–1.

Mardin and Volusia Soils

About 75 percent of the acreage of these undifferentiated soil groups consists of moderately well drained Mardin soils, and about 25 percent, of somewhat poorly drained Volusia soils. These soils are on the steep lower slopes along the sides of stream valleys. Most of the slopes are more than 500 feet long; they are fairly uniform but become steeper on the lower parts. The Volusia soils occur on narrow benches and seepage spots in which ground water is close to the surface.

Mardin and Volusia gravelly silt loams, 25 to 45 percent slopes (MeE).—The profiles of these soils resemble the profiles described under the Mardin and the Volusia series. Because of the movement of soil down the steep slopes, however, the surface layers are not so thick and the different soil layers are not so distinct.

These soils have good to excessive surface drainage. Internal drainage ranges from moderately good to somewhat poor. On the steep slopes adjacent to streams, weathered shale is at shallow depths.

These soils are suited to permanent grasses and legumes. Choose pasture mixtures that tolerate moderately good to somewhat poor internal drainage.

Because of the risk of erosion, this mapping unit is in capability unit VIIe–5.

Mardin and Volusia gravelly silt loams, 25 to 45 percent slopes, severely eroded (MeE3).—The profiles of these soils are like those described for the Mardin and the Volusia series except for differences caused by erosion. More than three-fourths of the original surface layer has eroded away; consequently, the soil contains less organic matter than formerly. Also, the root zone is shallower; internal drainage is somewhat poor to poor.

These soils can be used for trees. Because of the effects of erosion, this mapping unit is in capability unit VIIe–4.

Miner Series

The Miner series is made up of deep, very poorly drained soils that are on the low-lying plain in Conneaut Township. The soils occur on flats and in depressions where the water table is high.

The parent material consisted of silty glacial till that contained a few round particles of gravel or shale. A firm layer of silty clay or clay loam that is slowly permeable to air and water begins at depths of 4 to 6 inches. Free lime occurs at depths below 15 inches.

These soils are in the same catena as the moderately well drained to somewhat poorly drained Mahoning soils and the poorly drained Trumbull soils.

The native vegetation was a white ash or black ash-red maple type of forest. Aspen, willow, elderberry, goldenrod, deerstongue, woodreedgrass, and sedges now grow in idle areas.

In Erie County only one soil of the Miner series, Miner silt loam, 0 to 3 percent slopes, has been mapped.

Typical profile of Miner silt loam, 0 to 3 percent slopes:

0 to 5 inches, very dark gray silt loam; strong, medium, granular structure; friable when moist, slightly plastic when wet; pH 6.0; clear, smooth lower boundary.

5 to 8 inches, very dark brown silty clay loam; strong, medium, blocky structure; firm when moist, plastic when wet; pH 6.5; clear, smooth lower boundary.

8 to 14 inches, dark-gray clay loam; strong, medium, subangular blocky structure; firm when moist, very plastic when wet; pH 7.0; gradual, smooth lower boundary.

14 to 18 inches, light brownish-gray silty clay loam with a strong-brown coating on the soil particles; strong, medium, subangular blocky structure; firm when moist, plastic when wet; slight effervescence with dilute hydrochloric acid; gradual, smooth lower boundary.

18 to 24 inches, grayish-brown clay loam with a brown coating on the soil particles; strong, medium, platy structure; firm when moist, plastic when wet; strong effervescence with dilute hydrochloric acid; clear, smooth lower boundary.

24 to 36 inches, strong-brown loam with a gray coating on the soil particles; strong, thin, platy structure; firm when moist, nonplastic when wet; effervesces with dilute hydrochloric acid.

Miner silt loam, 0 to 3 percent slopes (MfA).—The profile of this soil is the same as the one described for the series. The soil is level to nearly level and has very poor surface and internal drainage. During wet seasons shallow water remains in depressions for periods of several days.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate very poor drainage. Divert surface water from adjoining higher areas into suitable waterways.

Because of restricted drainage, this soil is in capability unit IVw–1.

Muck and Peat

Muck and Peat (Mp).—These deep, very poorly drained organic soils occur in depressions. They are inextensive in Erie County. The areas are not flooded by streams, but the water table is near the surface.

These organic soils consist of a very dark gray to black mass of partly decomposed plants that are saturated with ground water. This material has no texture or structure. The organic material in the peat has not decomposed so much as that of the muck, and the kind of plant from which the peat originated can usually be identified.

Free lime, in the form of concretions, occurs within the organic matter and at the boundary between the organic matter and the underlying mineral soil. The depth to the mineral soil ranges from 1½ to 40 feet.

The native vegetation consisted of alders, sedges, mosses, and other swamp vegetation.

If the level of the water table is lowered through artificial drainage, these organic soils can be used to grow vegetables. Some of the organic material is dug up, dried, and sold for use as a soil conditioner.

Because of the very severe limitation of drainage, this mapping unit is in capability unit IVw–2.

Ottawa Series

The Ottawa soils are deep and well drained. They are acid and sandy but are among the best soils of the lake plain for growing fruits and early maturing vegetables. Nevertheless, unless the supply of organic matter is maintained, plant nutrients leach rapidly out of these sandy soils.

The parent material of these soils consisted of acid, lacustrine sands that were sorted and deposited by water. Gray, calcareous material occurs at depths of 4 feet or more. This material, locally called quicksand, is slowly permeable to air and water. It flows when saturated with water.

These soils are in the same catena as the moderately well drained Berrien soils, the somewhat poorly drained to poorly drained Rimer soils, and the very poorly drained Wauseon soils.

The native vegetation was a chestnut-oak-white pine type of forest. Sycamore, locust, sumac, wildgrape, aspen, little bluestem, broomsedge, povertygrass, cinquefoil, and sheep sorrel now grow in idle areas.

In Erie County two soil types—loamy fine sand and fine sandy loam—have been mapped in the Ottawa series.

Typical profile of an Ottawa loamy fine sand (cultivated):

0 to 7 inches, very dark yellowish-brown loamy fine sand; weak, fine, granular structure; friable when moist; pH 5.5; abrupt, smooth lower boundary.

7 to 14 inches, yellowish-brown fine sandy loam; weak, medium, subangular blocky structure; friable when moist; pH 5.6; clear, smooth lower boundary.

14 to 24 inches, dark yellowish-brown loamy sand with a reddish-brown coating on the soil particles; strong, coarse, blocky structure; friable when moist; pH 5.8; gradual, wavy lower boundary.

24 to 36 inches, brownish-yellow and dark yellowish-brown loamy sand with a reddish-brown coating on coarse sand grains; weak, thick, platy structure; hard when dry, friable when moist; pH 6.0; gradual, wavy lower boundary.

36 to 52 inches, variegated gray and dark grayish-brown loamy sand; weak, thick, platy structure to single grain (structureless); friable when moist; pH 6.2; abrupt, smooth lower boundary.

52 to 144 inches+, gray silt loam; strong, medium, platy structure to massive (structureless); very firm when moist, plastic when wet; pH 7.0 at a depth of 54 inches; violent effervescence with dilute hydrochloric acid at a depth of 72 inches.

In forested areas the surface is covered with leaf litter from mixed hardwoods. In these areas there is a layer of leaf mold about one-half inch thick, and the boundary between it and the mineral soil is clear and smooth.

In general, the depth to the gray, calcareous quicksand ranges from 4 to 8 feet. But in an area in the northwestern corner of the city of Erie, the quicksand, where present, occurs at depths of 15 feet or more. As a result, the soil in this area is especially droughty. This area covers about 100 acres.

Ottawa loamy fine sand, 0 to 2 percent slopes (ObA).—The profile of this soil is the same as the profile described for the series. Water infiltrates into the soil rapidly, and internal drainage is excessive.

This soil is suited to orchards, vineyards, and early maturing vegetables. Unless irrigated, it is too droughty for high yields of small grains and permanent pasture.

This soil needs careful management. Maintain good tilth by adding organic matter often; plow only when the soil contains plenty of moisture and after the danger of freezing has passed in spring.

Because of droughtiness, this soil is in capability unit IIIs–1.

Ottawa loamy fine sand, 2 to 8 percent slopes (ObB).—The profile of this soil resembles the profile described for the series, but the surface layer is only 6 inches thick. Water infiltrates into the soil rapidly, and internal drainage is excessive.

This soil is suited to orchards, vineyards, and early maturing vegetables. It is too droughty for high yields of small grains and permanent pasture.

This soil needs careful management. Maintain good tilth by adding organic matter often; plow only when the soil contains plenty of moisture and after the danger of freezing has passed in spring. Cultivate on the contour to control erosion and to help improve the water-holding capacity.

Because of droughtiness, this soil is in capability unit IIIs–1.

Ottawa loamy fine sand, 2 to 8 percent slopes, severely eroded (ObB3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is less than 5 inches thick. The soil also contains less organic matter; where it has been cultivated, part of the yellowish-brown subsoil has been mixed with the surface soil.

This soil is suited to orchards, vineyards, and early maturing vegetables. It is too droughty for high yields of small grains and permanent pasture.

This soil needs careful management. Maintain good tilth by adding organic matter often; plow only when the soil contains plenty of moisture and after the danger of freezing has passed in spring. Use contour stripcropping to control erosion and to help improve the water-holding capacity.

Because of droughtiness, this soil is in capability unit IIIs–1.

Ottawa loamy fine sand, 8 to 15 percent slopes (ObC).—The profile of this soil resembles the profile described for the series, but the surface layer is only 6 inches thick. The soil has uniform slopes, most of which are less than 300 feet long. Surface and internal drainage are excessive.

This soil is suited to orchards, vineyards, and early maturing vegetables. It is too droughty for high yields of small grains and permanent pasture.

This soil needs careful management. Maintain good tilth by adding organic matter often; plow only when the soil contains plenty of moisture and after the danger of freezing has passed in spring. Cultivate on the contour

to control erosion and to help improve the water-holding capacity.

Because of droughtiness, this soil is in capability unit IIIs–1.

Ottawa loamy fine sand, 8 to 15 percent slopes, severely eroded (ObC3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is less than 4 inches thick. Also, the soil contains less organic matter; where it has been cultivated, part of the yellowish-brown subsoil has been mixed with the surface soil.

This soil is suited to grasses and legumes. It is too droughty for high yields of permanent pasture. Choose hay and pasture mixtures that will grow on a droughty soil.

Because of droughtiness, this soil is in capability unit VIs–1.

Ottawa loamy fine sand, 15 to 25 percent slopes (ObD).—The profile of this soil resembles the profile described for the series, but the surface layer is only 5 inches thick. The soil has uniform slopes, most of which are less than 200 feet long. Surface and internal drainage are excessive.

This soil is suited to grasses and legumes. It is too droughty for high yields of permanent pasture. Choose hay mixtures that will grow on a droughty soil.

Because of droughtiness, this soil is in capability unit VIs–1.

Ottawa loamy fine sand, 15 to 25 percent slopes, severely eroded (ObD3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is less than 4 inches thick. Also, the soil contains less organic matter; where it has been cultivated, part of the yellowish-brown subsoil has been mixed with the surface soil.

This soil is suited to grasses and legumes. It is too droughty for high yields of permanent pasture. Choose hay mixtures that will grow on a droughty soil.

Because of droughtiness, this soil is in capability unit VIs–1.

Ottawa fine sandy loam, 0 to 2 percent slopes (OaA).—The profile of this soil resembles the profile described for the series. This soil, however, has a surface layer of fine sandy loam that contains more silt; as a result, the soil is not so droughty. Water infiltrates into the soil rapidly and does not remain on the surface. Internal drainage is rapid.

This soil is suited to orchards, vineyards, and early maturing vegetables. It is too droughty for high yields of small grains and permanent pasture.

This soil needs careful management. Maintain good tilth by adding organic matter often; plow only when the soil contains plenty of moisture and after the danger of freezing has passed in spring.

Because of droughtiness, this soil is in capability unit IIIs–1.

Ottawa fine sandy loam, 2 to 8 percent slopes (OaB).—The profile of this soil resembles the profile described for the series. The surface layer, however, consists of fine sandy loam and is only 6 inches thick. In addition, because the surface layer contains more silt, the soil is slightly less droughty. The soil has uniform slopes. Surface and internal drainage are rapid.

This soil is suited to orchards, vineyards, and early maturing vegetables. It is too droughty for high yields of small grains and permanent pasture.

This soil needs careful management. Maintain good tilth by adding organic matter often; plow only when the soil contains plenty of moisture and after the danger of freezing has passed in spring.

Because of droughtiness and the risk of erosion, this soil is in capability unit IIIs–1.

Ottawa fine sandy loam, 2 to 8 percent slopes, severely eroded (OaB3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is only 5 inches thick. It consists of fine sandy loam instead of loamy fine sand. This soil contains less organic matter than the uneroded soil; where it has been cultivated, part of the yellowish-brown subsoil has been mixed with the surface soil.

This soil is suited to orchards, vineyards, and early maturing vegetables. It is too droughty for high yields of small grains and permanent pasture.

This soil needs careful management. Maintain good tilth by adding organic matter often; plow only when the soil contains plenty of moisture and after the danger of freezing has passed in spring. Use contour stripcropping to control erosion and to make the soil less droughty.

Because of the effects of erosion and droughtiness, this soil is in capability unit IIIs–1.

Ottawa fine sandy loam, 8 to 15 percent slopes (OaC).—The profile of this soil resembles the profile described for the series. The surface layer, however, consists of fine sandy loam and is only 6 inches thick. In addition, because the surface layer contains more silt, the soil is slightly less droughty. This soil has uniform slopes, most of which are less than 300 feet long. Surface and internal drainage are rapid.

The soil is suited to orchards, vineyards, and early maturing vegetables. It is too droughty for high yields of small grains and permanent pasture.

This soil needs careful management. Maintain good tilth by adding organic matter often; plow only when the soil contains plenty of moisture and after the danger of freezing has passed in spring.

Because of droughtiness and the risk of erosion, this soil is in capability unit IIIs–1.

Ottawa fine sandy loam, 8 to 15 percent slopes, severely eroded (OaC3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is only 4 inches thick. Its texture is fine sandy loam instead of loamy fine sand. This soil contains less organic matter than the uneroded soil. Where it has been cultivated, part of the yellowish-brown subsoil has been mixed with the surface soil.

This soil is suited to grasses and legumes. It is too droughty for high yields of permanent pasture. Choose hay mixtures that will grow on a droughty soil.

Because of droughtiness and the effects of erosion, this soil is in capability unit VIs–1.

Ottawa fine sandy loam, 15 to 25 percent slopes (OaD).—The profile of this soil resembles the profile described for the series, but the surface layer consists of fine sandy loam and is only 5 inches thick. The soil has uniform slopes, most of which are less than 200 feet long. Surface and internal drainage are rapid.

This soil is suited to grasses and legumes. It is too droughty for high yields of permanent pasture. Choose hay mixtures that will grow on a droughty soil.

Because of droughtiness and the risk of erosion, this soil is in capability unit VIs–1.

Ottawa fine sandy loam, 15 to 25 percent slopes, severely eroded (OaD3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is less than 4 inches thick. Its texture is fine sandy loam instead of loamy fine sand. This soil contains less organic matter than the uneroded soil. Where it has been cultivated, part of the yellowish-brown subsoil has been mixed with the surface soil.

This soil is suited to grasses and legumes. It is too droughty for high yields of permanent pasture. Choose hay mixtures that will grow on a droughty soil.

Because of droughtiness and the effects of erosion, this soil is in capability unit VIs–1.

Phelps Series

The Phelps soils are deep and are moderately well drained. They have formed on gravelly outwash terraces along the stream valleys in the upland.

The parent material was sorted and deposited by melt water as the glacier retreated. It was laid down in alternate layers of sand and gravel that contained some silt and clay. This material was derived from sandstone and limestone of glacial origin and from acid shale bedrock.

A firm layer that is slowly permeable to air and water begins at depths of 18 to 30 inches. In most places a hard, porous, lime-cemented horizon is at depths of 4 to 8 feet.

These soils are in the same catena as the well-drained Howard soils, the somewhat poorly drained to poorly drained Fredon soils, and the very poorly drained Halsey soils.

The native vegetation was a sugar maple-white pine-hemlock type of forest. Sugar maple, red maple, wild crabapple, sumac, blackberry, orchardgrass, and Canada bluegrass now grow in idle areas.

Typical profile of a Phelps gravelly silt loam (cultivated):

0 to 7 inches, dark reddish-brown gravelly silt loam; moderate, fine to medium, granular structure; friable when moist; pH 5.8; abrupt, smooth lower boundary.

7 to 10 inches, dark reddish-brown gravelly silt loam; moderate, coarse, granular structure; friable when moist; pH 6.0; gradual, wavy lower boundary.

10 to 18 inches, dark-brown gravelly silt loam; moderate, medium, subangular blocky structure; friable when moist; pH 5.8; diffuse, wavy lower boundary.

18 to 28 inches, dark yellowish-brown gravelly silt loam with common, medium, distinct coatings of grayish brown on the soil particles; strong, coarse, subangular blocky structure; firm when moist, nonsticky when wet; pH 5.8; clear, wavy lower boundary.

28 to 40 inches, brown to dark-brown fine gravelly loam with common, medium, distinct coatings of dark reddish brown on the soil particles; massive to single grain (structureless); very hard when dry, nonsticky when wet; pH 5.6; distinct, wavy lower boundary.

40 to 48 inches, dark-brown and dark reddish-brown gravelly loam with some areas of yellowish-brown silt and clay; massive to single grain (structureless); friable when moist; pH 5.8; clear, wavy lower boundary.

48 to 72 inches+, dark reddish-brown, stratified gravelly sandy loam; single grain (structureless); loose when moist; pH 6.2 at a depth of 50 inches; effervesces with dilute hydrochloric acid at a depth of 72 inches.

In areas of these soils along the boundary between the glacial till of the upland and gravelly outwash material of the valleys, the parent material is glacial till covered with gravelly outwash to depths of 18 to 28 inches.

Phelps gravelly silt loam, 0 to 3 percent slopes (PaA).—The profile of this soil resembles the profile described for the series, but the surface layer is thicker, extending to a depth of 9 inches. This soil is level to nearly level. Surface and internal drainage are moderate. Shallow water remains in the depressions during wet seasons.

This soil is suited to late-maturing vegetables and to corn, small grains, grasses, and legumes. Choose hay and pasture mixtures that tolerate moderate surface and internal drainage. Keep the natural drainageways open.

Because of the moderate internal drainage, this soil is in capability unit IIw–1.

Phelps gravelly silt loam, 3 to 8 percent slopes (PaB).—The profile of this soil is the same as the profile described for the series. The soil has gentle slopes and occurs in a complex pattern of depressions and knolls. Shallow water remains in the depressions during the wet season. Internal drainage is moderate.

This soil is suited to late-maturing vegetables and to corn, small grains, grasses, and legumes. Choose hay and pasture mixtures that tolerate moderate surface and internal drainage. Keep the natural drainageways open. Divert surface water into suitable drainageways.

Because of the risk of erosion and the moderate internal drainage, this soil is in capability unit IIew–1.

Phelps gravelly silt loam, 3 to 8 percent slopes, severely eroded (PaB3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is only 5 inches thick. Also, the soil contains less organic matter and is shallower over the slowly permeable layer. Where this soil has been cultivated, part of the subsoil has been mixed with the surface soil.

This soil is suited to late-maturing vegetables and to corn, small grains, grasses, and legumes. Choose hay and pasture mixtures that tolerate moderate internal drainage. Use a long rotation in which a sod crop covers the soil at least half the time. Divert surface water into suitable drainageways.

Because of the effects of erosion and the moderate internal drainage, this soil is in capability unit IIIew–1.

Phelps gravelly silt loam, 8 to 15 percent slopes (PaC).—The profile of this soil resembles the profile described for the series. This soil has irregular slopes, most of which are less than 100 feet long. Surface drainage is good, and internal drainage is moderate.

This soil is suited to late-maturing vegetables and to corn, small grains, grasses, and legumes. Choose hay and pasture mixtures that tolerate moderate internal drainage. Use a long rotation in which a sod crop covers the soil at least half the time. Divert surface water into suitable waterways.

Because of the risk of erosion and the moderate internal drainage, this soil is in capability unit IIIew–1.

Phelps gravelly silt loam, 8 to 15 percent slopes, severely eroded (PaC3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is only 5 inches thick. Also, the soil contains less organic matter and is shallower over the slowly per-

meable layer. Where the soil has been cultivated, part of the subsoil has been mixed with the surface soil.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate moderate internal drainage.

Because of the effects of erosion and the moderate internal drainage, this soil is in capability unit IVew–2.

Platea Series

The Platea series consists of deep, somewhat poorly drained soils on the upland. The parent material was silty glacial till containing a few rounded pebbles of granite and sandstone. Moderately well drained variants of the Platea series occupy sites having favorable internal drainage.

A firm layer (fragipan) that is slowly permeable to air and water begins at depths of 12 to 26 inches. Stratified clay, silt, and fine sand occur at depths below 48 inches. An unleached layer containing free lime begins at depths between 42 and 84 inches.

The Platea soils are in the same catena as the very poorly drained Birdsall soils.

The native vegetation consisted of a beech-maple-oak type of forest. Aspen, goldenrod, blackberry, cinquefoil, sheep sorrel, broomsedge, velvetgrass, and povertygrass now grow in idle areas.

Typical profile of a Platea silt loam (cultivated):

0 to 8 inches, dark-brown silt loam; weak, fine, granular structure; friable when moist; pH 4.8; clear, wavy lower boundary.

8 to 15 inches, brown silt loam with common, medium, distinct mottles of light brownish gray and strong brown; compound structure—weak, medium, platy and weak, medium, subangular blocky; friable when moist, nonplastic when wet; pH 4.8; clear, wavy lower boundary.

15 to 28 inches, yellowish-brown silt loam with common, medium, distinct mottles of gray and strong brown; moderate, medium, blocky structure; hard when dry, firm when moist, and slightly plastic when wet; pH 5.6; clear, irregular lower boundary.

28 to 38 inches, dark yellowish-brown silt loam with common, coarse, distinct mottles of gray and dark brown; very coarse prisms that break to moderate, medium, blocky or platy structure; thick coating of clay on the structural units; hard when dry, firm when moist, and slightly plastic when wet; pH 5.8; gradual, wavy lower boundary.

38 to 48 inches, dark-brown silt loam with medium, distinct, mottles of gray; very coarse prisms that break to moderate, medium, platy structure; thick coating of clay on the structural units; firm when moist, slightly plastic when wet; pH 5.8; gradual, wavy lower boundary.

48 to 60 inches, dark yellowish-brown silt loam with a few, medium, distinct mottles of gray; very coarse prisms that break to moderate, medium, platy structure; distinct, thin coating of clay on the structural units; firm when moist, slightly plastic when wet; pH 6.8; gradual, wavy lower boundary.

60 to 80 inches, olive-brown silt loam; moderate, thick, platy structure; firm when moist, slightly plastic when wet; pH 7.2.

In undisturbed sites the surface is covered with leaf litter from hardwoods. Under this is a layer, about 1 inch thick, of dark reddish-brown leaf mold (pH 5.2). The boundary between the leaf mold and the underlying dark reddish-brown silt loam is clear and wavy. The silt loam has weak, fine granular structure and is very friable when moist and nonplastic when wet. It has a pH of 5.0.

The depth to stratified clay, silt, and fine sand varies. Typically, the depth to the firm, slowly permeable layer ranges from 12 to 18 inches.

Platea silt loam, 0 to 2 percent slopes (PbA).—The profile of this soil resembles the profile described for the series, but the surface soil is 9 inches thick instead of 8 inches. The soil is level to nearly level. Shallow water remains in depressions during wet seasons. The soil warms up slowly in spring and becomes wet early in fall.

This soil is suited to small grains, grasses, and legumes. Where the climate is favorable, the soil is suitable for vineyards. Corn and cabbage are grown, but often they cannot be harvested because the fields are wet.

This soil needs careful management. Choose hay and pasture mixtures that tolerate poor surface drainage and somewhat poor internal drainage. Replenish the supply of organic matter often. Maintain favorable tilth by cultivating only when the soil contains the proper amount of moisture. If tilth is good, crops can make the best use of the shallow root zone. Keep the natural drainageways open. Divert surface water from the adjoining higher areas into suitable waterways.

Because of restricted drainage, this soil is in capability unit IIIw–1.

Platea silt loam, 2 to 8 percent slopes (PbB).—The profile of this soil is the same as the profile described for the series. This soil has uniform slopes that are as much as 1,000 feet long. Surface drainage is moderate, and internal drainage is somewhat poor.

This soil is suited to corn, small grains, grasses, and legumes. Where the climate is favorable, the soil is suitable for vineyards.

The soil needs careful management. Choose hay and pasture mixtures that tolerate restricted drainage. Replenish the supply of organic matter often. Maintain favorable tilth by cultivating only when the soil contains the proper amount of moisture. If tilth is good, crops can make the best use of the shallow root zone. Keep the natural drainageways open. Divert surface water into suitable waterways.

Because of the somewhat poor internal drainage and the risk of erosion, this soil is in capability unit IIIwe–2.

Platea silt loam, 2 to 8 percent slopes, severely eroded (PbB3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is only 4 or 5 inches thick. Also, the soil contains less organic matter, is more poorly drained, and is shallower over the fragipan. Where the soil has been cultivated, part of the yellowish-brown subsoil has been mixed with the surface soil.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate poor to somewhat poor internal drainage. Keep the natural drainageways open. Divert surface water into suitable waterways.

Because of the effects of erosion and the restricted internal drainage, this soil is in capability unit VIew–1.

Platea silt loam, 8 to 15 percent slopes (PbC).—The profile of this soil resembles the profile described for the series, but the surface layer is only 7 inches thick. Because the slopes are uniform, this soil has good surface drainage. Internal drainage is somewhat poor.

This soil is suited to small grains, grasses, and legumes. Where the climate is favorable, it is also suitable for vine-

yards. Corn can be grown in a long rotation in which a sod crop covers the soil at least half the time.

This soil needs careful management. Choose hay and pasture mixtures that tolerate somewhat poor internal drainage. Replenish the supply of organic matter often. Maintain favorable tilth by cultivating only when the soil contains the proper amount of moisture. If tilth is good, crops can make the best use of the shallow root zone. Divert surface water into suitable waterways.

Because of the restricted internal drainage and the risk of erosion, this soil is in capability unit IIIwe–2.

Platea silt loam, 8 to 15 percent slopes, severely eroded (PbC3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is only 4 or 5 inches thick. Also, the soil contains less organic matter, is more poorly drained, and is shallower over the fragipan. Where this soil has been cultivated, part of the yellowish-brown subsoil has been mixed with the surface soil.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate poor internal drainage. Divert surface water into suitable waterways.

Because of the effects of erosion and the restricted internal drainage, this soil is in capability unit VIew–1.

Platea silt loam, 15 to 25 percent slopes (PbD).—The profile of this soil resembles the profile described for the series, but the surface layer is only 6 inches thick. This soil has uniform slopes that are as much as 500 feet long. Surface drainage is good to excessive, and internal drainage is somewhat poor.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate somewhat poor internal drainage. Divert surface water into suitable waterways.

Because of the risk of erosion and the restricted internal drainage, this soil is in capability unit IVew–3.

Platea silt loam, 15 to 25 percent slopes, severely eroded (PbD3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is only 4 or 5 inches thick. Also, the soil contains less organic matter, is more poorly drained, and is shallower over the fragipan. Where this soil has been cultivated, part of the yellowish-brown subsoil has been mixed with the surface soil.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate poor internal drainage. Divert surface water into suitable waterways.

Because of the effects of erosion and the restricted internal drainage, this soil is in capability unit VIew–1.

Platea Moderately Well Drained Variants

The Platea variants differ from the other Platea soils in being moderately well drained instead of somewhat poorly drained. They occupy the more favorably drained positions on the upland. As a result, these soils are warm earlier in spring and become wet later in fall than the other Platea silt loams. In other respects, the Platea variants are similar to the other soils of the Platea series.

Typical profile of Platea silt loam, moderately well drained variant (cultivated):

0 to 7 inches, dark-brown silt loam; weak, fine, granular structure; friable when moist; pH 5.8; abrupt, smooth lower boundary.

7 to 15 inches, brown silt loam; compound structure—weak, thin, platy and weak, medium, subangular blocky; friable when moist, nonplastic when wet; pH 4.8; clear, wavy lower boundary.

15 to 21 inches, yellowish-brown silt loam; compound structure—moderate, medium, platy and moderate, medium to coarse, blocky; friable when moist, nonplastic when wet; pH 5.6; clear, wavy lower boundary.

21 to 30 inches, yellowish-brown silt loam with common, medium, prominent mottles of gray and strong brown; very coarse prisms that break to moderate, coarse, blocky structure; firm when moist, slightly plastic when wet; pH 5.8; clear, irregular lower boundary.

30 to 48 inches, dark yellowish-brown silt loam with common, medium, distinct mottles of gray and dark brown; very coarse prisms that break to moderate, medium, blocky or moderate, thick, platy structure; firm when moist, slightly plastic when wet; pH 5.8.

Platea silt loam, moderately well drained variant, 0 to 2 percent slopes (PcA).—The profile of this soil resembles the profile described for the Platea moderately well drained variants, but the surface soil is thicker, extending to a depth of 9 inches. This soil has favorable internal drainage. Shallow water lies in depressions for short periods during wet seasons.

This soil is suited to late-maturing cabbage and to corn, small grains, grasses, and legumes. Where the climate is favorable, the soil is suitable for vineyards.

Choose hay and pasture mixtures that tolerate poor surface drainage and moderate internal drainage. Keep the natural drainageways open.

Because of somewhat restricted drainage, this soil is in capability unit IIw–1.

Platea silt loam, moderately well drained variant, 2 to 8 percent slopes (PcB).—The profile of this soil is the same as the profile described for the Platea moderately well drained variants. This soil has uniform slopes that are as much as 800 feet long. Surface and internal drainage are moderate.

This soil is suited to late-maturing cabbage and to corn, small grains, grasses, and legumes. Where the climate is favorable, the soil is suitable for vineyards.

Choose hay and pasture mixtures that tolerate moderate drainage. Keep the natural drainageways open. Divert surface water into suitable waterways. Cultivate clean-tilled crops on the contour.

Because of the risk of erosion and the moderate drainage, this soil is in capability unit IIew–3.

Platea silt loam, moderately well drained variant, 2 to 8 percent slopes, severely eroded (PcB3).—The surface layer of this soil is lighter colored than that of the profile described for the Platea moderately well drained variants and is only 4 to 5 inches thick. Also, the soil contains less organic matter and is shallower over the pan layer. Where this soil has been cultivated, part of the brown subsoil has been mixed with the surface soil.

This soil is best suited to grasses and legumes. It can be used for row crops grown in a long rotation.

Choose hay and pasture mixtures that tolerate somewhat poor internal drainage. Keep the natural drainageways open. Divert surface water into suitable waterways. Cultivate clean-tilled crops on the contour.

Because of the effects of erosion and the restricted internal drainage, this soil is in capability unit IVew–3.

Platea silt loam, moderately well drained variant, 8 to 15 percent slopes (PcC).—The profile of this soil re-

sembles the profile described for the Platea moderately well drained variants. This soil has slopes that are as much as 500 feet long. Because the slopes are uniform, surface drainage is good. Internal drainage is moderate.

This soil is suited to late-maturing cabbage and to corn, small grains, grasses, and legumes. Where the climate is favorable, the soil is suitable for vineyards.

Choose hay and pasture mixtures that tolerate moderate internal drainage. Divert surface water into suitable waterways. Cultivate clean-tilled crops on the contour.

Because of the risk of erosion and the moderate internal drainage, this soil is in capability unit IIIew–3.

Platea silt loam, moderately well drained variant, 8 to 15 percent slopes, severely eroded (PcC3).—The surface layer of this soil is lighter colored than that of the profile described for the Platea moderately well drained variants and is only 4 to 5 inches thick. Also, the soil contains less organic matter and is shallower over the pan layer. Where this soil has been cultivated, part of the brown subsoil has been mixed with the surface soil.

This soil is better suited to grasses and legumes than to row crops, but it can be used for row crops grown in a long rotation. Choose hay and pasture mixtures that tolerate somewhat poor internal drainage. Divert surface water into suitable waterways.

Because of the effects of erosion and the restricted internal drainage, this soil is in capabiilty unit IVew–3.

Platea silt loam, moderately well drained variant, 15 to 25 percent slopes (PcD).—The profile of this soil resembles the profile described for the Platea moderately well drained variants, but the surface layer is only 6 inches thick. This soil has slopes that are as much as 500 feet long. Because of the uniform slopes, surface drainage is good to excessive. Internal drainage is moderate.

This soil is better suited to grasses and legumes than to row crops, but it can be used for row crops grown in a long rotation. Choose hay and pasture mixtures that tolerate moderate internal drainage. Divert surface water into suitable waterways.

Because of the risk of erosion and the moderate internal drainage, this soil is in capability unit IVew–2.

Platea silt loam, moderately well drained variant, 15 to 25 percent slopes, severely eroded (PcD3).—The surface layer of this soil is lighter colored than that of the profile described for the Platea moderately well drained variants and is only 4 to 5 inches thick. Also, the soil contains less organic matter and is shallower over the pan layer. Where this soil has been cultivated, part of the brown subsoil has been mixed with the surface soil.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate somewhat poor internal drainage. Divert surface water into suitable waterways.

Because of the effects of erosion and the restricted internal drainage, this soil is in capability unit VIew–1.

Rimer Series

The Rimer series is made up of deep, somewhat poorly drained to poorly drained, sandy soils. The soils are acid, but they are among the most important soils of the lake plain for vineyards and for growing late-maturing vegetables.

The parent material consisted of acid, lacustrine sands that were sorted by water and deposited as lake sediments. A firm layer (fragipan) that is slowly permeable to air and water begins at depths of 12 to 20 inches (fig. 9). Gray, calcareous material, locally called quicksand, occurs at depths of 38 to 60 inches. This material is slowly permeable to air and water; it will flow if it is saturated with water.

Figure 9.—**Profile of a Rimer fine sandy loam. The water table occurs at a depth of about 4 feet.**

These soils are in the same catena as the well drained Ottawa soils, the moderately well drained Berrien soils, and the very poorly drained Wauseon soils.

The native vegetation consisted of a white elm-white ash or black ash-red maple type of forest. Red maple, aspen, white ash, blackgum, goldenrod, and dewberry bushes now grow in idle areas.

Typical profile of a Rimer fine sandy loam (cultivated):

0 to 9 inches, very dark brown to dark brown fine sandy loam with weak, medium, faint mottles of gray; very weak, medium, fine, granular structure; very friable to friable when moist; pH 5.6; abrupt, smooth lower boundary.
9 to 15 inches, yellowish-brown fine sandy loam with common, medium, distinct mottles of grayish brown and strong brown and a few black concretions with dark reddish-brown centers; weak, medium, subangular blocky to platy structure; friable when moist; pH 6.0; abrupt, irregular lower boundary.
15 to 19 inches, strong-brown fine sandy loam with common, coarse, distinct mottles of yellowish brown and yellowish red and streaks and concretions of iron and manganese; weak, coarse, blocky structure; very hard when dry, very firm when moist, and nonplastic when wet; pH 6.2; clear, irregular lower boundary.
19 to 22 inches, dark yellowish-brown to yellowish-brown loamy fine sand with common, medium, distinct mottles of yellowish red; massive (structureless); hard when dry, firm when moist, and nonplastic when wet; pH 6.8; clear, irregular lower boundary.
22 to 32 inches, dark yellowish-brown loamy sand with reddish-brown streaks; single grain (structureless); friable when moist; pH 6.8; clear, irregular lower boundary.
32 to 38 inches, very dark grayish-brown to dark-brown gravelly sand; single grain (structureless); friable when moist; pH 7.2; abrupt, smooth lower boundary with soil material containing some cobblestones and boulders.
38 to 48 inches+, gray silt loam; weak, medium, platy structure; very firm when moist, plastic when wet; effervesces with dilute hydrochloric acid.

Rimer fine sandy loam, 0 to 2 percent slopes (RaA).—The profile of this soil is the same as the profile described for the series. The soil is level to nearly level and has somewhat poor to poor internal drainage. In places it occurs in depressions where shallow water remains during wet seasons.

This soil is suited to late-maturing vegetables and to grasses, legumes, and vineyards. It is too sandy, however, for high yields of permanent pasture. Choose hay mixtures that tolerate poor surface drainage and somewhat poor to poor internal drainage. Keep the natural drainageways open. Divert surface water from adjoining higher areas into suitable waterways.

Because of the restricted drainage, this soil is in capability unit IIIw–2.

Rimer fine sandy loam, 2 to 8 percent slopes (RaB).—The surface layer of this soil is lighter colored than that of the profile described for the series and is only 7 inches thick. This soil has uniform slopes, most of which are less than 300 feet long. Surface drainage is moderate, and internal drainage is somewhat poor to poor.

This soil is suited to late-maturing vegetables and to grasses, legumes, and vineyards. It is too sandy for high yields of permanent pasture. Choose hay mixtures that tolerate moderate surface drainage and somewhat poor to poor internal drainage. Keep the natural drainageways open. Divert surface water into suitable waterways.

Because of the risk of erosion and the restricted drainage, this soil is in capability unit IIIew–4.

Rimer fine sandy loam, 2 to 8 percent slopes, severely eroded (RaB3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is only 5 inches thick. Also, the soil contains less organic matter and is shallower over the fragipan. Where this soil has been cultivated, part of the yellowish-brown subsoil has been mixed with the surface soil.

This soil is suited to grasses and legumes, but it is too sandy for high yields of permanent pasture. Choose hay mixtures that tolerate moderate surface drainage and poor internal drainage. Keep the natural drainageways open. Divert surface water into suitable waterways.

Because of the effects of erosion and the restricted drainage, this soil is in capability unit IIIew–4.

Scio Series

The Scio series consists of deep, moderately well drained soils on stream terraces. The parent material consisted of sediments that washed down from the glaciated upland and were deposited in streams. These sediments were derived from the bedrock of acid shale and from granite, sandstone, and limestone of the glacial till.

These soils have a firm layer (fragipan) that is slowly permeable to air and water. The firm layer begins at depths of 18 to 30 inches.

The Scio soils are in the same catena as the well-drained Unadilla soils, the somewhat poorly drained to poorly drained Fredon soils, and the very poorly drained Halsey soils.

The native vegetation was a beech-maple-tuliptree type of forest. Wild cherry, red oak, red maple, locust, goldenrod, broomsedge, and povertygrass now grow in idle areas.

Typical profile of a Scio silt loam (cultivated):

0 to 6 inches, dark-brown silt loam; moderate, fine, granular structure; friable when moist; pH 4.8; abrupt, smooth lower boundary.
6 to 10 inches, dark yellowish-brown silt loam; moderate, medium, granular structure; friable when moist; pH 5.2; gradual, smooth lower boundary.
10 to 19 inches, yellowish-brown silt loam; moderate, medium, subangular blocky structure; friable when moist; pH 5.2; gradual, smooth lower boundary.
19 to 26 inches, yellowish-brown silt loam with common, coarse, faint mottles of brownish yellow; strong, medium, subangular blocky structure; firm when moist; pH 4.8; gradual, smooth lower boundary.
26 to 30 inches, yellowish-brown silty clay loam with a few, medium, distinct mottles of strong brown; moderate, medium, blocky structure; hard when dry, firm when moist, and sticky when wet; pH 5.0; gradual, smooth lower boundary.
30 to 46 inches, dark yellowish-brown silt loam with a few, fine, distinct mottles of strong brown; weak, medium, blocky structure; firm when moist, slightly sticky when wet; pH 5.2; abrupt, smooth lower boundary.
46 inches+, dark-gray, acid material weathered from shale of the Devonian age.

Scio silt loam, 0 to 3 percent slopes (SaA).—The profile of this soil resembles the profile described for the series, but the surface soil is 7 inches thick instead of 6. The soil is level to nearly level and has moderate internal drainage. In places it occurs in depressions where shallow water remains during wet seasons.

This soil is suited to late-maturing vegetables and to corn, small grains, grasses, and legumes. Where the climate is favorable, the soil is suitable for vineyards.

Choose hay and pasture mixtures that tolerate poor surface drainage and moderate internal drainage. Keep the natural drainageways open. Divert surface water from adjoining higher areas into suitable waterways.

Because of restricted drainage, this soil is in capability unit IIw–1.

Scio silt loam, 3 to 8 percent slopes (SaB).—The profile of this soil is the same as the profile described for the series. This soil has uniform slopes, most of which are 200 feet long. Surface and internal drainage are moderate.

This soil is suited to late-maturing vegetables and to corn, small grains, grasses, and legumes. Where the climate is favorable, the soil is suitable for vineyards.

Choose hay and pasture mixtures that tolerate moderate drainage. Keep the natural drainageways open. Divert surface water into suitable waterways.

Because of the risk of erosion and the moderate drainage, this soil is in capability unit IIew–3.

Scio silt loam, 8 to 15 percent slopes (SaC).—The profile of this soil resembles the profile described for the series, but the surface layer is only 5 inches thick. This soil has uniform slopes, most of which are less than 100 feet long. Surface drainage is good, and internal drainage is moderate.

This soil is suited to corn, small grains, grasses, and legumes. Where the climate is favorable, the soil is suitable for vineyards.

Careful management is needed. Choose hay and pasture mixtures that tolerate moderate internal drainage. Replenish the supply of organic matter often. Use a long rotation in which a sod crop covers the soil at least half the time. Divert surface water into suitable waterways.

Because of the risk of erosion and the moderate internal drainage, this soil is in capability unit IIIew–3.

Scio silt loam, 8 to 15 percent slopes, severely eroded (SaC3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is only 3 to 4 inches thick. Also, the soil contains less organic matter and is shallower over the fragipan. Where this soil has been cultivated, part of the yellowish-brown subsoil has been mixed with the surface soil.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate somewhat poor internal drainage. Divert surface water into suitable waterways.

Because of the effects of erosion and the restricted internal drainage, this soil is in capability unit IVew–3.

Sloan Series

The Sloan series consists of deep, very poorly drained soils of the bottom land. The soils occur on parts of the flood plains of streams where the water table is near or slightly above the surface. In places they are covered permanently with water.

The parent material consisted of silt and clay deposited in still, or slack, water. These sediments were washed down from the upland by streams and deposited on the flood plains. They were derived from acid shale bedrock and from sandstone, granite, and limestone of glacial origin.

These soils are in the same catena as the well drained Chagrin soils, the moderately well drained Lobdell soils, and the somewhat poorly drained to poorly drained Wayland soils.

Tamarack and hemlock grow in wooded areas. Alder, aspen, cattails, and sedges grow in idle areas and in areas that are permanently wet.

Typical profile of a Sloan silty clay loam:

0 to 10 inches, very dark grayish-brown silty clay loam; weak, medium, granular structure; friable when moist; pH 6.6; clear, smooth lower boundary.
10 to 16 inches, light brownish-gray silty clay loam with common, medium, distinct mottles of yellowish brown; weak, medium, granular structure; firm when moist, nonplastic when wet; pH 6.4; diffuse, smooth lower boundary.
16 to 36 inches+, gray silty clay loam with common, medium, distinct mottles of brownish yellow; moderate, medium, granular structure; hard when dry, very firm when moist, and slightly plastic when wet; pH 7.0.

The height of the permanent water table in these soils ranges from 12 to 18 inches above the surface to 6 to 12 inches below the surface.

Sloan silty clay loam, 0 to 3 percent slopes (SbA).—The profile of this soil is the same as the profile described for the series. The soil is level to nearly level. It has poor surface drainage and poor to very poor internal drainage. After floods, water remains on the surface.

This soil is suited to permanent pasture. Choose pasture mixtures that tolerate restricted drainage. Keep the natural drainageways open.

Because of restricted drainage, this soil is in capability unit VIw–1.

Sloan silty clay loam, permanently wet, 0 to 3 percent slopes (ScA).—The profile of this soil resembles the profile described for the series, but the surface layer is darker and consists of 6 to 12 inches of partly decomposed plants or peat. The soil is covered with 12 to 18 inches of water.

This soil is suitable as a habitat for wildlife. Because it is permanently wet, it is in capability unit VIIIw–1.

Trumbull Series

The Trumbull series consists of deep, poorly drained, silty soils that occur on the low-lying plain in Conneaut Township. The parent material was medium-textured glacial till that contained a few rounded particles of gravel or shale.

A layer of heavy silt loam that is slowly permeable to air and water begins at depths of 6 to 12 inches. Free lime occurs in the till beginning at depths between 30 and 40 inches.

These soils are in the same catena as the moderately well drained to somewhat poorly drained Mahoning soils and the very poorly drained Miner soils.

The native vegetation was a bur oak-hickory-swamp white oak-pin oak type of forest. Red maple, aspen, ironwood, dogwood, wild crabapple, sumac, locust, blackberry bushes, goldenrod, cinquefoil, and povertygrass now grow in idle areas. Areas that have never been cultivated have mounds, called cradle knolls, that are 3 to 6 feet in diameter and 1 to 3 feet high. The cradle knolls are covered with moss and ferns.

Typical profile of a Trumbull silt loam (cultivated):

0 to 7 inches, dark grayish-brown silt loam; weak, fine, granular structure; friable when moist; pH 5.6; abrupt, smooth lower boundary.
7 to 9 inches, grayish-brown to light olive-brown silt loam with common, medium, distinct mottles of brownish gray

and strong brown; weak, fine, subangular blocky structure; friable when moist; pH 5.8; clear, wavy lower boundary.

9 to 17 inches, light olive-brown, heavy silt loam with common, medium, distinct mottles of light brownish gray and strong brown; has coating of clay one-half millimeter thick on the soil particles; moderate, medium, blocky structure; hard when dry, firm when moist, and slightly plastic when wet; pH 4.8; clear, wavy lower boundary.

17 to 33 inches, olive-brown silty clay with a few, medium, distinct mottles of strong brown; coating of gray clay one-half millimeter thick on the soil particles; very coarse prisms that break to moderate, coarse, blocky structure; hard when dry, very firm when moist, and sticky and plastic when wet; pH 7.0; abrupt, wavy lower boundary.

33 to 52 inches, olive-brown silty clay with yellowish-brown streaks; has dark-gray coating on the soil particles; very coarse prisms that break to moderate, medium to coarse, blocky structure; hard when dry, very firm when moist, and slightly sticky and plastic when wet; free lime effervesces with dilute hydrochloric acid.

In undisturbed sites the surface is covered with dark-brown leaf litter from hardwoods. In these areas there is a layer of leaf mold about three-fourths inch thick that overlies a 3-inch layer of black silt loam. The silt loam has a weak, fine, granular structure and is very friable when moist and slightly sticky when wet; it has a pH of 5.2.

Trumbull silt loam, 0 to 3 percent slopes (TaA).—The profile of this soil in cultivated areas is the same as the profile described for the series. In uncultivated areas there is a thin layer of organic matter at the surface. The boundary between this layer and the underlying mineral soil is clear and smooth.

This level to nearly level soil has a poorly developed pattern of drainage. Shallow water remains in depressions during wet seasons. Internal drainage is poor. The soil dries out slowly in spring and becomes wet early in fall.

This soil is suited to small grains, grasses, and legumes. Choose hay and pasture mixtures that tolerate poor drainage. To maintain favorable tilth, plow early in fall so that the plow layer will freeze during the winter; cultivate only when the soil contains the proper amount of moisture. Keep the natural drainageways open. Divert surface water from adjoining higher areas into suitable waterways.

Because of restricted drainage, this soil is in capability unit IVw–1.

Trumbull silt loam, 0 to 3 percent slopes, severely eroded (TaA3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is less than 5 inches thick. Also, the soil contains less organic matter and is more poorly drained. Where this soil has been cultivated, part of the light olive-brown subsoil has been mixed with the surface soil.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate wet soil. Keep the natural drainageways open. Divert surface water from adjoining higher areas into suitable waterways.

Because of the effects of erosion and the restricted drainage, this soil is in capability unit VIew–1.

Trumbull silt loam, 3 to 8 percent slopes (TaB).—The profile of this soil resembles the profile described for the series. In uncultivated areas there is a thin layer of organic matter at the surface. The boundary between this layer and the underlying mineral soil is clear and smooth.

This soil has uniform slopes, most of which are less than 300 feet long. Cradle knolls are common. The drainage pattern is poorly developed. Surface drainage is moderate, and internal drainage is poor. The soil dries out slowly in spring and becomes wet early in fall.

This soil is suited to corn, small grains, grasses, and legumes. Choose hay and pasture mixtures that tolerate moderate surface drainage and poor internal drainage. Use a long rotation in which a sod crop covers the soil at least half the time. To maintain favorable tilth, plow early in fall so that the plow layer will freeze during winter; cultivate only when the soil contains the proper amount of moisture. Keep the natural drainageways open. Divert surface water into suitable waterways.

Because of moderate surface drainage and poor internal drainage, this soil is in capability unit IVw–1.

Trumbull silt loam, 3 to 8 percent slopes, moderately eroded (TaB2).—Except for the effects of erosion, this soil has a profile similar to that described for the series. As the result of cultivation, the cradle knolls have been removed and the soil contains less organic matter than formerly.

This soil is suited to corn, small grains, grasses, and legumes. Choose hay and pasture mixtures that tolerate moderate surface drainage and poor internal drainage. Use a long rotation in which a sod crop covers the soil at least half the time. To maintain favorable tilth, plow early in fall so that the plow layer will freeze during winter; cultivate only when the soil contains the proper amount of moisture. Keep the natural drainageways open. Divert surface water into suitable waterways.

Because of moderate surface drainage and poor internal drainage, this soil is in capability unit IVw–1.

Trumbull silt loam, 3 to 8 percent slopes, severely eroded (TaB3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is less than 5 inches thick. Also, the soil contains less organic matter and is more poorly drained. Where this soil has been cultivated, part of the light olive-brown subsoil has been mixed with the surface soil.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate wet soil. Keep the natural drainageways open. Divert surface water into suitable waterways.

Because of the effects of erosion and the restricted drainage, this soil is in capability unit VIew–1.

Trumbull silt loam, 8 to 15 percent slopes (TaC).—The profile of this soil resembles the profile described for the series. In uncultivated areas there is a thin layer of organic matter at the surface. The boundary between this layer and the underlying mineral soil is clear and smooth.

This soil has uniform slopes, most of which are less than 200 feet long. Cradle knolls are common. Surface drainage is good, and internal drainage is poor. The soil dries out slowly in spring and becomes wet early in fall.

This soil is suited to corn, small grains, grasses, and legumes. Choose hay and pasture mixtures that tolerate poor internal drainage. Use a long rotation in which a sod crop covers the soil at least half the time. To maintain favorable tilth, plow early in fall so that the plow layer will freeze during the winter; cultivate only when the soil contains the proper amount of moisture. Divert surface water into suitable waterways.

Because of the risk of erosion and the poor internal drainage, this soil is in capability unit IVew–3.

Trumbull silt loam, 8 to 15 percent slopes, moderately eroded (TaC2).—Except for the effects of erosion, the profile of this soil is similar to the profile described for the series. As the result of cultivation, the cradle knolls have been removed and the soil contains less organic matter than formerly.

This soil is suited to corn, small grains, grasses, and legumes. Choose hay and pasture mixtures that tolerate poor internal drainage. Use a long rotation in which a sod crop covers the soil at least half the time. To maintain favorable tilth, plow early in fall so that the plow layer will freeze during the winter; cultivate only when the soil contains the proper amount of moisture. Divert surface water into suitable waterways.

Because of the effects of erosion and the poor internal drainage, this soil is in capability unit IVew–3.

Trumbull silt loam, 8 to 15 percent slopes, severely eroded (TaC3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is less than 5 inches thick. Also, the soil contains less organic matter and is more poorly drained. Where this soil has been cultivated, part of the light olive-brown subsoil has been mixed with the surface soil.

This soil is suited to permanent pasture. Choose grasses and legumes that tolerate poor internal drainage. Divert surface water into suitable waterways.

Because of the effects of erosion and the restricted drainage, this soil is in capability unit VIew–1.

Unadilla Series

The Unadilla series is made up of deep, well-drained soils on stream terraces. The parent material consisted of sediments washed down from the glaciated upland and deposited by streams. These sediments were derived from acid shale bedrock and from sandstone and limestone of glacial origin.

These soils are in the same catena as the moderately well drained Scio soils, the somewhat poorly drained to poorly drained Fredon soils, and the very poorly drained Halsey soils.

The native vegetation was a maple-beech-red oak type of forest. Red oak, locust, wild cherry, broomsedge, cinquefoil, and povertygrass now grow in idle areas.

Typical profile of an Unadilla fine sandy loam (cultivated):

0 to 7 inches, dark-brown fine sandy loam; weak, fine, granular structure; friable when moist; pH 5.2; abrupt, smooth lower boundary.
7 to 11 inches, dark yellowish-brown fine sandy loam; moderate, fine, granular structure; friable when moist; pH 5.2; gradual, smooth lower boundary.
11 to 26 inches, yellowish-brown loam; moderate, medium, subangular blocky structure; friable when moist; pH 5.0; gradual, smooth lower boundary.
26 to 38 inches+, light brownish-gray to pale-brown loam; weak, medium, granular structure; friable when moist; pH 5.4.

The color of the subsoil varies according to the length of time that leaching has taken place. It ranges from dark yellowish brown in the younger profiles of these soils to light yellow in the older profiles.

Unadilla fine sandy loam, 0 to 3 percent slopes (UaA).—The profile of this soil resembles the profile described for the series, but the surface layer is 8 inches thick instead of 7 inches. Any crop suited to the climate can be grown.

There are no serious limitations in the use of this soil; it is in capability unit I–2.

Unadilla fine sandy loam, 3 to 8 percent slopes (UaB).—The profile of this soil is the same as the profile described for the series. This soil has uniform slopes, most of which are 200 to 400 feet long.

Any crop suited to the climate can be grown. Cultivate on the contour to control erosion.

Because of the risk of erosion, this soil is in capability unit IIe–2.

Unadilla fine sandy loam, 3 to 8 percent slopes, severely eroded (UaB3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is only 4 to 5 inches thick. Also, the soil contains less organic matter; where it has been cultivated, part of the yellowish-brown subsoil has been mixed with the surface soil.

This soil is suited to corn, small grains, grasses, and legumes. Where the climate is favorable, the soil is suitable for vineyards.

Careful management is needed. Replenish the supply of organic matter often. Use a long rotation in which a sod crop covers the soil at least half the time. Plant clean-cultivated crops on the contour. Divert surface water into suitable waterways.

Because of the effects of erosion, this soil is in capability unit IIIe–2.

Unadilla fine sandy loam, 8 to 15 percent slopes (UaC).—The profile of this soil resembles the profile described for the series, but the surface layer is only 6 inches thick. The soil has uniform slopes, most of which are less than 200 feet long.

This soil is suited to corn, small grains, grasses, and legumes. Where the climate is favorable, the soil is suitable for vineyards.

Plant clean-cultivated crops in contour strips. Divert surface water into suitable waterways.

Because of the risk of erosion, this soil is in capability unit IIIe–2.

Unadilla fine sandy loam, 8 to 15 percent slopes, severely eroded (UaC3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is only 4 or 5 inches thick. Also, the soil contains less organic matter; where it has been cultivated, part of the yellowish-brown subsoil has been mixed with the surface soil.

This soil is suited to grasses and legumes. Divert surface water into suitable waterways.

Because of the effects of erosion, this soil is in capability unit VIe–1.

Volusia Series

The Volusia series is made up of deep, somewhat poorly drained to poorly drained soils of the upland. The parent material of glacial till consisted of a mixture of materials derived mainly from acid shale bedrock and sandstone, and partly from granite. Soils on glacial till at high ele-

vations contain more gravel than do the lower lying Volusia soils.

A firm layer (fragipan) begins at depths of 6 to 18 inches. This layer is slowly permeable to air and water.

These soils are in the same catena as the well drained Wooster soils, the moderately well drained Mardin soils, and the very poorly drained Alden soils.

The native vegetation was a birch-beech-maple type of forest. Wild cherry, aspen, sumac, wild crabapple, goldenrod, cinquefoil, sheep sorrel, and povertygrass now grow in idle areas.

In Erie County there are two soil types of the Volusia series—gravelly silt loam and silt loam.

Typical profile of a Volusia gravelly silt loam (cultivated):

0 to 6 inches, dark-brown gravelly silt loam; moderate, fine, granular structure; friable when moist; pH 4.8; abrupt, smooth lower boundary.
6 to 10 inches, yellowish-brown, heavy silt loam with common, medium, faint mottles of light yellowish brown; moderate, medium, granular structure; friable when moist; pH 5.0; gradual, wavy lower boundary.
10 to 17 inches, dark yellowish-brown, heavy silt loam with a few, medium, distinct mottles of yellowish red; weak, medium, subangular blocky structure; friable when moist; pH 5.4; gradual, wavy lower boundary.
17 to 25 inches, grayish-brown silty clay loam with common, coarse, distinct mottles of dark yellowish brown; strong, coarse, blocky structure; hard when dry, firm when moist, and slightly plastic when wet; pH 5.4; diffuse lower boundary.
25 to 36 inches+, grayish-brown flaggy silty clay loam with common, coarse, distinct mottles of yellowish red; moderate, medium, subangular blocky structure; hard when dry, firm when moist, and sticky when wet; pH 5.6.

In areas that have not been cultivated, there is a dark layer of organic matter at the surface. The boundary between this layer and the underlying mineral soil is clear and abrupt.

Volusia gravelly silt loam, 0 to 3 percent slopes (VaA).—The profile of this soil resembles the profile described for the series, but the surface layer is 7 or 8 inches thick instead of 6 inches. This soil is in depressions or in areas at the bases of steeper slopes. Shallow water remains in the depressions during wet seasons. Internal drainage is poor. The soil warms up slowly in spring and becomes wet early in fall. Cradle knolls are common in areas that have not been cultivated.

This soil is suited to small grains, grasses, and legumes. Where the climate is favorable, the soil is suitable for vineyards. Corn and cabbage are grown. Often they cannot be harvested because the fields are wet.

This soil needs careful management. Choose hay and pasture mixtures that tolerate poor surface and internal drainage. Replenish the supply of organic matter often. Maintain favorable tilth by cultivating only when the soil contains the proper amount of moisture. If tilth is good, crops can make the best use of the shallow root zone. Keep the natural drainageways open. Divert surface water from adjoining higher areas into suitable waterways.

Because of poor drainage, this soil is in capability unit IIIw-4.

Volusia gravelly silt loam, 3 to 8 percent slopes (VaB).—The profile of this soil is the same as the profile described for the series. The soil has uniform slopes that are as much as 700 feet long. Surface drainage is moderate, and internal drainage is somewhat poor. Cradle knolls are common in areas that have not been cultivated.

This soil is suited to small grains, grasses, and legumes. Where the climate is favorable, the soil is suitable for vineyards. Corn and cabbage are grown, but often they cannot be harvested because the fields are wet.

This soil needs careful management. Choose hay and pasture mixtures that tolerate moderate surface drainage and somewhat poor internal drainage. Replenish the supply of organic matter often. Maintain favorable tilth by cultivating only when the soil contains the proper amount of moisture. If tilth is good, crops can make the best use of the shallow root zone. Keep the natural drainageways open. Divert surface water into suitable waterways.

Because of the risk of erosion and the somewhat poor internal drainage, this soil is in capability unit IIIew-5.

Volusia gravelly silt loam, 3 to 8 percent slopes, severely eroded (VaB3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is only 4 or 5 inches thick. Also, the soil contains less organic matter and is shallower over the fragipan. Where this soil has been cultivated, part of the yellowish-brown subsoil has been mixed with the surface soil.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate moderate surface drainage and poor internal drainage. Keep the natural drainageways open. Divert surface water into suitable waterways.

Because of the effects of erosion and the poor internal drainage, this soil is in capability unit VIew-2.

Volusia gravelly silt loam, 8 to 15 percent slopes (VaC).—The profile of this soil resembles the profile described for the series. This soil has uniform slopes that are as much as 500 feet long. Cradle knolls are common in areas that have not been cultivated. Surface drainage is good, and internal drainage is somewhat poor.

This soil is suited to small grains, grasses, and legumes. Where the climate is favorable, the soil is suitable for vineyards. Corn and cabbage can be grown in a long rotation in which a sod crop covers the soil at least half the time.

Choose hay and pasture mixtures that tolerate restricted internal drainage. Divert surface water into suitable waterways.

Because of the risk of erosion and the restricted internal drainage, this soil is in capability unit IIIew-5.

Volusia gravelly silt loam, 8 to 15 percent slopes, severely eroded (VaC3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is only 4 or 5 inches thick. Also, the soil contains less organic matter and is shallower over the fragipan. Where this soil has been cultivated, part of the yellowish-brown subsoil has been mixed with the surface soil.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate poor internal drainage. Divert surface water into suitable waterways.

Because of the effects of erosion and the poor internal drainage, this soil is in capability unit VIew-2.

Volusia gravelly silt loam, 15 to 25 percent slopes (VaD).—The profile of this soil resembles the profile described for the series. The soil has uniform slopes that

are as much as 400 feet long. Cradle knolls are common in areas that have never been cultivated. Surface drainage is good to excessive, and internal drainage is somewhat poor.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate restricted internal drainage. Divert surface water into suitable waterways.

Because of the risk of erosion and the restricted internal drainage, this soil is in capability unit VIew–2.

Volusia gravelly silt loam, 15 to 25 percent slopes, severely eroded (VaD3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is only 4 or 5 inches thick. Also, the soil contains less organic matter and is shallower over the fragipan. Where this soil has been cultivated, part of the yellowish-brown subsoil has been mixed with the surface soil.

This soil is suited to grasses and legumes. Choose pasture mixtures that tolerate poor internal drainage. Divert surface water into suitable waterways.

Because of the effects of erosion, this soil is in capability unit VIIe–5.

Volusia silt loam, 3 to 8 percent slopes (VbB).—The profile of this soil resembles the profile of Volusia gravelly silt loam described for the series. However, this soil, like the other Volusia silt loams, contains more silt and clay and has a more strongly developed structure throughout the profile. This soil has uniform slopes that are as much as 1,000 feet long. Surface drainage is moderate, and internal drainage is somewhat poor.

Typical profile:

0 to 7 inches, dark grayish-brown to very dark grayish-brown silt loam; weak, fine, subangular blocky structure; friable when moist; pH 5.2; abrupt, smooth lower boundary.

7 to 9 inches, olive-brown silt loam with common, medium, distinct mottles of strong brown; weak, medium, subangular blocky structure; friable when moist; pH 5.2; clear, wavy lower boundary.

9 to 12 inches, light olive-brown silty clay loam; soil particles stained with iron and manganese; moderate, medium, subangular blocky structure; firm when moist; pH 5.4; clear, wavy lower boundary.

12 to 30 inches, light olive-brown, shaly silty clay loam; soil particles faintly mottled and coated with gray; strong, coarse prisms that break to strong, medium, platy structure; hard when dry, very firm when moist, and plastic when wet; pH 5.8; diffuse, wavy lower boundary.

30 to 72 inches+, dark grayish-brown, shaly silt loam with common, medium, distinct mottles of olive brown, light olive brown, and gray; massive (structureless); hard when dry, firm when moist; pH 6.2.

This soil is suited to late-maturing vegetables and to small grains, grasses, and legumes. Where the climate is favorable, the soil is suitable for vineyards.

Careful management is needed. Choose hay and pasture mixtures that tolerate moderate surface drainage and somewhat poor internal drainage. Replenish the supply of organic matter often. Maintain favorable tilth by cultivating only when the soil contains the proper amount of moisture. If tilth is good, crops can make the best use of the shallow root zone. Keep the natural drainageways open. Divert surface water into suitable waterways.

Because of the risk of erosion and the restricted internal drainage, this soil is in capability unit IIIew–5.

Volusia silt loam, 0 to 3 percent slopes (VbA).—The profile of this soil resembles the profile described for Volusia silt loam, 3 to 8 percent slopes. This soil occurs in depressions or in areas at the bases of steep slopes. Shallow water remains in the depressions during wet seasons. Surface drainage is poor, and internal drainage is somewhat poor to poor. The soil warms up slowly in spring.

This soil is suited to late-maturing vegetables and to small grains, grasses, and legumes. Where the climate is favorable, the soil can be used for vineyards.

Careful management is needed. Choose hay and pasture mixtures that tolerate restricted drainage. Replenish the supply of organic matter often. Maintain favorable tilth by cultivating only when the soil contains the proper amount of moisture. If tilth is good, crops can make the best use of the shallow root zone. Keep the natural drainageways open. Divert surface water into suitable waterways.

Because of restricted drainage, this soil is in capability unit IIIw–4.

Volusia silt loam, 0 to 8 percent slopes, severely eroded (VbB3).—The surface layer of this soil is lighter colored than that of the profile described for Volusia silt loam, 3 to 8 percent slopes, and is only 4 or 5 inches thick. Also, the soil contains less organic matter and is shallower over the fragipan. Where this soil has been cultivated, part of the olive-brown subsoil has been mixed with the surface soil.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate moderate surface drainage and poor internal drainage. Keep the natural drainageways open. Divert surface water into suitable waterways.

Because of the effects of erosion and the restricted internal drainage, this soil is in capability unit VIew–2.

Volusia silt loam, 8 to 15 percent slopes (VbC).—The profile of this soil resembles the profile described for Volusia silt loam, 3 to 8 percent slopes. This soil has uniform slopes that are as much as 700 feet long. Surface drainage is good, and internal drainage is somewhat poor.

This soil is suited to late-maturing vegetables and to small grains, grasses, and legumes. Where the climate is favorable, the soil can be used for vineyards.

Use a long rotation in which a sod crop covers the soil at least half the time. Divert surface water into suitable waterways.

Because of the risk of erosion and the restricted internal drainage, this soil is in capability unit IIIew–5.

Volusia silt loam, 8 to 15 percent slopes, severely eroded (VbC3).—The surface layer of this soil is lighter colored than that of the profile described for Volusia silt loam, 3 to 8 percent slopes, and is only 4 or 5 inches thick. Also, the soil contains less organic matter and is shallower over the fragipan. Where this soil has been cultivated, part of the olive-brown subsoil has been mixed with the surface soil.

This soil is suited to permanent grasses and legumes. Choose hay and pasture mixtures that tolerate poor internal drainage. Divert surface water into suitable waterways.

Because of the effects of erosion and the restricted internal drainage, this soil is in capability unit VIew–2.

Volusia silt loam, 15 to 25 percent slopes (VbD).—The profile of this soil resembles the profile described for

Volusia silt loam, 3 to 8 percent slopes. This soil has uniform slopes that are as much as 500 feet long. Surface drainage is good to excessive, and internal drainage is somewhat poor.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate restricted internal drainage. Divert surface water into suitable waterways.

Because of the risk of erosion and the restricted internal drainage, this soil is in capability unit VIew–2.

Volusia silt loam, 15 to 25 percent slopes, severely eroded (VbD3).—The surface layer of this soil is lighter colored than that of the profile described for Volusia silt loam, 3 to 8 percent slopes, and is only 4 to 5 inches thick. Also, the soil contains less organic matter and is shallower over the fragipan. Where this soil has been cultivated, part of the olive-brown subsoil has been mixed with the surface soil.

This soil is suitable for growing trees. Choose planting stock that tolerates poor internal drainage. Divert surface water into suitable waterways.

Because of the effects of erosion, this soil is in capability unit VIIe–4.

Wallington Series

The Wallington soils are deep and are somewhat poorly drained to poorly drained. They are important soils of the lake plain for vineyards and for the growing of vegetables.

The parent material consisted of lacustrine deposits derived from acid shale bedrock and from sandstone and limestone of glacial origin. These sediments were laid down as layers of silt and sand; some layers of clay were also deposited in areas of still, or slack, water. A firm layer (fragipan) that is slowly permeable to air and water begins at depths of 10 to 18 inches.

These soils are in the same catena as the moderately well drained Williamson soils and the very poorly drained Birdsall soils.

The native vegetation was a beech-maple type of forest. Aspen, goldenrod, cinquefoil, sheep sorrel, broomsedge, velvetgrass, and povertygrass now grow in idle areas.

In Erie County there are two soil types of the Wallington series—silt loam and fine sandy loam.

Typical profile of a Wallington silt loam (cultivated):

0 to 8 inches, dark yellowish-brown silt loam; moderate, coarse, granular structure; friable when moist; pH 5.0; clear, smooth lower boundary.

8 to 11 inches, dark yellowish-brown silt loam; moderate, medium, granular structure; friable when moist; pH 5.4; clear, smooth lower boundary.

11 to 16 inches, very pale brown silt loam with common, coarse, distinct mottles of dark yellowish brown and brownish yellow; weak, fine, subangular blocky structure; slightly hard when dry, firm when moist, and nonplastic when wet; pH 5.2; clear, smooth lower boundary.

16 to 25 inches, yellowish-brown loam; light brownish-gray clay forms a thin coat on the soil particles and fills the cracks; very coarse prisms that break to strong, coarse, subangular blocky structure; hard when dry, firm when moist, and nonplastic when wet; pH 5.8; gradual, smooth lower boundary.

25 to 35 inches, dark yellowish-brown silt loam with many, coarse, distinct mottles of olive brown and grayish brown; very coarse prisms that break to moderate, medium, subangular blocky structure; hard when dry, firm when moist, and nonplastic when wet; pH 6.4; gradual, smooth lower boundary.

35 to 41 inches, olive-brown, heavy silt loam with common, coarse, distinct mottles of grayish brown; weak, coarse, subangular blocky structure; firm when moist, slightly plastic when wet; pH 6.8; diffuse, smooth lower boundary.

41 to 60 inches+, olive-brown, heavy silt loam with a few, coarse, distinct mottles of grayish brown; weak, coarse, subangular blocky structure; firm when moist, slightly plastic when wet; pH 6.6.

The soils in the western part of the lake plain have a more pronounced fragipan than those in the eastern part.

Wallington silt loam, 0 to 2 percent slopes (WbA).—The profile of this soil resembles the profile described for the series, but the surface layer is 9 inches thick instead of 8 inches. The areas are level to nearly level. Shallow water remains in the depressions during wet seasons. The soil warms up slowly in spring and becomes wet early in fall.

This soil is suited to late-maturing vegetables and to corn, small grains, grasses, and legumes. Where the climate is favorable, the soil can be used for vineyards.

Careful management is needed. Choose hay and pasture mixtures that tolerate poor surface and internal drainage. Replenish the supply of organic matter often. Maintain favorable tilth by cultivating only when the soil contains the proper amount of moisture. If tilth is good, crops can make the best use of the shallow root zone. Keep the natural drainageways open. Divert surface water from adjoining higher areas into suitable waterways.

Because of restricted drainage, this soil is in capability unit IIIw–1.

Wallington silt loam, 2 to 8 percent slopes (WbB).—The profile of this soil is the same as the profile described for the series. This soil has uniform slopes, most of which are less than 500 feet long. Surface drainage is moderate, and internal drainage is somewhat poor to poor.

This soil is suited to late-maturing vegetables and to corn, small grains, grasses, and legumes. Where the climate is favorable, the soil is suitable for vineyards.

Careful management is needed. Choose hay and pasture mixtures that tolerate moderate surface drainage and poor internal drainage. Replenish the supply of organic matter often. Maintain favorable tilth by cultivating only when the soil contains the proper amount of moisture. If tilth is good, crops can make the best use of the shallow root zone. Keep the natural drainageways open. Divert surface water into suitable waterways.

Because of restricted internal drainage and the risk of erosion, this soil is in capability unit IIIwe–2.

Wallington silt loam, 2 to 8 percent slopes, severely eroded (WbB3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is only 4 or 5 inches thick. Also, the soil contains less organic matter and is shallower over the fragipan. Where the soil has been cultivated, part of the very pale brown subsoil has been mixed with the surface soil.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate moderate surface drainage and poor to very poor internal drainage. Keep the natural drainageways open. Divert surface water into suitable waterways.

Because of the effects of erosion and the restricted internal drainage, this soil is in capability unit VIew–1.

Wallington silt loam, 8 to 15 percent slopes (WbC).—The profile of this soil resembles the profile described for the series, but the surface layer is only 7 inches thick. This soil has uniform slopes, most of which are less than 300 feet long. Surface drainage is good, and internal drainage is somewhat poor to poor.

This soil is suited to small grains, grasses, and legumes. Where the climate is favorable, the soil is suitable for vineyards. Corn can be grown in a long rotation in which a sod crop covers the soil at least half the time.

This soil needs careful management. Choose hay and pasture mixtures that tolerate restricted internal drainage. Replenish the supply of organic matter often. Maintain favorable tilth by cultivating only when the soil contains the proper amount of moisture. If tilth is good, crops can make the best use of the shallow root zone. Divert surface water into suitable waterways.

Because of restricted internal drainage and the risk of erosion, this soil is in capability unit IIIwe–2.

Wallington fine sandy loam, 0 to 2 percent slopes (WaA).—Except that it contains more sand, the profile of this soil resembles the profile described for the series. This soil is level to nearly level. Shallow water remains in depressions during wet seasons. Surface drainage is poor, and internal drainage is somewhat poor to poor.

This soil is suited to late-maturing vegetables and to grasses and legumes. Where the climate is favorable, the soil is suitable for vineyards.

Choose hay and pasture mixtures that tolerate poor drainage. Keep the natural drainageways open. Divert surface water from adjoining higher areas into suitable waterways.

Because of restricted drainage, this soil is in capability unit IIIw–2.

Wallington fine sandy loam, 2 to 8 percent slopes (WaB).—Except that it contains more sand, the profile of this soil resembles the profile described for the series. This soil has uniform slopes, most of which are less than 500 feet long. Surface drainage is moderate, and internal drainage is somewhat poor to poor.

This soil is suited to late-maturing vegetables and to corn, small grains, grasses, and legumes. Where the climate is favorable, the soil is suitable for vineyards.

Choose hay and pasture mixtures that tolerate moderate surface drainage and poor internal drainage. Keep the natural drainageways open. Divert surface water into suitable waterways.

Because of the risk of erosion and the restricted internal drainage, this soil is in capability unit IIIew–4.

Wallington fine sandy loam, 2 to 8 percent slopes, severely eroded (WaB3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is less than 4 inches thick. Also, this soil contains more sand throughout the profile, has less organic matter, and is shallower over the fragipan. Where the soil has been cultivated, part of the very pale brown subsoil has been mixed with the surface layer.

This soil is suited to grasses and legumes. Where the climate is favorable, the soil can be used for vineyards.

Choose hay and pasture mixtures that tolerate moderate surface drainage and poor to very poor internal drainage. Keep the natural drainageways open. Divert surface water into suitable waterways.

Because of the effects of erosion and the restricted internal drainage, this soil is in capability unit IIIew–4.

Wallington fine sandy loam, 8 to 15 percent slopes (WaC).—The profile of this soil resembles the profile described for the series, but it contains more sand and the surface layer is only 7 inches thick. This soil has uniform slopes, most of which are less than 500 feet long. Surface drainage is good, and internal drainage is somewhat poor.

Small areas of Wallington silt loam with slopes of 8 to 15 percent are included with this soil.

This soil is suited to late-maturing vegetables and to small grains, grasses, and legumes. Where the climate is favorable, the soil is suitable for vineyards. Corn can be grown in a long rotation if the soil is kept in sod at least half the time.

Choose hay and pasture mixtures that tolerate restricted internal drainage. Divert surface water into suitable waterways.

Because of the risk of erosion and the restricted internal drainage, this soil is in capability unit IIIew–4.

Wallington fine sandy loam, 8 to 15 percent slopes, severely eroded (WaC3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is less than 4 inches thick. Also, this soil contains more sand throughout the profile, has less organic matter, and is shallower over the fragipan. Where the soil has been cultivated, part of the very pale brown subsoil has been mixed with the surface soil.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate poor to very poor internal drainage. Divert surface water into suitable waterways.

Because of the effects of erosion and the restricted internal drainage, this soil is in capability unit VIew–3.

Wallington fine sandy loam, 15 to 25 percent slopes (WaD).—The profile of this soil resembles the profile described for the series, but it contains more sand and the surface layer is only 7 inches thick. This soil has uniform slopes, most of which are less than 300 feet long. Surface drainage is good to excessive, and internal drainage is somewhat poor.

Small areas of Wallington silt loam with slopes of 15 to 25 percent are included with this soil.

This soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate restricted internal drainage.

Because of the risk of erosion and the restricted internal drainage, this soil is in capability unit VIew–3.

Wallington fine sandy loam, 15 to 25 percent slopes, severely eroded (WaD3).—The surface layer of this soil is lighter colored than that of the profile described for the series and is less than 4 inches thick. Also, this soil contains more sand throughout the profile, has less organic matter, and is shallower over the fragipan. Where the soil has been cultivated, part of the very pale brown subsoil has been mixed with the surface soil.

This soil is suited to permanent grasses and legumes. Choose hay and pasture mixtures that tolerate poor to very poor internal drainage. Divert surface water into suitable waterways.

Because of the effects of erosion and the restricted internal drainage, this soil is in capability unit VIew–3.

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Wauseon Series

The Wauseon soils are deep, very poorly drained, acid, and sandy. The parent material consisted of acid lacustrine sands that were sorted and deposited by water.

A firm layer that is slowly permeable to air and water begins at depths of 6 to 10 inches. Gray, calcareous material, locally called quicksand, is at depths of 24 to 48 inches. The quicksand is slowly permeable to air and water. It flows when saturated with water.

These soils are in the same catena as the well drained Ottawa soils, the moderately well drained Berrien soils, and the somewhat poorly drained to poorly drained Rimer soils.

The native vegetation was a white elm-white ash or black ash type of forest. Now, alder, aspen, red maple, willow, and sedges grow in idle areas.

In Erie County only one member of the Wauseon series, Wauseon fine sandy loam, 0 to 2 percent slopes, has been mapped.

Typical profile of Wauseon fine sandy loam, 0 to 2 percent slopes (cultivated):

0 to 9 inches, very dark brown to very dark grayish-brown very fine sandy loam to fine sandy loam; moderate, medium, granular structure; friable when moist; pH 5.6; clear, smooth lower boundary.
9 to 18 inches, light olive-brown sandy loam with many, coarse, distinct mottles of yellowish brown; weak, medium, subangular blocky structure; hard when dry, firm when moist, and slightly sticky when wet; pH 6.0; gradual, smooth lower boundary.
18 to 26 inches, yellowish-red loamy sand; soil particles coated with light olive brown; moderate, medium, subangular blocky structure; hard when dry, firm when moist, and nonplastic when wet; pH 6.4; gradual, smooth lower boundary.
26 to 48 inches, light olive-brown loamy sand with many, coarse, distinct mottles of yellowish brown; stratified; single grain (structureless); friable when moist; pH 6.6; clear, wavy lower boundary.
48 to 72 inches+, gray silt loam; massive (structureless); hard when dry, very firm when moist, and plastic to fluid when wet; pH 7.2 at a depth of 48 inches; effervesces with dilute hydrochloric acid at a depth of 60 inches.

Wauseon fine sandy loam, 0 to 2 percent slopes (WcA).—The profile of this soil is the same as the profile described for the Wauseon series. The soil is level to nearly level. Shallow water remains in depressions for a long time after wet seasons. Surface and internal drainage are very poor.

After the woodlands were cleared, organic material in the soils dried out and burned. The remains of this material occur in the form of charcoal in some areas.

This soil is suited to late-maturing vegetables and to grasses and legumes. It also can be used for vineyards.

Choose hay and pasture mixtures that tolerate restricted drainage. Keep the natural drainageways open. Divert surface water from adjoining higher areas into suitable waterways.

Because of restricted drainage, this soil is in capability unit IIIw–3.

Wayland Series

The Wayland series consists of deep, somewhat poorly drained to poorly drained soils on the flood plains of streams. In spring the soils are covered by water for long periods. The parent material was made up of sediments of silt and clay washed down from the upland. This material was derived from acid shale bedrock and from sandstone and limestone of glacial origin.

A firm layer that is slowly permeable to air and water begins at depths of 12 to 18 inches.

These soils are in the same catena as the well drained Chagrin soils, the moderately well drained Lobdell soils, and the very poorly drained or permanently wet Sloan soils.

Alder, willow, red maple, sedges, and Canada bluegrass grow in wooded or idle sites.

In Erie County only one member of the Wayland series, Wayland silt loam, 0 to 3 percent slopes, has been mapped.

Typical profile of Wayland silt loam, 0 to 3 percent slopes:

0 to 10 inches, dark-gray silt loam with common, coarse, distinct mottles of yellowish brown; moderate, medium, granular structure; friable when moist; pH 5.8; clear, smooth lower boundary.
10 to 25 inches, light brownish-gray silty clay loam with common, coarse, distinct mottles of olive brown and strong brown; moderate, coarse, granular structure; firm when moist, nonsticky when wet; pH 6.4; gradual, smooth lower boundary.
25 to 35 inches+, light yellowish-brown silty clay loam with common, coarse, distinct mottles of olive brown and strong brown; moderate, medium, granular structure; firm when moist, slightly sticky when wet; pH 6.8.

Wayland silt loam, 0 to 3 percent slopes (WdA).—The profile of this soil is the same as the profile described for the Wayland series. The soil is level to nearly level and is subject to frequent flooding. Surface drainage is poor, and internal drainage is somewhat poor.

This soil is suited to permanent grasses and legumes. Choose pasture mixtures that tolerate restricted drainage. Keep the natural drainageways open.

Because of restricted drainage and the hazard of flooding, this soil is in capability unit VIw–1.

Williamson Series

The Williamson series is made up of deep, moderately well drained soils of the lake plain. The soils are important for growing vegetables and fruits.

The parent material consisted of lacustrine deposits derived from acid shale bedrock and from sandstone and limestone of glacial origin. This material was laid down as layers of silt and sand; layers of clay were also deposited in areas of still, or slack, water.

A firm layer (fragipan) that is slowly permeable to air and water begins at depths of 22 to 30 inches. The fragipan is firm when moist and nonsticky when wet. The Williamson soils, unlike the Collamer, have a well-developed fragipan.

The Williamson soils are in the same catena as the somewhat poorly drained to poorly drained Wallington soils and the poorly drained to very poorly drained Birdsall soils.

The native vegetation was a maple-beech-tuliptree type of forest. Locust, sassafras, aspen, sumac, sheep sorrel, cinquefoil, and broomsedge now grow in idle areas.

In Erie County the Williamson soils occur with the Collamer soils in a complex pattern. Because it was dif-

ficult to separate the two series in mapping, they have been mapped together as Williamson and Collamer soils. Two soil types—fine sandy loam and silt loam—occur in this county.

Williamson and Collamer fine sandy loams, 0 to 2 percent slopes (WeA).—The profile of the Collamer soil in this mapping unit is similar to the profile described for the Collamer series. The profile of the Williamson soil resembles that of the Collamer soil, but it has a more highly developed fragipan below a depth of 30 inches.

These soils occupy level to nearly level areas or depressions. Shallow water remains in the depressions for a short time during wet seasons.

The soils are suited to corn, small grains, grasses, and legumes. Where the climate is favorable, they are suitable for vegetables, vineyards, and orchards.

Choose hay and pasture mixtures that tolerate poor surface drainage and moderate internal drainage. Keep the natural drainageways open. Divert surface water from adjacent higher areas into suitable waterways.

Because of poor surface drainage and moderate internal drainage, this mapping unit is in capability unit IIw–1.

Williamson and Collamer fine sandy loams, 2 to 8 percent slopes (WeB).—The profile of the Collamer soil in this mapping unit is the same as the profile described for the Collamer series. The profile of the Williamson soil resembles that of the Collamer soil, but it has a more highly developed fragipan below a depth of 30 inches.

These soils have uniform slopes, most of which are less than 300 feet long. Surface and internal drainage are moderate.

These soils are suited to corn, small grains, grasses, and legumes. Where the climate is favorable, they are suitable for vegetables, vineyards, and orchards.

Choose hay and pasture mixtures that tolerate moderate drainage. Keep the natural drainageways open. Divert surface water into suitable waterways. Plant clean-cultivated crops on the contour.

Because of the risk of erosion and the moderate internal drainage, this mapping unit is in capability unit IIew–2.

Williamson and Collamer fine sandy loams, 2 to 8 percent slopes, severely eroded (WeB3).—The surface layer of the Collamer soil in this mapping unit is lighter colored than that of the profile described for the Collamer series and is less than 4 inches thick. Also, the soil contains less organic matter and is shallower over the firm layer (fragipan). In areas that have been cultivated, part of the yellowish-brown subsoil is mixed with the surface soil. The Williamson soil is like the Collamer soil, but it has a more highly developed fragipan below a depth of 30 inches.

These soils are suited to late-maturing vegetables and to corn, small grains, grasses, and legumes. Where the climate is favorable, they are suitable for vineyards.

Choose hay and pasture mixtures that tolerate somewhat poor internal drainage. Keep the natural drainageways open. Divert surface water into suitable waterways. Plant clean-cultivated crops on the contour.

Because of the effects of erosion and the restricted internal drainage, this mapping unit is in capability unit IIIew–2.

Williamson and Collamer fine sandy loams, 8 to 15 percent slopes (WeC).—The profile of the Collamer soil in this mapping unit resembles the profile described for the Collamer series, but the surface layer is only 7 inches thick. The Williamson soil is like the Collamer soil, but it has a more highly developed fragipan below a depth of 30 inches.

These soils have uniform slopes, most of which are less than 300 feet long. Surface drainage is good, and internal drainage is moderate.

The soils are suited to corn, small grains, grasses, and legumes. Where the climate is favorable, they are suitable for vegetables, vineyards, and orchards.

Choose hay and pasture mixtures that tolerate moderate internal drainage. Divert surface water into suitable waterways. Plant clean-cultivated crops on the contour.

Because of the risk of erosion and the moderate internal drainage, this mapping unit is in capability unit IIIew–2.

Williamson and Collamer fine sandy loams, 8 to 15 percent slopes, severely eroded (WeC3).—The surface layer of the Collamer soil in this mapping unit is lighter colored than that of the profile described for the Collamer series and is less than 4 inches thick. Also, the soil contains less organic matter and is shallower over the firm layer (fragipan). Where the soil has been cultivated, part of the yellowish-brown subsoil has been mixed with the surface soil. The Williamson soil is like the Collamer soil, but it has a more highly developed fragipan below a depth of 30 inches.

These soils are suited to grasses and legumes. Choose hay and pasture mixtures that tolerate restricted internal drainage. Divert surface water into suitable waterways.

Because of the risk of erosion and the restricted drainage, this mapping unit is in capability unit IVew–1.

Williamson and Collamer fine sandy loams, 15 to 25 percent slopes (WeD).—The profile of the Collamer soil in this mapping unit resembles the profile described for the Collamer series, but the surface layer is only 6 inches thick. The Williamson soil is like the Collamer soil, but it has a more highly developed fragipan below a depth of 30 inches.

These soils have uniform slopes, most of which are less than 200 feet long. Surface drainage is good to excessive, and internal drainage is moderate.

The soils are suited to grasses and legumes. Choose hay and pasture mixtures that tolerate moderate internal drainage.

Because of the risk of erosion and the moderate internal drainage, this mapping unit is in capability unit IVew–1.

Williamson and Collamer fine sandy loams, 15 to 25 percent slopes, severely eroded (WeD3).—The surface layer of the Collamer soil in this mapping unit is lighter colored than that of the profile described for the Collamer series and is less than 4 inches thick. Also, the soil contains less organic matter and is shallower over the firm layer (fragipan). Where the soil has been cultivated, part of the yellowish-brown subsoil has been mixed with the surface soil. The Williamson soil is like the Collamer soil, but it has a more highly developed fragipan below a depth of 30 inches.

These soils are suited to grasses and legumes. Choose hay and pasture mixtures that tolerate restricted internal drainage. Divert surface water into suitable waterways.

Because of the risk of erosion and the restricted drainage, this mapping unit is in capability unit VIew–3.

Williamson and Collamer silt loams, 0 to 2 percent slopes (WfA).—The profile of the Collamer soil in this mapping unit resembles the profile described for the Collamer series. It contains more silt, however, and, therefore, is slower in permeability. The soil material in the layer between depths of about 22 and 30 inches is slightly hard when dry, friable when moist, and nonsticky when wet. The Williamson soil is similar to the Collamer soil, but it has a more highly developed fragipan below a depth of 30 inches.

These soils occur in level to nearly level areas or in depressions. Shallow water remains in the depressions for a short time during wet seasons. Internal drainage is moderate.

The soils are suited to corn, small grains, grasses, and legumes. Where the climate is favorable, they are suitable for vegetables and vineyards.

Choose hay and pasture mixtures that tolerate poor surface drainage and moderate internal drainage. Keep the natural drainageways open. Divert surface water from adjacent higher areas into suitable waterways.

Because of poor surface drainage and moderate internal drainage, this mapping unit is in capability unit IIw–1.

Williamson and Collamer silt loams, 2 to 8 percent slopes (WfB).—The profile of the Collamer soil in this mapping unit resembles the profile described for the Collamer series. It contains more silt, however, and, therefore, is slower in permeability. The soil material in the layer between depths of about 22 and 30 inches is slightly hard when dry, friable when moist, and nonsticky when wet. The Williamson soil is similar to the Collamer soil, but it has a more highly developed fragipan below a depth of 30 inches.

These soils have uniform slopes, most of which are less than 300 feet long. Surface and internal drainage are moderate.

The soils are suited to corn, small grains, grasses, and legumes. Where the climate is favorable, they are suitable for vegetables and vineyards.

Choose hay and pasture mixtures that tolerate moderate drainage. Keep the natural drainageways open. Divert surface water into suitable waterways. Plant clean-cultivated crops on the contour.

Because of the risk of erosion and the moderate drainage, this mapping unit is in capability unit IIew–3.

Williamson and Collamer silt loams, 8 to 15 percent slopes (WfC).—The profile of the Collamer soil in this mapping unit resembles the profile described for the Collamer series. It contains more silt, however, and, therefore, is slower in permeability; also, the surface layer is only 7 inches thick. The soil material in the layer between depths of about 22 and 30 inches is slightly hard when dry, friable when moist, and nonsticky when wet. The Williamson soil is similar to the Collamer soil, but it has a more highly developed fragipan below a depth of about 30 inches.

These soils have moderate slopes, most of which are less than 300 feet long. Surface drainage is good, and internal drainage is moderate.

The soils are suited to vegetables, corn, small grains, grasses, and legumes. Where the climate is favorable, they are suitable for vineyards.

Choose hay and pasture mixtures that tolerate moderate internal drainage. Divert surface water into suitable waterways. Plant clean-cultivated crops on the contour.

Because of the risk of erosion and the moderate internal drainage, this mapping unit is in capability unit IIIew–3.

Wooster Series

The Wooster soils are deep and well drained. Consequently, they are among the best agricultural soils of the glaciated upland. These soils occur on terminal moraines that form complex patterns of depressions and knolls known as kettles and kames. The pattern of stream drainage is poorly developed.

The parent material consisted of glacial till. It was made up of a mixture of materials derived mainly from acid shale bedrock and sandstone and partly from granite. The till has weathered considerably, and the lime has leached out.

These soils are in the same catena as the moderately well drained Mardin soils, the somewhat poorly drained to poorly drained Volusia soils, and the very poorly drained Alden soils.

The native vegetation was a chestnut-oak-maple type of forest. Sugar maple, aspen, beech, hemlock, cinquefoil, sheep sorrel, and povertygrass now grow in idle areas.

Typical profile of a Wooster gravelly silt loam (cultivated):

0 to 6 inches, dark grayish-brown gravelly silt loam; moderate, fine, granular structure; very friable when moist; pH 5.8; abrupt, smooth lower boundary.
6 to 13 inches, dark-brown, heavy silt loam; moderate, thin, platy structure becoming weak, medium, subangular blocky in the lower part of horizon; friable when moist; pH 5.6; gradual, wavy lower boundary.
13 to 18 inches, brown, heavy silt loam; moderate, medium, subangular blocky structure; friable when moist, slightly plastic when wet; pH 5.2; clear, smooth lower boundary.
18 to 24 inches, brown gravelly loam: weak, medium, subangular blocky structure; friable when moist; pH 5.4; gradual, wavy lower boundary.
24 to 40 inches, dark yellowish-brown gravelly silt loam; strong, medium, subangular blocky structure; firm when moist; pH 5.2; clear, smooth lower boundary.
40 to 72 inches+, dark reddish-brown gravelly sandy loam; weak, fine to medium, subangular blocky structure; very friable when moist; pH 5.6.

The amount of gravel throughout the profile varies in these soils.

Wooster gravelly silt loam, 3 to 12 percent slopes (WgB).—The profile of this soil is the same as the profile described for the series. This soil has undulating slopes, most of which are less than 300 feet long. Because of the complex pattern of depressions and knolls (kettles and kames), surface drainage is moderate to poor. Internal drainage is good.

This soil is suited to corn, small grains, grasses, and legumes. Where the slopes are not too complex, erosion can be controlled by cultivating on the contour.

Because of the risk of erosion, this soil is in capability unit IIe–1.

Wooster gravelly silt loam, 12 to 20 percent slopes (WgC).—The profile of this soil resembles the profile described for the series. This soil occurs in a complex pattern of depressions and knolls (kettles and kames). Surface drainage is good to moderate, and internal drainage is good.

This soil is suited to corn, small grains, grasses, and legumes. Where the climate is favorable, the soil is suitable for vegetables and vineyards.

In areas where the slopes are not too complex, plant clean-cultivated crops in contour strips. Divert surface water into suitable waterways.

Because of the risk of erosion, this soil is in capability unit IIIe–1.

Wooster gravelly silt loam, 20 to 30 percent slopes (WgD).—The profile of this soil resembles the profile described for the series. This soil is hilly. Most of the slopes are less than 200 feet long. Surface and internal drainage are good.

The soil is suited to grasses and legumes. Choose hay and pasture mixtures that tolerate droughty soil.

Because of the risk of erosion, this soil is in capability unit IVe–1.

Wooster gravelly silt loam, 30 to 40 percent slopes (WgE).—The profile of this soil resembles the profile described for the series. This soil is hilly. Most of the slopes are less than 200 feet long. Surface and internal drainage are excessive. The soil is suitable for trees. Choose planting stock that tolerates droughty soil.

Because of the risk of erosion, this soil is in capability unit VIIe–3.

Wooster gravelly silt loam, 30 to 40 percent slopes, severely eroded (WgE3).—This soil is droughty. The surface layer is lighter colored than that of the profile described for the series and is less than 4 inches thick. Also, the soil contains less organic matter. In areas that have been cultivated, part of the dark-brown subsoil is mixed with the surface soil.

This soil is suitable as woodland. Choose planting stock that tolerates droughty soil. Divert surface water into suitable waterways.

Because of the effects of erosion, this soil is in capability unit VIIe–3.

Formation and Classification of the Soils

Soils are formed through the interaction of five major factors. These soil-forming factors are (1) *parent material*, (2) *climate*, (3) *relief*, (4) *living organisms*, and (5) *time*. The degree to which the soils are influenced by the individual factors of soil formation varies from place to place. All sites that are subject to the same combined influence of these factors have one particular kind of soil.

Formation of the Soils

In Erie County the kind of rock from which the *parent material* was derived has had an important effect on the kind of soil that has formed. The character of the parent material influences the kind of changes that take place during the weathering process and also the speed of the weathering. Soil properties, such as texture, color, lime content, and permeability, are affected by the geologic properties of the original parent material.

Climate affects the formation of soils by influencing the rate of weathering of the rocks and the decomposition of minerals. Climate also affects leaching and the translocation of weathered materials.

Relief affects the rate of surface drainage and the movement of water through the soil. The degree of geologic erosion that has taken place was determined, in part, by the rate of surface drainage. Drainage has also influenced the rate and depth to which rock has weathered.

Living organisms, both plants and animals, affect the soil in several ways. They are sources of organic matter. The roots of plants absorb minerals and return some of them to the surface of the soil. Through the action of burrowing animals and the uprooting of trees, some of the subsoil is mixed with the surface soil.

The length of *time* the other factors of soil formation have been operating is indicated, to some extent, by the degree of development of the soil profile. The last of the Wisconsin glaciers retreated from the area that is now Erie County only 10,000 to 15,000 years ago. Consequently, most of the soils are fairly young; in some of them, soil-forming factors have not operated long enough for distinct horizons to have formed. Differences in time have not been responsible for most of the differences in the kind and distinctness of horizons. Such differences have been caused mainly by varying combinations of parent material, relief, and living organisms.

Soil profile

As a result of the interaction of the various factors of soil formation, layers of soil lying parallel to the land surface have formed. A vertical exposure of soil shows these layers, or horizons, which are called the soil profile.

The surface layer, or A horizon, of most of the soils in Erie County is high in organic matter and is less than 12 inches thick.

The B horizon contains less organic matter than the A, and it usually differs in color from the A horizon. The B horizon generally has different structure than the A and C horizons, and in most places it is between 12 and 18 inches thick. In soils that lack a B horizon, the A horizon is underlain by the C horizon.

The A and B horizons constitute the solum—the zone in which most of the organic and mineral matter has been added, removed, transferred, or translocated through soil-forming processes. Below the solum is the C horizon, or zone of parent material. This horizon contains little organic matter; it is made up of partly weathered rock material. Underlying the C horizon is unweathered geologic material, called the D horizon.

Soil catenas

Soils may be grouped in various ways to show their relationship to each other. One such grouping is the soil catena. A catena is a group of soils, within a specific soil zone, formed from similar parent materials but with unlike soil characteristics because of differences in relief or drainage. The soils of Erie County have been grouped in the soil catenas shown in table 6.

TABLE 6.—*Soil series arranged in catenas to show the relationship of parent material to drainage*

Land form and principal parent material	Well drained		Moderately well drained	Somewhat poorly drained	Poorly drained	Very poorly drained
	Shallow soils	Deep soils				
Upland covered by glacial till derived from:						
Acid sandstone and siltstone	Lordstown	Wooster	Mardin	Volusia	Volusia; Ellery	Alden.
Acid siltstone and shale	Manlius				Allis; Ellery	Alden.
Moderately calcareous, very silty shale, sandstone, and limestone.				Dalton	Ellery	Alden.
Calcareous shale, sandstone, and limestone.			Langford	Erie	Ellery	Alden.
Calcareous shale and silty clay			Mahoning	Mahoning	Trumbull	Miner.
Calcareous silt			Platea (moderately well drained variant).	Platea	Birdsall	Birdsall.
Lake plain:						
Calcareous, lacustrine silty clay				Caneadea	Canadice; Birdsall	Birdsall.
Lacustrine fine sand and silt			Williamson; Collamer	Wallington	Wallington; Birdsall	Birdsall.
Lacustrine fine sand over calcareous silt.		Ottawa	Berrien	Rimer	Rimer	Wauseon.
Terraces:						
Acid sand and gravel of beaches		Conotton	Conotton (moderately well drained variant).	Conotton (moderately well drained variant); Fredon.	Fredon	Halsey.
Outwash material derived from acid sandstone, shale, and limestone.		Howard	Phelps	Fredon	Fredon	Halsey.
Acid stream deposits washed from glaciated upland.		Unadilla	Scio	Fredon	Fredon	Halsey.
Bottom land:						
Recent alluvium washed from glaciated upland.		Chagrin	Lobdell	Wayland	Wayland	Sloan.[1]

[1] Ranges from very poorly drained to permanently wet.

Classification of the Soils

The soil series in this county have been classified in great soil groups. The soils within each great soil group have several characteristics in common, although they may differ greatly in other characteristics. Five great soil groups are represented in the county. In addition, some of the soils are intergrading from one great soil group to another; the Sols Bruns Acides great soil group is further subdivided according to whether or not the soils have a fragipan. The soil series and the great soil group to which each belongs are as follows:

Alluvial:	
Chagrin	Lobdell
Sols Bruns Acides:	
Berrien	Unadilla
Ottawa	
Sols Bruns Acides intergrading to Lithosols:	
Lordstown	Manlius
Sols Bruns Acides with fragipans:	
Langford	Scio
Mardin	Williamson
Platea	
Sols Bruns Acides intergrading to Low-Humic Gley soils:	
Dalton	Wallington
Erie	
Volusia	
Low-Humic Gley soils:	
Allis	Rimer
Ellery	Wayland
Humic Gley soils:	
Alden	Miner
Birdsall	Sloan
Halsey	Wauseon
Gray-Brown Podzolic soils:	
Caneadea	Mahoning
Collamer	Phelps
Conotton	Wooster
Howard	
Gray-Brown Podzolic soils intergrading to Low-Humic Gley soils:	
Canadice	Trumbull
Fredon	

Alluvial soils

Alluvial soils are forming in material that has been deposited recently. Not enough time has elapsed for them to have formed distinct horizons. The Alluvial soils in Erie County are the Chagrin soils, which are well drained, and the Lobdell, which are moderately well drained. These soils are forming in sediments washed from the upland by streams and deposited on the flood plain. The profile described for the Chagrin series in the section, Descriptions of the Soils, is typical of the Alluvial soils.

Sols Bruns Acides

The soils of this great soil group are weathered to great depths. In these soils the content of silt and clay, as well as the color of the soil, is fairly uniform throughout the solum. The boundary between the A and B horizons is not abrupt.

In Erie County the typical Sols Bruns Acides are the Ottawa and Berrien soils, which have formed in lacustrine deposits, and the Unadilla soils of the stream terraces. Of these soils the Ottawa and Unadilla are well drained and the Berrien are moderately well drained. The profile described for the Ottawa series in the section, Descriptions of the Soils, is typical of the Sols Bruns Acides.

In addition to the typical Sols Bruns Acides in Erie County, there are Sols Bruns Acides intergrading to Lithosols, Sols Bruns Acides with fragipans, and Sols Bruns Acides intergrading to Low-Humic Gley soils.

The Lordstown and Manlius soils, which are execessively drained, are Sols Bruns Acides intergrading to Lithosols. These soils are shallow to bedrock and have a weakly developed B horizon. As the result of biological activity, organic matter has been mixed throughout the solum. The Lordstown soils have formed mainly from material derived from sandstone, and the Manlius soils, mainly from material derived from shale. The profile described for the Manlius series in the section, Descriptions of the Soils, is typical of the Sols Bruns Acides intergrading to Lithosols.

The following soils are Sols Bruns Acides with fragipans: The Langford soils, formed in moderately limy till; the Mardin soils, in till that is low in lime; the Platea soils, in limy, silty till; the Scio soils, on stream terraces in deposits washed from glaciated upland; and the Williamson soils, in lacustrine fine sand and silt. These soils have a very firm, dense, brittle layer that generally begins at depths of about 26 to 30 inches. As a rule, this layer is hard when dry and slightly plastic when wet. It limits the movement of air and water and thus restricts the weathering of the underlying material. The profile described for the Langford series in the section, Descriptions of the Soils, is typical of the Sols Bruns Acides with fragipans.

Sols Bruns Acides intergrading to Low-Humic Gley soils have somewhat poor to poor internal drainage. This group is made up of the Dalton and Erie soils, formed in moderately limy till; the Volusia soils, in till that is low in lime; and the Wallington soils, mainly in lacustrine fine sand and silt. A high water table in these soils causes the process known as gleization. This has caused mottles and streaks to form, beginning at depths of about 12 to 26 inches. The profile described for the Erie series is in the section, Descriptions of the Soils.

A study of the effect of drainage on the mineralogical composition of soils of several catenas in Pennsylvania was made by Leon J. Johnson. Undisturbed profiles taken from adjacent areas of moderately well drained Langford soils, which are typical Sols Bruns Acides, and somewhat poorly drained Erie soils, which are Sols Bruns Acides intergrading to Low-Humic Gley soils, were examined and analyzed.[2] (Chemical and physical data for two of the profiles studied, Langford (profile A) and Erie (profile B), are given in table 7.) The soils of both these series formed from similar parent material, and the heavy mineral suites are similar in the parent material of both. The following are some of the findings of this study:

(1) The Langford and Erie soils have been subjected to similar weathering, but the Langford soils, which are better drained than the Erie, have weathered to a greater depth and have a more strongly developed profile.

(2) In the very fine sand fraction of both series, much feldspar and some quartz and mica are distributed throughout the profile.

[2] JOHNSON, LEON J. THE INFLUENCE OF DRAINAGE ON THE MINERALOGICAL COMPOSITION OF SEVERAL SOIL CATENAS IN PENNSYLVANIA. Thesis, Ph. D., Pennsylvania State Univ. 1957.

(3) The silt fractions contain more mica, kaolin, and chlorite than the very fine sand fractions. In the horizons in the upper part of the profile, the mica is weathered somewhat. In the Erie soils there is much mica below a depth of 14 inches, but in the more highly weathered Langford soils, which have better drainage, only a moderate amount of mica occurs above a depth of 21 inches.
(4) The cation exchange capacity of the clay appears to increase with increased weathering of the illite.
(5) In the clay fraction of the Erie soils, vermiculite is abundant above a depth of 14 inches but scarce below a depth of 21 inches. In the Langford soils vermiculite is abundant above a depth of 15 inches, common between depths of 15 and 28 inches, and scarce below a depth of 28 inches. Illite is common below a depth of 14 inches in the Erie soils and below a depth of 21 inches in the Langford soils.
(6) There is a close relationship between the content of potash (K_2O) of the clay fraction and the pH of the soil. The upper horizons of the Erie soils have a greater content of K_2O than those of the Langford soils.

Low-Humic Gley soils

The Allis, Ellery, Rimer, and Wayland soils are in the Low-Humic Gley great soil group. These soils have a shallow water table that causes the reduction of minerals beginning at depths of 6 to 12 inches. The Allis soils have formed from shallow, acid till that is underlain by weathered shale at depths of 18 to 26 inches. The Ellery soils have formed from moderately limy till; the Rimer soils, from lacustrine fine sand over calcareous silt; and the Wayland, from alluvium deposited recently on the flood plains. A profile of a soil of the Rimer series is described in the section, Descriptions of the Soils.

Humic Gley soils

The Humic Gley soils have a water table at shallow depths. In this great soil group are the Alden soils, formed in moderately limy till; the Birdsall soils, formed mainly in lacustrine deposits of silty clay; the Halsey soils, in outwash material deposited mainly on terraces; the Miner soils, from silty till; the Sloan soils, from alluvium deposited recently on bottom land; and the Wauseon soils, in lacustrine fine sand over calcareous silt.

The Humic Gley soils have very dark brown or black surface horizons that are high in organic matter and that range from 6 to 10 inches in thickness. The profile described for the Miner series in the section, Descriptions of the Soils, is typical of the Humic Gley soils.

Gray-Brown Podzolic soils

This great soil group is made up of soils that are weathered to a considerable depth. In general, the B horizons in these soils have a blocky structure and contain more clay than the A and C horizons. In wooded areas a marked accumulation of organic matter lies on the surface. Carbonates have been leached to depths of more than 3 feet. Some clay has moved downward from the A horizon to the B horizon.

The Gray-Brown Podzolic soils in Erie County are the Caneadea soils, formed in calcareous, lacustrine silty clay; the Collamer soils, in lacustrine fine sand and silt; the Conotton soils, mainly in acid sand and gravel of the beach ridges; the Howard soils, in outwash material; the Mahoning soils, in calcareous silty clay till; the Phelps soils, in outwash material; and the Wooster soils, in glacial till. The profile described for the Howard series in the section, Descriptions of the Soils, is typical of the Gray-Brown Podzolic soils.

Gray-Brown Podzolic soils intergrading to Low-Humic Gley soils have somewhat poor internal drainage. These are the Canadice soils, formed in calcareous, lacustrine silty clay; the Fredon soils, in glacial outwash deposited on beach ridges and terraces; and the Trumbull soils, in calcareous silty clay till. These soils have a shallow water table that has resulted in gleization of the soil material at depths of about 12 to 26 inches. The profile described for the Trumbull series in the section, Descriptions of the Soils, is typical for Gray-Brown Polzolic soils that intergrade to Low-Humic Gley soils.

Laboratory Determinations

Physical and chemical properties of selected soils in Erie County are shown in table 7. Two sites were selected for sampling each soil type analyzed. Samples were collected from each horizon that could be recognized in a pit dug through the solum and into the parent material.

Most of the laboratory tests were made at the Soil Survey Laboratory in Lincoln, Nebr. Other tests, including bulk density determinations, were made at the Soil Survey Laboratory, Beltsville, Md., and at Pennsylvania State University.

Size class and diameter of particles, as shown in table 7, were determined by methods developed by V. J. Kilmer and L. T. Alexander (*3*) and V. J. Kilmer and J. F. Mullins (*4*). Organic carbon and exchangeable cations were determined by a method developed by Michael Peech, L. T. Alexander, L. A. Dean, and J. F. Reed (*6*). Free iron oxides were determined by a method developed by V. J. Kilmer that involves reducing and dissolving the iron by means of sodium hydrosulfite and titration with potassium dichromate ($K_2Cr_2O_7$).

For most horizons of the soils sampled, bulk density was determined by the core method. Some of the determinations were made from 3-inch by 3-inch cores, taken by L. T. Kardos, Pennsylvania State University, with a Uhland sampler. Other determinations were made at the Beltsville Laboratory using 2-inch by 1-inch cores, taken with the Salinity Laboratory sampler. Bulk density in the D_1 and D_2 horizons in Profile B of the Langford soil and in the C_{1g} and C_2 horizon in Profile A of the Erie soil was determined by the clod method.

The Langford soil (Profile A) and the Erie soil (Profile B) were sampled at sites about 500 feet apart in woodland northwest of Lake Pleasant. This area seems to be part of a moraine of one of the midstages of the Wisconsin glaciation. The Langford soil (Profile B) and the Erie soil (Profile A) were sampled at sites about 300 feet apart in a grazed woodlot about 1 mile east of Mill Village. This area appears to be ground moraine of a slightly

earlier stage of the Wisconsin glaciation. Both of the Langford profiles are similar to the typical profile described for the Langford series in the section, Descriptions of the Soils. Profile B of the Erie soil is the basis for the typical profile described for the Erie series.

Data in table 7 show little evidence of movement of clay in the Langford and Erie soils. Differences in the amount of clay in various horizons seem to be more the product of stratification and of weathering of the less resistant material than of eluviation. In general, the Langford and Erie soils on the more strongly rolling and more stratified moraine have a lower pH and are deeper to carbonates than these soils on less rolling areas. This suggests that in these areas the soil either has been leached more or the parent material originally was lower in lime than that of less strongly sloping, less stratified areas.

The Platea soils were sampled in woodland. Profile A, slightly modified, is the basis of the typical profile described for the Platea series. Movement of clay along ped faces, noted in the field as clay coatings, has not been sufficient to result in much concentration of clay in the lower horizons. The base exchange capacity of the Platea is only slightly greater than that of the Langford and Erie soils. Because the Platea soils, in general, have slightly more bases in the upper horizons than the Erie soils, they have a slightly higher degree of base saturation. Compared to the Trumbull soils, however, both the Platea and Erie soils are low in degree of saturation and in total bases.

The Trumbull soils were sampled in the southwestern corner of the county. Samples for Profile A were taken in a wooded site on an upland plain at an elevation of 925 feet. At this location, the soil has a slope of 1 percent toward the west. Samples for Profile B were taken in a cleared field at an elevation of 960 feet where the soil has a slope of 1 percent toward the south.

In field examination the two profiles appeared very similar except that Profile B showed a sharply defined band of gravel between depths of 4 and 5 feet. Laboratory analysis revealed that Profile B has more fine silt and less clay than Profile A. As a result, the textural class of the horizons of the two profiles differ, but this difference has not had much effect on soil structure and other physical properties observed in the field. The typical profile described for the Trumbull series is a composite of Profiles A and B.

The Trumbull soils have the highest exchange capacity of the soils sampled. Also, carbonates occur nearer the surface. The degree of saturation in the horizons above the carbonate zone is not much greater than that of the Platea soils. The Trumbull soils have no consistent pattern of textural changes from one horizon to another; differences in texture seem to be related to the stratification of soil material.

The Rimer soils were sampled on the lake plain near the Ohio State line at elevations between 650 and 665 feet. Samples for Profile A were taken in an area of second-growth timber and brush covering a field that was formerly cleared. Samples for Profile B were taken in woodland northeast of Avonia. In both sites the soil had formed in sediments from Glacial Lake Warren. Profile A is the basis for the typical profile described for the Rimer series.

Unlike the other soils analyzed, the Rimer soils are very sandy in all horizons above the calcareous substratum. Their base exchange capacity is low. Rimer fine sandy loam (Profile A) has a fairly high degree of saturation with calcium and magnesium, apparently because of the seepage of alkaline ground water from higher lying soil. In Profile B the water table was deeper than in Profile A and, in general, Profile B was lower in calcium and magnesium.

The Dalton soils were sampled east of Cranesville on smooth, nearly level upland at an elevation of about 1,120 feet. Samples for Profile A were taken in woods that have a strongly developed microrelief of cradle knolls. Samples for Profile B were taken in idle cropland. In both profiles the upper horizons are very silty; less than 1 percent of the particles are larger than 2 millimeters. The typical profile described for the Dalton series is based on Profile B.

The Dalton soils are characterized by a sharp break in texture between the very silty upper horizons and the gravelly loam in the lower part of the subsoil. This break, which is apparent in Profile B, indicates that the soil has developed from a thin, silty surface deposit overlying mixed material. The development of the solum has extended downward into the mixed material.

Additional Facts About the County

This section provides general information about the geology, climate, water supply, native vegetation, population, transportation, market facilities, and agriculture of Erie County. The statistics used are mainly from reports published by the U.S. Bureau of the Census.

Geology

The bedrock of Erie County is sedimentary, that is, it has formed from sediments deposited on the floors of ancient seas. Shale of the Devonian age underlies most of the soils. It has formed from layers of silt and clay alternating with thin strata of sandstone. Sandstone, formed from sandy sediments, caps some of the higher hills. The stratified shale and sandstone lie horizontal to the surface with but little distortion by folding.

Effects of glaciation

The area that is now Erie County was covered by at least three different glaciers. Geologists estimate that the last glaciation, the Late Wisconsin, occurred between 10 and 15 thousand years ago, overriding and masking evidence of previous glaciation in the area (*8*).

As the glacier melted, it left the landscape coated with debris, or glacial till, carried by the ice. The glacial till consists of a mixture of former soils and some granite, limestone, quartzite, and sandstone. These materials were picked up and carried into the county from areas to the north. The till also contains various amounts of sandstone and acid shale bedrock ground into fine particles by the ice. The glacial material ranges in size from clay particles to boulders.

TABLE 7.—*Mechanical and chemical*

[Lack of data indicates

Soil and location	Horizon	Depth	Mechanical analysis										Bulk density
			Size class and diameter of particles (in millimeters)							Other size classes			
			Very coarse sand (2–1)	Coarse sand (1–0.5)	Medium sand (0.5–0.25)	Fine sand (0.25–0.10)	Very fine sand (0.10–0.05)	Silt (0.05–0.002)	Clay (<0.002)	0.2–0.02	0.02–0.002	>2	
		Inches	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	
Langford silt loam, 3 to 8 percent slopes (Profile A): In Greene Township on S. S. Firewich Farm; 0.5 mi. SE. of West Greene School; in woods 40 ft. S. of line fence.	A_1	0–2	[1] 5.8	[1] 4.4	[1] 3.3	[1] 9.4	[1] 11.3	51.0	14.8	39.6	28.4	13.8	0.63
	A_2	2–8	[1] 5.9	[1] 4.5	[1] 3.3	[1] 9.0	[1] 10.7	52.4	14.2	39.8	28.6	17.9	.93
	B_{21}	8–15	[1] 5.4	[1] 4.1	[1] 2.9	[1] 7.9	[1] 9.0	57.6	13.1	37.6	33.6	18.0	1.12
	B_{22}	15–21	[1] 7.9	[1] 6.1	[1] 4.4	[3] 11.6	[3] 12.2	47.4	10.4	40.6	25.7	23.2	1.06
	B_{23gm}	21–28	[1] 8.1	[1] 6.2	[1] 4.4	[3] 11.8	[3] 14.4	46.1	9.0	45.2	22.3	24.3	1.60
	C_{1g}	28–36	[1] 17.9	[1] 12.8	[1] 8.3	[3] 15.1	[3] 9.6	25.4	10.9	28.5	14.3	39.5	1.68
	C_{2g}	36–48	[1] 11.1	[1] 8.3	[1] 5.6	[3] 14.3	[3] 13.7	31.8	15.2	38.4	15.7	23.4	1.67
	C_{3g}	48–60	[4] 10.8	[4] 5.1	[4] 3.6	[5] 9.4	[5] 11.8	47.2	12.1	41.4	23.1	19.1	------
	C_4	60–72+	[4] 7.0	[4] 5.7	[4] 4.1	[5] 10.6	[5] 12.5	55.3	4.8	46.0	27.8	20.2	------
Langford silt loam, 0 to 3 percent slopes (Profile B): In Le Boeuf Township on Helen Henry Farm; 1 mi. E. of Mill Village and 250 ft. S. of U.S. Highway No. 6; in grazed woodlot.	A_1	0–2½	[1] 1.4	[1] 1.8	[1] 2.0	[1] 16.8	[1] 24.1	41.7	12.2	55.5	21.9	([6])	1.08
	A_2	2½–9	[1] 1.0	[1] 1.3	[1] 1.7	[1] 17.0	[1] 26.3	42.9	9.8	59.3	21.6	([6])	.94
	B_1	9–18	[1].6	[1] 1.3	[1] 2.0	[1] 18.7	[1] 25.8	42.2	9.4	59.6	21.4	([6])	.95
	B_{21}	18–24	[1] 1.2	[1] 1.2	[1] 1.8	[1] 20.0	[1] 25.7	39.3	10.8	59.0	19.6	3.7	1.39
	A'_{21g}	24–30	[3].6	[3].8	[3] 1.4	[3] 21.2	[3] 33.5	34.5	8.0	68.6	14.8	([6])	1.65
	A'_{22g}	30–34	[3] 1.0	[3] 1.3	[3] 2.0	[3] 47.8	[3] 20.1	21.2	6.6	64.3	8.6	1.1	1.58
	B'_{2gm}	34–44	[3] 1.9	[3] 1.4	[3] 2.3	[3] 37.8	[3] 17.3	25.7	13.6	55.7	11.7	2.9	1.68
	D_1	44–54	[3] 4.2	[3] 3.5	[3] 2.1	[3] 5.0	[3] 7.3	51.9	26.0	29.5	32.6	16.4	1.80
	D_2	54–70	[7] 4.7	[7] 2.9	[7].6	[7] 1.2	[7] 5.0	62.2	23.4	31.1	36.8	13.5	1.98
	D_3	70–75+	[7] 9.5	[7] 5.5	[7] 1.5	[7] 4.3	[7] 8.4	52.7	18.1	33.5	30.3	27.6	2.02
Erie silt loam, 3 to 8 percent slopes (Profile A): In Le Boeuf Township on Helen Henry Farm; 1 mi. E. of Mill Village and just S. of U.S. Highway No. 6; in grazed woodlot.	A_1	0–1½	[8] 4.1	[8] 3.0	[8] 1.9	[8] 5.0	[8] 8.0	62.8	15.2	36.7	36.9	5.0	------
	A_2	1½–6½	[8] 3.8	[8] 2.3	[8] 1.6	[8] 4.0	[8] 7.1	62.7	18.5	36.2	36.0	11.7	1.14
	B_{1g}	6½–13	[8] 1.7	[8] 1.9	[8] 1.4	[8] 4.1	[8] 7.3	63.5	20.1	37.0	36.3	7.0	1.19
	A'_{2g}	13–22	[8] 3.6	[8] 3.8	[8] 2.8	[8] 6.9	[8] 9.4	56.0	17.5	41.0	28.4	11.8	1.41
	B'_{21gm}	22–31	[8] 4.2	[8] 7.4	[8] 6.8	[8] 13.3	[8]10.4	38.7	19.2	37.5	18.4	11.9	1.48
	B'_{22gm}	31–43	[8] 5.8	[8] 4.5	[8] 3.4	[8] 6.9	[8] 7.3	47.7	24.4	29.8	28.9	24.9	1.50
	C_{1g}	43–58	[8] 3.2	[8] 3.4	[8] 1.9	[8] 4.3	[8] 6.7	55.3	25.2	30.1	34.4	22.5	2.02
	C_2	58–64+	[9] 5.0	[9] 4.4	[9] 2.6	[9] 5.6	[9] 8.0	53.0	21.4	33.0	31.4	16.5	1.96
Erie silt loam, 3 to 8 percent slopes (Profile B): In Greene Township on S. S. Firewich Farm; 0.6 mi. SE. of West Greene School; in woods 400 ft. S. of line fence.	A_1	0–2	[10] 5.2	[10] 3.4	[10] 2.4	[10] 5.8	[10] 7.6	60.7	14.9	34.8	36.9	11.7	.79
	A_2	2–9	[10] 2.2	[10] 2.0	[10] 1.5	[10] 4.1	[10] 6.6	65.1	18.5	35.8	38.5	13.2	.95
	B_1	9–14	[10] 6.0	[10] 6.4	[10] 4.6	[10] 11.2	[10] 15.0	48.8	8.0	50.1	20.4	15.9	1.30
	B_{21g}	14–21	[10] 4.0	[10] 4.7	[10] 3.8	[10] 10.2	[10] 13.7	53.6	10.0	48.4	25.0	16.4	1.64
	B_{22gm}	21–29	[10] 10.2	[10] 5.0	[10] 3.2	[10] 8.7	[10] 10.7	47.8	14.4	39.4	24.2	16.2	1.79
	B_{23gm}	29–38	[10] 5.3	[10] 5.8	[10] 4.5	[10] 11.3	[10] 12.5	48.3	12.3	43.7	23.7	8.5	1.80
	C_{1g}	38–43	[10] 5.0	[10] 6.0	[10] 4.2	[10] 10.4	[10] 12.2	51.0	11.2	43.2	26.0	15.1	1.85
	C_2	43–51+	[11] 10.0	[11] 6.4	[11] 4.2	[11] 10.6	[11] 12.0	45.5	11.3	40.8	23.0	22.2	1.91
Platea silt loam, 8 to 15 percent slopes (Profile A): In Girard Township on David Blair Farm; 2.75 mi. SE. of Girard along Route No. 25014; in woods 115 ft. N. of road.	A_1	0–4	[8] 1.9	[8] 2.4	[8] 1.6	[8] 5.0	[8] 7.1	54.4	27.6	28.0	36.6	3.7	.72
	A_2	4–10	[8] 1.1	[8] 2.5	[8] 2.1	[8] 6.0	[8] 8.5	55.9	23.9	32.0	36.0	7.6	1.07
	B_{1g}	10–15	[8] 1.7	[8] 3.5	[8] 2.5	[8] 6.6	[8] 9.2	56.2	20.3	33.6	35.7	8.0	1.38
	B_{21g}	15–21	[8] 1.6	[8] 2.5	[8] 1.8	[8] 4.8	[8] 7.5	59.7	22.1	32.1	38.1	7.7	1.53
	B_{22g}	21–28	[8] 2.2	[8] 2.5	[8] 1.8	[8] 5.3	[8] 8.3	58.8	21.1	33.8	36.6	6.3	1.64
	B_{23g}	28–38	[8] 1.5	[8] 2.7	[8] 2.1	[8] 6.4	[8] 10.0	54.6	22.7	34.6	34.0	6.1	1.76
	B_{24g}	38–48	[8] 1.9	[8] 2.7	[8] 2.1	[8] 6.9	[8] 11.2	53.5	21.7	35.4	33.7	12.3	1.79
	B_{25g}	48–60	[12] 1.4	[12] 2.2	[12] 2.0	[12] 6.9	[12] 11.0	56.0	20.5	35.9	35.7	5.5	1.78
	C_1	60–72	[12] 4.7	[12] 4.1	[12] 2.7	[12] 7.4	[12] 10.6	52.5	18.0	33.7	34.1	6.8	1.74
	C_2	72–80+	[12] 3.2	[12] 3.3	[12] 2.7	[12] 7.8	[12] 11.8	53.7	17.5	37.8	32.6	14.4	1.78

See footnotes at end of table.

analyses of selected soils

determinations not made]

Mechanical analysis—Con.	Chemical analysis														
Textural class	Reaction	Organic carbon	Nitrogen	C/N ratio	Free iron oxide Fe_2O_3	$CaCO_3$ equivalent	Cation exchange capacity by NH_4Ac	Extractable cations (meq./100 gm.)					Degree of base saturation		Ca/Mg ratio
								Ca	Mg	H	Na	K	Capacity by NH_4Ac	Capacity by sum of cations	
	pH	*Percent*	*Percent*		*Percent*	*Percent*	*Meq./100 g.*						*Percent*	*Percent*	
Silt loam	[2] 4. 2	9. 44	0. 579	16. 3	1. 9		27. 6	4. 4	0. 3	33. 2	0. 1	0. 5	19	14	14. 7
Silt loam	4. 6	2. 74	. 225	12. 2	2. 1		15. 7	1. 1	. 1	22. 7	<. 1	. 3	10	6	11. 0
Silt loam	4. 7	1. 74	. 136	12. 8	2. 0		11. 4	. 6	. 2	18. 9	<. 1	. 2	9	5	3. 0
Loam	4. 9	1. 07	. 091	11. 8	1. 6		8. 4	. 5	. 1	14. 3	<. 1	. 2	10	5	5. 0
Loam	5. 2	. 20	. 024	8. 0	1. 4		4. 0	. 8	. 2	5. 7	<. 1	. 1	28	16	4. 0
Coarse sandy loam.	6. 1	. 20			1. 7		5. 8	3. 4	. 7	4. 5	<. 1	. 1	72	48	4. 8
Sandy loam	7. 1	. 12			1. 8	<1	7. 7	6. 5	1. 2	4. 1	<. 1	. 1	101	66	5. 4
Loam	7. 9	. 10			1. 4	3	4. 7	15. 1	1. 1	. 8	<. 1	. 1	347	95	13. 7
Silt loam	8. 0	. 08			1. 1	8	2. 4	15. 3	. 5	<. 1	<. 1	<. 1	658	100	30. 6
Loam	4. 2	8. 53	. 490	17. 4	1. 6		21. 5	1. 8	. 5	30. 2	<. 1	. 5	13	8	3. 6
Loam	4. 5	2. 07	. 134	15. 4	1. 9		9. 2	. 1	. 1	18. 0	<. 1	. 2	4	2	1. 0
Loam	4. 6	1. 37	. 095	14. 4	1. 5		6. 6	<. 1	<. 1	13. 5	<. 1	. 2	3	1	
Loam	4. 6	. 38	. 040	10. 0	1. 2		4. 2	. 1	<. 1	8. 1	<. 1	. 1	5	2	
Very fine sandy loam.	5. 0	. 14			. 8		2. 9	. 5	<. 1	5. 3	<. 1	. 1	21	10	
Fine sandy loam.	5. 3	. 08			1. 2		3. 0	1. 0	. 3	4. 0	<. 1	. 1	47	26	3. 3
Fine sandy loam.	5. 8	. 08			1. 6		6. 5	4. 3	1. 2	3. 7	<. 1	. 1	86	60	3. 6
Silt loam	6. 5	. 11			2. 1		9. 0	7. 1	1. 8	4. 9	. 1	. 1	101	65	3. 9
Silt loam	6. 5	. 13			2. 1		8. 6	6. 8	2. 0	4. 9	<. 1	. 1	103	64	3. 4
Silt loam	6. 0	. 23			2. 2		7. 0	4. 9	1. 4	5. 7	<. 1	. 1	91	53	3. 5
Silt loam	4. 0	8. 08	. 479	16. 9	1. 9		20. 6	1. 3	. 4	32. 7	<. 1	. 3	10	6	3. 2
Silt loam	4. 2	1. 59	. 114	13. 9	1. 9		10. 5	. 1	. 1	19. 3	<. 1	. 2	4	2	1. 0
Silt loam	4. 3	. 76	. 076	10. 0	2. 0		8. 5	<. 1	<. 1	15. 6	<. 1	. 2	2	1	
Silt loam	4. 5	. 34	. 042	8. 0	2. 0		7. 0	. 5	. 1	11. 8	<. 1	. 2	11	6	5. 0
Loam	4. 7	. 12	. 028	4. 0	1. 7		7. 5	2. 2	. 9	9. 4	<. 1	. 2	44	26	2. 4
Loam	5. 7	. 10			2. 2		9. 6	6. 9	1. 6	5. 3	<. 1	. 1	90	62	4. 3
Silt loam	7. 1	. 12			2. 1	<1	8. 8	8. 0	1. 6	4. 5	<. 1	. 1	110	68	5. 0
Silt loam	7. 5	. 20			1. 8	3	7. 3	15. 7	1. 2	2. 8	<. 1	. 1	233	86	13. 1
Silt loam	4. 2	11. 34	. 668	17. 0	1. 7		25. 5	8. 4	1. 4	32. 4	<. 1	. 3	40	24	6. 0
Silt loam	4. 4	3. 00	. 263	11. 4	2. 2		15. 1	1. 2	. 4	26. 0	<. 1	. 2	12	6	3. 0
Loam	4. 6	. 91	. 082	11. 0	1. 2		5. 5	<. 1	<. 1	11. 0	<. 1	. 1	2	1	
Silt loam	4. 9	. 21	. 029	7. 0	1. 5		4. 8	1. 3	. 4	6. 5	<. 1	. 1	38	22	3. 2
Loam	5. 3	. 12	. 023	5. 0	1. 8		6. 4	3. 7	. 9	4. 5	<. 1	. 1	73	51	4. 1
Loam	6. 5	. 19			1. 7		4. 9	3. 8	. 7	2. 4	<. 1	<. 1	92	65	5. 4
Silt loam	7. 2	. 10			1. 5	<1	5. 5	5. 2	. 8	1. 6	<. 1	. 1	111	79	6. 5
Loam	8. 0	. 09			1. 4	7	4. 7	18. 8	1. 0	<. 1	<. 1	. 1	340	100	18. 8
Silty clay loam.	4. 1	6. 97	. 534	13. 0	2. 5		26. 3	2. 9	1. 8	33. 6	<. 1	. 5	20	13	1. 6
Silt loam	4. 3	1. 87	. 177	10. 6	2. 3		14. 2	. 6	. 8	20. 5	<. 1	. 3	12	8	. 8
Silt loam	4. 4	. 51	. 074	7. 0	2. 4		8. 5	. 4	. 4	14. 3	<. 1	. 2	12	6	1. 0
Silt loam	4. 6	. 37	. 059	6. 0	2. 4		8. 8	. 7	. 2	9. 4	<. 1	. 2	12	10	3. 5
Silt loam	4. 8	. 28	. 049	6. 0	2. 2		7. 1	1. 2	. 6	8. 1	<. 1	. 2	28	20	2. 0
Silt loam	5. 0	. 20			2. 5		8. 4	2. 7	1. 4	7. 7	<. 1	. 1	50	35	1. 9
Silt loam	5. 6	. 19			2. 5		9. 2	5. 3	2. 2	4. 9	. 1	. 1	84	61	2. 4
Silt loam	6. 5	. 16			2. 4		10. 6	7. 5	2. 5	3. 2	<. 1	. 1	95	76	3. 0
Silt loam	6. 8	. 18			2. 3		8. 8	6. 8	2. 0	2. 8	<. 1	. 1	101	76	3. 4
Silt loam	7. 8	. 17			1. 6	11	7. 2	11. 9	1. 7	. 8	<. 1	. 1	190	94	7. 0

TABLE 7.—*Mechanical and chemical*

[Lack of data indicates

Soil and location	Horizon	Depth	Mechanical analysis										Bulk density
			Size class and diameter of particles (in millimeters)										
			Very coarse sand (2–1)	Coarse sand (1–0.5)	Medium sand (0.5–0.25)	Fine sand (0.25–0.10)	Very fine sand (0.10–0.05)	Silt (0.05–0.002)	Clay (<0.002)	Other size classes			
										0.2–0.02	0.02–0.002	>2	
		Inches	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	
Platea silt loam, 2 to 8 percent slopes (Profile B): On Cary Scott Farm near S. edge of village of Platea; in woods 400 ft. E. of Pa. Route No. 18.	A_1	0–4	[8] 1. 4	[8] 2. 1	[8] 2. 5	[8] 8. 7	[8] 11. 1	57. 6	16. 6	40. 2	34. 0	2. 0	0. 94
	A_2	4–7½	[8] 1. 6	[8] 2. 4	[8] 2. 6	[8] 9. 0	[8] 11. 5	56. 7	16. 2	40. 6	33. 2	7. 7	1. 22
	B_1	7½–10	[8] 1. 3	[8] 2. 6	[8] 3. 2	[8] 9. 2	[8] 11. 8	57. 1	14. 8	41. 6	33. 0	18. 8	1. 62
	B_{21g}	10–20	[8] 2. 2	[8] 3. 0	[8] 3. 1	[8] 9. 0	[8] 11. 9	56. 0	14. 8	40. 8	32. 6	5. 3	1. 45
	B_{22g}	20–32	[8] 1. 4	[8] 3. 0	[8] 3. 0	[8] 8. 9	[8] 12. 3	52. 6	18. 8	40. 0	30. 4	5. 4	1. 35
	B_{23g}	32–42	[12] 2. 8	[12] 3. 1	[12] 2. 5	[12] 8. 4	[12] 11. 6	52. 4	19. 2	37. 5	31. 9	11. 4	1. 83
	C_1	42–53	[12] 2. 2	[12] 3. 2	[12] 2. 5	[12] 8. 6	[12] 11. 7	53. 4	18. 4	37. 5	33. 0	12. 2	1. 73
	C_2	53–61	[12] 1. 7	[12] 2. 4	[12] 2. 2	[12] 7. 6	[12] 10. 6	59. 7	15. 8	37. 2	38. 1	3. 8	1. 83
	C_3	61–68	[13] 4. 2	[13] 4. 0	[13] 3. 1	[13] 10. 0	[13] 11. 9	54. 4	12. 4	39. 0	33. 7	6. 0	1. 86
	D	68–77+	[13] 4.	[13] 6	[13] 3	[13] 1. 0	[13] 1. 3	65. 4	31. 0	7. 5	59. 8	2. 9	1. 73
Trumbull silt loam, 0 to 3 percent slopes (Profile A): In Conneaut Township on Harold Williams Farm; S. of Township Route No. 883 and 2,200 ft. E. of Township Route No. 312; in woods.	A_1	0–3	[14] 1. 2	[14] 1. 4	[14] 1. 1	[14] 3. 7	[14] 3. 8	57. 6	31. 2	26. 7	36. 9	([6])	. 81
	A_{2g}	3–7	[14] 5	[14] 1. 4	[14] 1. 3	[14] 4. 1	[14] 4. 8	50. 5	37. 4	20. 6	37. 2	([6])	1. 13
	B_{1g}	7–12	[14] 6	[14] 1. 3	[14] 1. 4	[14] 4. 5	[14] 5. 3	55. 0	31. 9	23. 2	39. 8	1. 2	1. 18
	B_{21g}	12–24	[15] 4	[15] 9	[15] 7	[15] 2. 2	[15] 3. 1	58. 5	34. 2	16. 2	46. 7	([6])	1. 63
	B_{22g}	24–30	[15] 5	[15] 7	[15] 6	[15] 1. 7	[15] 2. 6	61. 5	32. 4	15. 4	49. 8	1. 7	1. 69
	C_1	30–39	[15] 7	[15] 8	[15] 5	[15] 1. 7	[15] 2. 5	63. 6	30. 2	15. 6	51. 6	([6])	1. 75
	C_2	39–80+	[16] 1. 1	[16] 8	[16] 6	[16] 1. 7	[16] 2. 9	62. 5	30. 4	16. 5	50. 0	2. 6	1. 74
Trumbull silt loam, 0 to 3 percent slopes (Profile B): In Conneaut Township on State Game Lands No. 101; in open area; E. of Township Route No. 312 and 700 ft. S. of Township Route No. 341.	A_p	0–7	[15] 1. 6	[15] 1. 8	[15] 1. 7	[15] 5. 5	[15] 6. 5	61. 3	21. 6	29. 2	42. 0	2. 5	1. 18
	B_{1g}	7–9	[15] 1. 1	[15] 1. 4	[15] 1. 6	[15] 4. 8	[15] 6. 7	62. 2	22. 2	28. 6	43. 2	3. 9	1. 33
	B_{21g}	9–17	[15] 1. 1	[15] 1. 9	[15] 1. 9	[15] 5. 9	[15] 8. 2	60. 6	20. 4	33. 8	38. 7	2. 9	1. 50
	B_{22g}	17–25	[15] 1. 6	[15] 1. 8	[15] 1. 6	[15] 5. 0	[15] 6. 6	58. 3	25. 1	27. 4	40. 7	2. 3	1. 74
	C_{1g}	25–33	[16] 2. 0	[16] 2. 0	[16] 1. 6	[16] 4. 4	[16] 5. 7	59. 7	24. 6	23. 6	44. 5	2. 7	1. 82
	C_{21}	33–45	[16] 1. 7	[16] 1. 1	[16] 9	[16] 2. 8	[16] 5. 1	65. 5	22. 9	24. 5	47. 9	5. 4	1. 78
	C_{22}	45–52	[16] 2. 4	[16] 1. 2	[17] 1. 0	[17] 2. 7	[17] 3. 7	68. 5	20. 5	22. 2	51. 6	5. 4	1. 80
	Du(lens)	52–58	[16] 16. 7	[16] 10. 7	[17] 3. 9	[17] 6. 9	[17] 4. 6	39. 0	18. 2	19. 0	28. 4	32. 8	------
	C_3	58–72	[18] 5	[18] 6	[18] 5	[18] 1. 5	[18] 2. 1	63. 4	31. 4	13. 7	52. 7	1. 4	------
Rimer fine sandy loam, 0 to 2 percent slopes (Profile A): In Springfield Township on Paul Duris Farm; 70 ft. W. of Township Route No. 310 and 0.25 mi. S. of New York Central Railroad.	A_{p1}	0–3	[8] 9	[8] 1. 8	[8] 3. 2	[8] 57. 1	[8] 5. 7	21. 6	9. 7	48. 3	12. 2	([6])	. 88
	A_{p2}	3–9	[8] 2. 2	[8] 1. 9	[8] 2. 9	[8] 54. 3	[8] 5. 3	23. 2	10. 2	46. 7	13. 0	2. 6	1. 26
	A_{3g}	9–15	[8] 7	[8] 1. 4	[8] 3. 2	[8] 68. 3	[8] 4. 8	16. 4	5. 2	51. 6	8. 6	. 9	1. 61
	B_{21g}	15–19	[8] 7	[8] 1. 9	[8] 2. 3	[8] 67. 4	[8] 5. 5	14. 4	7. 8	56. 5	7. 5	. 9	1. 62
	B_{22g}	19–22	[19] 3. 7	[19] 4. 4	[19] 2. 9	[8] 64. 4	[8] 4. 5	11. 9	8. 2	48. 8	7. 0	3. 0	1. 64
	B_{23g}	22–32	[19] 8. 7	[19] 16. 9	[19] 8. 0	[8] 37. 5	[8] 3. 0	16. 5	9. 4	27. 3	9. 2	5. 8	1. 64
	C_1	32–38	[20] 15. 0	[20] 5. 4	[20] 3. 3	[13] 40. 5	[13] 4. 4	23. 2	8. 2	35. 6	12. 1	31. 4	------
	D	38–66+	[13] 1. 8	[13] 1. 9	[13] 1. 3	[13] 4. 1	[13] 4. 7	66. 7	19. 5	28. 5	45. 5	5. 9	1. 96

See footnotes at end of table.

analyses of selected soils—Continued

determinations not made]

Mechanical analysis—Con.	Chemical analysis														
Textural class	Reaction	Organic carbon	Nitrogen	C/N ratio	Free iron oxide Fe_2O_3	$CaCO_3$ equivalent	Cation exchange capacity by NH_4Ac	Extractable cations (meq./100 gm.)					Degree of base saturation		Ca/Mg ratio
								Ca	Mg	H	Na	K	Capacity by NH_4Ac	Capacity by sum of cations	
	pH	*Percent*	*Percent*		*Percent*	*Percent*	*Meq./100 g.*						*Percent*	*Percent*	
Silt loam	4.6	7.91	0.474	16.7	2.2	-------	26.2	9.5	2.2	23.9	<0.1	1.2	49	35	4.3
Silt loam	4.6	2.08	.172	12.1	1.8	-------	12.7	3.5	1.0	14.7	<.1	.3	38	25	3.5
Silt loam	4.5	1.06	.096	11.0	1.9	-------	8.7	1.4	.4	11.0	<.1	.2	23	15	3.5
Silt loam	4.5	.56	.062	9.0	2.1	-------	6.9	.7	.1	9.4	<.1	.2	14	10	7.0
Silt loam	4.7	.29	.046	6.0	2.4	-------	8.1	1.8	.8	9.0	<.1	.2	34	24	2.2
Silt loam	6.3	.23	-------	------	2.5	-------	9.5	6.8	2.5	3.2	<.1	.1	99	75	2.7
Silt loam	6.8	.22	-------	------	2.3	-------	8.6	6.5	2.2	2.0	.1	.1	103	82	3.0
Silt loam	7.6	.20	-------	------	2.3	1	8.1	19.3	2.8	.4	.1	.1	275	98	6.9
Silt loam	7.7	.21	-------	------	2.0	4	6.3	18.0	2.2	<.1	.2	.1	325	100	8.2
Silty clay loam	7.5	.40	-------	------	2.6	5	12.7	34.1	6.5	<.1	.3	.1	323	100	5.2
Silty clay loam	[2] 4.6	8.22	.582	14.1	3.0	-------	28.9	3.3	3.0	34.2	<.1	.8	24	17	1.1
Silty clay loam	4.3	2.28	.264	8.6	3.8	-------	21.5	1.5	1.8	25.2	<.1	.4	17	13	.8
Silty clay loam	4.4	1.00	.136	7.4	4.0	-------	13.7	.8	.9	18.1	<.1	.3	14	10	.9
Silty clay loam	6.2	.31	.065	5.0	2.8	-------	13.6	7.1	5.2	4.9	.1	.2	93	72	1.4
Silty clay loam	7.4	.28	-------	------	2.3	1	11.7	7.8	5.6	2.0	.1	.2	117	87	1.4
Silty clay loam	7.9	.28	-------	------	2.1	13	9.8	21.0	4.5	<.1	.2	.1	263	100	4.7
Silty clay loam	7.9	.26	-------	------	2.1	18	9.2	19.8	4.3	<.1	.2	.2	266	100	4.6
Silt loam	4.4	2.94	.216	13.6	2.2	-------	14.5	2.2	.6	17.2	<.1	.2	21	15	3.7
Silt loam	4.7	.76	.076	10.0	1.9	-------	9.0	1.5	.6	9.8	<.1	.2	26	19	2.5
Silt loam	5.0	.39	.052	8.0	2.4	-------	8.7	2.8	1.0	7.7	<.1	.2	46	34	2.8
Silt loam	6.9	.23	.048	5.0	2.5	-------	12.7	9.7	3.4	2.9	.1	.1	105	82	2.8
Silt loam	7.8	.23	-------	------	2.2	1	10.5	17.8	2.9	<.1	.1	.1	199	100	6.1
Silt loam	7.9	.20	-------	------	2.1	5	9.2	21.3	2.3	<.1	<.1	.1	258	100	9.3
Silt loam	8.0	.19	-------	------	2.0	7	8.1	21.1	2.0	<.1	<.1	.1	286	100	10.6
Loam	8.0	.12	-------	------	2.0	13	7.1	19.7	1.9	<.1	<.1	.1	306	100	10.4
Silty clay loam	7.9	.23	-------	------	2.0	6	9.9	21.8	2.4	<.1	<.1	.2	246	100	9.1
Fine sandy loam	4.9	3.45	.242	14.2	1.9	-------	13.5	3.3	1.2	14.0	<.1	.4	36	26	2.8
Fine sandy loam	5.1	2.00	.157	12.7	2.2	-------	9.1	2.0	.5	10.2	<.1	.2	30	21	4.0
Loamy fine sand	5.6	.23	.026	9.0	1.5	-------	2.4	1.1	.5	2.8	<.1	.1	71	38	2.2
Loamy fine sand to fine sandy loam	6.1	.12	.026	5.0	2.5	-------	3.0	1.9	.6	2.4	<.1	<.1	83	51	3.2
Loamy fine sand	6.4	.11	.019	6.0	2.4	-------	3.5	2.5	.8	2.4	<.1	<.1	94	58	3.1
Coarse sandy loam	6.8	.16	.023	7.0	2.8	-------	4.5	3.7	1.1	2.0	<.1	.1	109	71	3.4
Fine sandy loam	7.4	.26	-------	------	2.5	<1	3.6	3.6	1.4	1.2	<.1	.1	142	81	2.6
Silt loam	7.2	1.08	-------	------	.3	5	3.0	16.8	2.2	.4	<.1	.2	640	98	7.6

TABLE 7.—*Mechanical and chemical*

[Lack of data indicates

Soil and location	Horizon	Depth	Mechanical analysis										Bulk density
			Size class and diameter of particles (in millimeters)							Other size classes			
			Very coarse sand (2–1)	Coarse sand (1–0.5)	Medium sand (0.5–0.25)	Fine sand (0.25–0.10)	Very fine sand (0.10–0.05)	Silt (0.05–0.002)	Clay (<0.002)	0.2–0.02	0.02–0.002	>2	
		Inches	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	
Rimer fine sandy loam, 0 to 2 percent slopes (Profile B): In Fairview Township on White Swan Farm; in woods 200 ft. W. of drainage ditch W. of Pasadena Drive.	A_1	0–4	[21] 5.8	[21] 3.7	[21] 5.8	[21] 39.5	[21] 7.0	31.4	6.8	46.9	16.0	[6]	0.68
	A_{21}	4–7	[21] .5	[21] 2.1	[21] 5.6	[21] 42.4	[21] 7.1	31.1	11.2	50.2	16.3	1.0	1.00
	A_{22}	7–11	[21] .4	[21] 1.8	[21] 5.4	[21] 43.5	[21] 7.1	30.6	11.2	50.3	16.4	[6]	1.04
	B_1	11–15	[21] .8	[21] 1.8	[21] 5.5	[21] 46.4	[21] 7.0	28.9	9.6	50.8	15.8	[6]	1.20
	B_{21}	15–22	[21] 2.6	[21] 8.8	[21] 16.0	[21] 40.6	[21] 6.0	19.2	6.8	37.9	9.5	4.1	1.36
	B_{22}	22–26	[22] .1	[22] .3	[22] .5	[22] 78.3	[22] 6.3	10.7	3.8	73.9	6.2	[6]	1.38
	C_1	26–35	[22] .1	[22] .2	[22] .3	[22] 76.0	[22] 6.0	12.1	5.3	76.1	8.1	[6]	1.43
	C_{21}	35–46	[22] .2	[22] 1.1	[22] .3	[22] 78.2	[22] 5.5	8.6	7.0	75.6	5.7	1.6	1.48
	C_{22}	46–55	[22] 1.2	[22] .7	[22] .6	[22] 85.9	[22] 4.4	3.9	3.3	71.7	2.9	1.8	.47
	C_3	55–58	[23] 41.7	[23] 7.0	[23] .8	[22] 30.0	[22] 5.4	11.4	3.7	36.9	6.8	53.6	------
	D_1	58–76+	[23] 2.2	[23] 1.7	[23] 1.2	[23] 10.3	[23] 25.2	48.8	10.6	55.7	26.5	4.6	------
Dalton silt loam, 0 to 3 percent slopes (Profile A): 3 mi. E. of Cranesville and 0.5 mi. S. of Trinity Lutheran Church.	A_1	0–4	[24] 1.0	.7	.6	2.8	4.7	66.8	23.4	28.5	44.9	1	------
	A_2	4–6	[25] .5	[25] .8	[21] .6	[21] 3.0	[21] 5.5	68.6	21.0	31.2	44.9	<1	------
	A_{2g}	6–10	[25] .4	[25] .7	[21] .6	[21] 2.9	[21] 5.2	69.5	20.7	30.7	45.9	<1	------
	B_{1g}	10–17	[26] 3.0	[26] 3.2	[26] 2.5	[26] 6.5	[26] 7.5	58.5	18.8	33.0	36.8	12	------
	B_{2g}	17–35	[27] 3.6	[27] 3.9	[27] 2.1	[27] 5.0	[27] 5.9	61.1	18.4	27.0	43.0	20	------
	C	35–42	[27] 4.9	[27] 3.8	[27] 2.6	[27] 5.7	[27] 6.6	58.4	18.0	29.5	38.8	25	------
Dalton silt loam, 0 to 3 percent slopes (Profile B): 2 mi. E. of Cranesville and 70 ft. S. of Cranesville-Franklin Center Road.	A_p	0–7	[21] 1.2	[21] 2.7	[21] 2.1	[21] 5.2	[21] 5.8	57.4	25.6	28.6	37.6	<1	------
	A_2	7–8	[21] 1.0	[21] 2.4	[21] 2.6	[21] 5.8	[21] 6.4	52.7	29.1	27.9	34.4	<1	------
	B_{2g}	8–18	[21] 2.1	[21] 4.2	[21] 3.4	[21] 7.1	[21] 7.8	52.7	22.7	32.7	31.7	4	------
	B_{2m}	18–26	[28] 5.8	[28] 6.2	[28] 4.8	[21] 12.9	[21] 11.2	43.6	15.5	38.1	24.1	35	------
	C_1	26–34	[28] 6.0	[28] 7.3	[28] 5.1	[21] 8.5	[21] 8.3	48.8	16.0	32.6	29.3	16	------

[1] Common, smooth, light-brown to black concretions.
[2] Soil-water ratio of 1 to 5 instead of 1 to 1.
[3] Common, smooth, light-brown to black concretions. Also, few mica flakes.
[4] Common, smooth, light-brown to black concretions. Also, common $CaCO_3$ concretions.
[5] Common, smooth, light-brown to black concretions. Also, few mica flakes and common $CaCO_3$ concretions.
[6] Trace.
[7] Mostly sandstone fragments (?).
[8] Few, smooth, light-brown to black concretions.
[9] Few, smooth, light-brown and black concretions. Also, common $CaCO_3$ concretions.
[10] Few, smooth, light-brown concretions.
[11] Few, smooth, light-brown concretions. Also, common $CaCO_3$ concretions.
[12] Few, smooth, black concretions.
[13] Few, smooth, black concretions. Also, few $CaCO_3$ concretions.
[14] Many, light-brown concretions and few, black concretions.
[15] Few, light-brown to black concretions.

In the valleys the glacial ice was thick and melted slowly. Melt water running off the ice deposited coarse gravel as small hills or kames along the edges of the valleys. It carried the finer material farther from the ice front and deposited it in nearly level areas marked by a few potholes formed by the melting ice. Silt and clay were carried and deposited in still water as lake (lacustrine) or stream sediments.

The glacial ice disrupted the drainage pattern in the area. It reversed the direction of stream flow in some of the valleys and caused the streams to find new outlets in others. After the ice melted, the streams in some of the large valleys were too small to continue the process of natural, or geologic, erosion at the former rate. In these places streams, such as French Creek, now meander back and forth across the flood plain. Where large streams, as

analyses of selected soils—Continued

determinations not made]

Mechanical analysis—Con.	Chemical analysis															
Textural class	Reaction	Organic carbon	Nitrogen	C/N ratio	Free iron oxide Fe_2O_3	$CaCO_3$ equivalent	Cation exchange capacity by NH_4A_c	Extractable cations (meq./100 gm.)					Degree of base saturation		Ca/Mg ratio
								Ca	Mg	H	Na	K	Capacity by NH_4A_c	Capacity by sum of cations	
	pH	*Percent*	*Percent*		*Percent*	*Percent*	*Meq./100 g.*						*Percent*	*Percent*	
Fine sandy loam.	3.9	5.32	0.528	10.1	1.6	-------	33.3	5.0	1.0	36.8	<0.1	0.3	19	15	5.0
Fine sandy loam.	4.2	3.00	.127	23.6	2.3	-------	13.0	.3	<.1	22.5	<.1	.1	3	2	------
Fine sandy loam.	4.3	1.89	.095	19.9	2.4	-------	9.6	.2	.2	15.9	<.1	.1	5	3	1.0
Fine sandy loam.	4.4	.82	.051	16.0	1.4	-------	5.8	.1	<.1	9.8	<.1	.1	3	2	------
Fine sandy loam.	4.4	.55	.034	16.0	1.5	-------	4.0	.1	1.3	7.7	<.1	.1	38	16	.1
Loamy fine sand.	4.6	.39	.033	12.0	1.2	-------	2.6	<.1	.2	5.7	<.1	.1	12	5	------
Loamy fine sand.	5.4	.18	-------	------	.8	-------	2.9	1.9	<.1	2.0	<.1	.1	69	50	------
Loamy fine sand.	6.3	.23	-------	------	1.2	-------	3.7	2.8	.4	1.6	<.1	.1	89	67	7.0
Fine sand	6.9	.20	-------	------	.6	<1	1.7	1.3	.4	.8	<.1	.1	106	69	3.2
Loamy coarse sand.	7.5	.20	-------	------	.7	3	2.0	3.5	.9	.4	<.1	.1	225	92	3.9
Loam	7.4	.73	-------	------	.3	7	2.1	17.7	1.1	<.1	<.1	.2	905	100	16.1
Silt loam	4.7	6.44	-------	------	------	-------	-------	------	------	------	------	------	-------	-------	------
Silt loam	4.4	2.50	-------	------	------	-------	-------	------	------	------	------	------	-------	-------	------
Silt loam	4.5	1.10	-------	------	------	-------	-------	------	------	------	------	------	-------	-------	------
Silt loam	5.6	.22	-------	------	------	-------	-------	------	------	------	------	------	-------	-------	------
Silt loam	7.7	.16	-------	------	------	1	-------	------	------	------	------	------	-------	-------	------
Silt loam	7.9	.15	-------	------	------	4	-------	------	------	------	------	------	-------	-------	------
Silt loam	4.6	2.53	-------	------	------	-------	-------	------	------	------	------	------	-------	-------	------
Silty clay loam.	4.7	1.01	-------	------	------	-------	-------	------	------	------	------	------	-------	-------	------
Silt loam	4.9	.21	-------	------	------	-------	-------	------	------	------	------	------	-------	-------	------
Loam	6.5	.13	-------	------	------	≤1	-------	------	------	------	------	------	-------	-------	------
Loam	7.1	.14	-------	------	------	<1	-------	------	------	------	------	------	-------	-------	------

[16] Few, light-brown to black concretions. Also, few $CaCO_3$ concretions.

[17] Few, light-brown to black concretions. Also, few $CaCO_3$ concretions and few mica flakes.

[18] Few $CaCO_3$ concretions.

[19] Few, smooth, light-brown to dark-brown concretions. Also, many sandstone fragments.

[20] Few, smooth, light-brown to dark-brown concretions. Also, many sandstone fragments and few $CaCO_3$ concretions.

[21] Few, smooth and irregular, light-brown to dark-brown concretions.

[22] Few, smooth and irregular, black concretions or minerals.

[23] Few, smooth and irregular, black concretions or minerals. Also, few $CaCO_3$ concretions.

[24] Some organic matter.

[25] Common, smooth and irregular, light-brown to dark-brown concretions.

[26] Few, smooth and irregular, light-brown to dark-brown concretions. Also, few sandstone fragments.

[27] Few, smooth and irregular, light-brown to dark-brown concretions. Also, few sandstone fragments and few $CaCO_3$ concretions.

[28] Few, smooth and irregular, light-brown to dark-brown concretions. Also, many sandstone-siltstone fragments.

Conneaut Creek and Elk Creek, flowed through small valleys, they rapidly cut narrow, steep-sided gorges to handle the flow of water.

Enough time elapsed between the Early and Late stages of the Wisconsin glaciation to cause distinct differences in the development of stream drainage. In areas covered by glacial till of the Early Wisconsin stage, the drainage pattern is well developed and the streams provide good surface drainage. In areas covered by glacial till of the Late Wisconsin stage, however, the drainage pattern is poorly developed and surface drainage is restricted; many of these areas are very poorly drained.

The ice front alternately advanced and retreated. The farthest advance made during the Wisconsin glaciation is marked by a terminal moraine of glacial till that is in the southeastern corner of the county; this moraine ex-

tends in a southwesterly direction into Crawford County. Later advances of the ice front are marked by moraines or their remnants extending southwest and northeast across the county.

The water level of Lake Erie fluctuated during the final retreat of the ice front. The location of the shoreline at different periods in the past is marked by gravelly beach ridges that extend in a southwesterly direction across the county parallel to the present shoreline. Low-lying areas between the beach ridges contain deposits of silt and clay. These areas were formerly covered by slack-water lakes or lagoons that were cut off and protected from the current of Lake Erie by the beach ridges. Gently sloping areas of stratified silt and sand with a gentle slope toward Lake Erie make up the lake plain of these glacial lakes.

The glacial till of Erie County is unusual in that, in most places, it contains almost no stones. An area of stony soils occurs near Colts Station, however, in the eastern part of the county. Another area containing a few, scattered stones lies on the plateau southeast of Middleboro (McKean). Most of the stones are granite, but some are quartzite and sandstone. The stony areas are used largely as permanent pasture.

Lake bluff erosion

The shoreline of Lake Erie consists of a narrow beach, 10 to 50 feet wide, that lies at the base of a steep bluff, 50 to 75 feet high. The only interruption in the shoreline is a baymouth bar, known as Presque Isle, that extends into the lake to the northwest of the city of Erie. Gradually, the shoreline is submerging and becoming lower than the outlet of the lake. The rate of submergence is very slow, being measured in hundredths of an inch per year. Nevertheless, over the centuries the erosive force of the waves has formed the steep bluff along the shoreline.

Between the New York boundary and the city of Erie, the lacustrine deposits are less than 25 feet thick and residual shale of the Devonian age is exposed at the bottom of the lake bluff. Consequently, this part of the shoreline has a rock-defended terrace of shale bedrock. Even though the shale is more resistant to wave action than the lacustrine materials, wave erosion is active and lake bluffs are forming in the shale. The shaly material cannot be stabilized by vegetation.

Between the city of Erie and the boundary separating the county from Ohio, lacustrine deposits extend from the top of the bluff to the level of the lake. The bluff is not protected by shale. Vegetation grows on the bluff, but if the plant cover is removed, severe erosion occurs (fig. 10). If the vegetation is destroyed in only a small area, erosion becomes active. Once started, it soon damages areas that are protected by vegetation.

The lake bluff faces north and is occupied by soils that are not particularly droughty. In places that are not too steep, grass will stabilize the soil until woody plants can take over. In steeper areas natural erosion will gradually reduce the degree of slope and in time permit grass and woody vegetation to stabilize the soil. Grass can be established even on the very steep bluffs. The Pennsylvania Department of Highways has successfully established a cover of plants on roadbanks in similar condition.

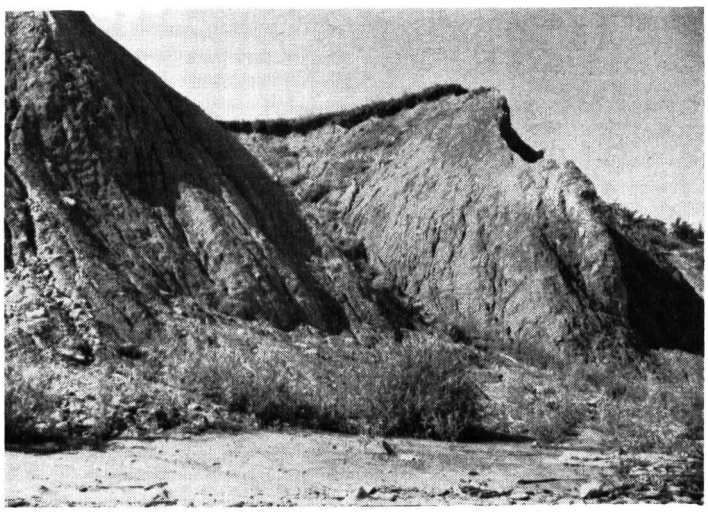

***Figure 10.*—Severe erosion has occurred on the lake bluff north of West Springfield. The bluff was not protected by vegetation nor defended by exposed bedrock.**

On the steep slopes a cover of grass will not prevent slumping. Silty material withstands slumping better than either coarse sand and gravel or fine clay. Because woody plants have strong, long-living root systems, they hold soil material more effectively than does grass.

Beach and stream erosion

The narrow beaches along Lake Erie are subject to active geologic erosion. Frequently, all the beach deposits are removed from an area during a storm. A succeeding storm, however, will wash new deposits onto the area. The beach along the lake bluff is composed largely of flaggy aggregate that is laid down in a shingled pattern. The covered part of the flagstone faces the lake; the flagstone is resistant to waves breaking on the beach and gives optimum stabilization to the rest of the beach material. If this pattern is disturbed, the material erodes easily.

The shingled arrangement is also characteristic of riverwash that is forming islands and bars in and along streams. The covered, or protected, end of the stone points upstream toward the force of the flow. This pattern is pronounced on flood plains. If one stands on a gravel bar and looks downstream, it is like looking down from the top of a shingled roof. Looking upstream is like standing on the ground and looking up at a shingled roof—the exposed edges of the stone are seen.

Most storms severe enough to cause beach erosion occur in winter and early in spring. Frequently, no damage is done, because the beach is coated with ice. Geyserlike ice mounds form on the beaches in winter.

Climate

The climate of Erie County is greatly influenced by the waters of Lake Erie. In fall and winter cold air reaching the area is moderated in temperature by the warmer water of the lake. In spring and summer warm air is moderated by the cooler lake water. This moderating effect is most noticeable from the shoreline to 5 or 6 miles inland and disappears entirely from 8 to 16 miles inland. As a

result, the climate of the lake plain differs markedly from that of the upland. This is shown in table 8, which gives climatic data for two weather stations in the county.

The data given for the weather station at Erie is representative of the climate of the lake plain. That given for Corry is fairly representative of the climate in the inland, or upland, area. These statistics were taken from reports published by the U.S. Weather Bureau.

As shown in table 8, the average annual precipitation ranges from 37.28 inches at Erie to 43.68 inches at Corry. The average yearly temperature is 49.3° F. at Erie and 47.8° F at Corry.

Figure 11 shows the average dates for the last killing frost in spring for different parts of the county; figure 12 shows average dates for the first killing frost in fall. The growing season averages only 119 days in the southwestern part of the county but averages 194 days on the lake plain. Also, the growing season becomes progressively longer as one moves in a southwesterly direction along the lake plain. For example, the growing season increases from 194 days in Erie County to 203 days in Cleveland, Ohio.

Partly because of variations in the amount of annual precipitation and in the length of the growing season, the lake plain and the upland are used for different types of agriculture. Grapes, other fruits, and early maturing vegetables are grown on the lake plain. Late-maturing vegetables, potatoes, cabbage, and cauliflower are produced on the better drained soils in the interior part of the county. Dairy farming predominates on the poorly drained soils of the upland and bottom land.

The climate of the county affects the value of the soils. For example, a Volusia soil that occurs in an area where the climate is favorable for grapevines is more valuable than the same soil occurring in an unfavorable location.

Water Supply

The shale that underlies the county has a limited capacity for storing ground water. Nevertheless, abundant water of good quality occurs under the outwash gravel of the valley fill and the gravelly beach ridges of the lake plain (*5*). Springs hold only a limited amount of ground water. The water is of low quality and usually is high in sulfur and iron. In some parts of Summit and Elk Creek Townships, salt water lies within 30 feet of the surface.

TABLE 8.—*Temperature and precipitation at two stations in Erie County, Pa.*

[PORT ERIE AIRPORT, ERIE COUNTY, ELEVATION 732 FEET]

Month	Temperature [1]			Precipitation [2]			
	Average	Absolute maximum	Absolute minimum	Average	Driest year (1934)	Wettest year (1950)	Average snowfall
	°F.	°F.	°F.	Inches	Inches	Inches	Inches
December	31.9	70	−2	2.74	1.50	3.03	12.6
January	27.8	72	−13	2.76	2.04	6.25	12.6
February	26.9	66	−19	2.44	1.01	4.97	10.4
Winter	28.9	72	−19	7.94	4.55	14.25	35.6
March	34.6	82	−10	2.76	2.36	4.41	8.2
April	45.4	83	18	3.03	2.10	4.12	2.8
May	56.7	89	21	3.40	.55	2.64	.1
Spring	45.6	89	−10	9.19	5.01	11.17	11.1
June	66.8	94	37	3.31	1.45	2.19	0
July	71.7	96	44	3.27	1.90	6.12	0
August	70.1	92	42	3.16	3.15	3.98	0
Summer	69.5	96	37	9.74	6.50	12.29	0
September	64.2	98	33	3.50	2.93	4.48	[3]
October	53.4	88	25	3.55	1.89	3.71	1.2
November	41.8	81	9	3.36	2.96	8.93	7.6
Fall	53.1	98	9	10.41	7.78	17.12	8.8
Year	49.3	98	−19	37.28	23.84	54.83	55.5

[CORRY, ERIE COUNTY, ELEVATION 1,420 FEET]

Month	Temperature [1]			Precipitation [2]			
	Average	Absolute maximum	Absolute minimum	Average	Driest year (1941)	Wettest year (1945)	Average snowfall
	°F.	°F.	°F.	Inches	Inches	Inches	Inches
December	29.0	68	−22	3.56	2.71	2.32	21.7
January	26.8	70	−24	3.51	2.61	2.48	18.0
February	25.3	69	−30	2.91	2.79	3.07	17.7
Winter	27.0	70	−30	9.98	8.11	7.87	57.4
March	33.9	82	−14	3.91	1.76	4.87	16.3
April	45.7	88	9	3.89	2.21	4.44	2.7
May	56.5	91	21	3.68	1.44	4.16	[3]
Spring	45.4	91	−14	11.48	5.41	13.47	19.0
June	66.4	99	30	4.38	3.88	6.03	[3]
July	70.5	110	35	3.71	2.62	2.42	[3]
August	68.2	99	32	3.24	2.77	3.32	0
Summer	68.4	110	30	11.33	9.27	11.77	[3]
September	61.7	96	27	3.73	2.63	8.38	[3]
October	51.0	88	11	3.19	4.88	6.57	.6
November	38.8	78	−2	3.97	1.79	3.51	14.4
Fall	50.5	96	−2	10.89	9.30	18.46	15.0
Year	47.8	110	−30	43.68	32.09	51.57	91.4

[1] *Port Erie Airport:* Average temperature based on an 85-year record, through 1958; highest and lowest temperatures, on a 13-year record, through 1952. *Corry:* Average temperature based on a 20-year record, through 1952; highest temperature, on a 19-year record, and lowest temperature, on a 20-year record, through 1952.

[2] *Port Erie Airport:* Average precipitation based on an 85-year record, through 1958; wettest and driest years based on a 49-year record, in the period 1910–58; snowfall based on a 74-year record, through 1958. *Corry:* Average precipitation based on a 20-year record, through 1952; wettest and driest years based on a 22-year record, in the period 1931–52; snowfall based on an 18-year record, through 1952.

[3] Trace.

532937—60——8

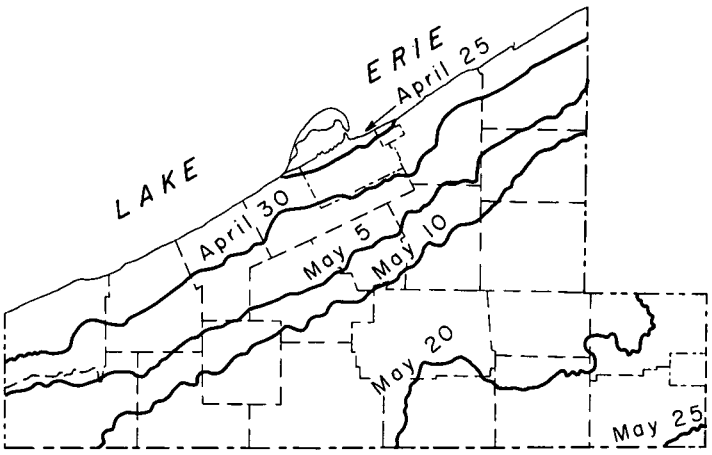

Figure 11.—**Average dates of the last killing frost in spring for different parts of Erie County.**

In most parts of the county, the relief is favorable for the impounding of large amounts of surface water. Also, the adequate amount of precipitation and the low rate of infiltration permit water to collect on the surface. Lake Erie is the source of water for the city of Erie. Water for supplemental irrigation is obtained from the larger streams. Where feasible, it could be obtained from Lake Erie.

The larger streams in the county flood each year after the spring thaw. These floods are anticipated, however, and cause little damage. Flash floods occur occasionally along the smaller streams, generally during July and August when rainfall is heavy. A disastrous flash flood occurred along Mill Creek, which flows through the city of Erie, after a cloudburst in August of 1915. Thirty-seven people were drowned, and property damage was estimated at several million dollars. A structure has since been built in Mill Creek at Glenwood Park to collect debris and thus prevent a recurrence of this disaster.

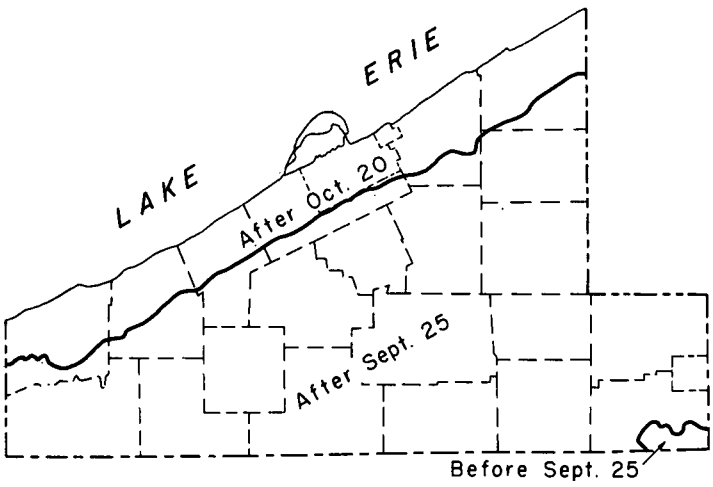

Figure 12.—**Average dates of the first killing frost in fall for different parts of Erie County.**

Native Vegetation

The original vegetation in Erie County was nearly all forest. Most of the trees were hardwoods, but there were some pines and hemlocks. All of this native vegetation has since been removed. The forest types that now predominate differ from those making up the original vegetation.

Studies made of the original forest types in this area show that beech-sugar maple and beech-red maple forest types predominated.[3] Less important forest types were the white elm-white or black ash-red maple; chestnut-oak; Northeast conifer; and oak-hickory.

Chestnut grew mainly on the lake plain, presumably on the gravelly soils. Beech, maple, and white pine dominated on the slopes south of the watershed that divided the Ohio and St. Lawrence drainage systems. Beech and sugar maple grew on sloping, poorly drained soils, and beech and red maple grew on nearly level, poorly drained soils. Hemlock, black ash, and larch or tamarack dominated in the swampy areas. Oaks were scattered throughout the area. On the better drained soils, white, red, black, scarlet, and chestnut oaks grew.

Population

The population of Erie County was 219,388 in 1950. The population of the city of Erie was 130,803. In 1950, only 2.9 percent of the total population worked on farms. The rural farm population has remained about the same since 1930. It has showed a steady decrease, however, in proportion to the increase in total population.

The large urban population has given good local markets for farm produce and has led to the need for additional recreational facilities. As a result, a large acreage has been set aside for public parks and many additional areas have been used for private parks and gun clubs.

Transportation and Markets

Erie County has abundant transportation facilities, most of which are concentrated along the lake plain. Much of the lake plain has been set aside to provide rights-of-way and service facilities for railroads and highways.

The New York Central Railroad and the New York, Chicago and St. Louis Railroad (Nickel Plate Road) cross the county along the lake plain. In the inland part of the county, a line of the Pennsylvania Railroad connects Erie, Union City, and Corry with the north-central part of the State. Another line of the Pennsylvania Railroad, extending between Erie and Pittsburgh, serves the towns of Girard and Albion. The Erie Railroad extends from Buffalo, N.Y., to Corry and Union City. The Bessemer and Lake Erie Railroad, a road built to carry iron ore, serves Albion, in the southwestern corner of the county.

Erie County has more than 2,000 miles of public highways. Most of the roads are improved. The roads on well over half of the mileage are paved. A superhighway, the Erie Thruway, is being constructed just south of the

[3] HICKS, L. E. THE ORIGINAL FOREST VEGETATION AND THE VASCULAR FLORA OF NORTHEASTERN OHIO-ASHTABULA COUNTY. Thesis, Ph. D., Ohio State Univ. 1934.

lake plain. It will run parallel to U.S. Highway 20 and State Highway 5, which follow the lake plain in a southwesterly direction. U.S. Highway 20 connects North East, an important community on the northern part of the lake plain, with the city of Erie.

U.S. Highways 6 and 6N run from east to west across the southern part of the county. They serve the towns of Corry, Union City, Edinboro, Albion, and West Springfield. U.S. Highway 19, connecting Erie with points south, crosses the center of the county. It serves the town of Waterford. Several State routes cross the county and connect local communities with the main highways.

The Port Erie Airport is located on the lake plain west of the city of Erie. The city of Erie is an important port on the St. Lawrence Seaway for shipping products to and from the area. This port and the other good transportation facilities in other parts of the county have helped to promote industrialization, not only in and around the city of Erie, but also in inland cities and towns. Corry and Union City, in particular, have become important industrial centers.

Agriculture

Different kinds of agriculture are practiced in various parts of Erie County. The kind of farming depends not only on the type but also on the location of the soil. For example, a soil on the lake plain, unlike a soil of an inland area, is subject to the moderating effect of the waters of Lake Erie; therefore, it may be especially suitable for the growing of either vegetables or fruits.

Vegetables are grown for commercial use mainly on the fine sandy lacustrine soils of the lake plain southwest of the city of Erie; most grapevines and orchards are on the silty lacustrine and gravelly soils of the lake plain northeast of Erie. On the glacial till soils of the upland, dairy farming predominates although some cabbage and cauliflower are grown as cash crops. Also, potatoes are a major crop on the gravelly soils formed on glacial outwash of the inland valleys.

About 60.6 percent of Erie County, or 314,971 acres, was in farms in 1954. This is a decrease of 132,720 acres since 1910, when the total acreage in farms reached an all-time high. The average-size farm in 1954 was 94.9 acres. Approximately 97 percent of the farm operators were full owners or part owners of their farms.

Crops

Slightly more than half of the income from all farm products sold in Erie County in 1954 was from crops. Fruits and nuts accounted for approximately 22.8 percent of the farm income; field crops, other than vegetables and fruits and nuts, accounted for an additional 17.1 percent; horticultural specialties accounted for approximately 7.7 percent; and vegetables grown for sale accounted for approximately 2.9 percent.

Orchard fruits and grapes.—Fruit production in Erie County is concentrated in a strip, 5 or 6 miles wide, that runs along the lake front. Most of the orchards and vineyards are northeast of the city of Erie. In this area the tempering effect of the lake water on temperature and the cool, humid climate during the growing season favor the growing of fruit trees and grapevines. The favorable climate compensates for the shallowness of the root zone in the poorly drained soils, as well as for the droughtiness of the sandy and gravelly soils. Grapes are the most important from the standpoint of amount of fruit produced, and sour cherries rank next in importance. The number of fruit trees and grapevines of all ages in the county in 1954 were reported as follows:

	Number
Apple trees	69,716
Peach trees	78,731
Pear trees	10,868
Cherry trees	199,666
Plum and prune trees	21,595
Grapevines	5,108,767

These figures do not include the trees and vines on farms that had less than 20 trees or vines.

The short growing season limits the choice of fruit trees to early maturing varieties. McIntosh and Jonathan are the leading varieties of apples. Concord is one of the leading varieties of grapes. Peaches and cherries grown in this county mature about 1 month later than the same varieties grown in the southern part of the State.

The number of apple trees of all ages has shown a steady decrease since 1910 when there were 312,269 apple trees in the county. The yield has shown a slight increase. Peaches likewise show a decrease in the number of trees. In 1910, there were 253,457 peach trees of all ages in the county. The number of grapevines has increased steadily since the early 1900's. The number of cherry trees likewise has increased steadily. In 1940, there were 151,710 cherry trees of all ages in the county as compared to 199,666 in 1954.

Field crops.—Field crops are less important as a source of farm income in Erie County than orchard fruits and grapes. The acreages of the principal field crops grown in the county in 1954 were as follows:

	Acres
Corn for all purposes	20,618
Oats, threshed or combined	15,138
Wheat, threshed or combined	10,912
Buckwheat, threshed or combined	1,919
Rye, threshed or combined	366
Hay crops (land from which hay, excluding soybean hay, was cut)	46,884

Corn is the principal grain crop in Erie County. In 1954, slightly more than half of the crop was harvested for grain, and most of the rest was cut for silage. The average yield of corn per acre has increased almost 100 percent in the past 80 years. Oats and wheat are the most important of the small grains. A large part of the oats are fed on the farm. Buckwheat, once an important crop, has declined steadily in acreage. In 1909, buckwheat was grown on 9,776 acres as compared to 1,919 acres in 1954. Rye also once occupied a much larger acreage; in 1909, it was grown on 3,378 acres.

Hay and forage crops are important in this county because they provide feed for the dairy cattle and other livestock and are also a cash crop. In 1954, clover, timothy, and mixtures of clover and grasses were cut for hay on 40,206 acres. Alfalfa and alfalfa mixtures, cut for hay, were grown on 2,773 acres. Grass silage was made from grasses, alfalfa, clover, or small grains grown on 2,756 acres, and other crops, including small grains cut for hay, were grown on 1,149 acres.

Truck crops.—Truck crops are an important source of income in Erie County. In 1954, a total of 2,861 acres of

vegetables was reported harvested for sale. Potatoes were harvested for home use or for sale on an additional 4,690 acres.[4]

Early maturing vegetables are grown mainly on the well drained and moderately well drained soils on the lake plain in the western part of the county. Here, the growing season is longer than elsewhere in the county and the soils have a fairly coarse texture so that they warm up early in spring. Asparagus is usually grown on the well-drained fine sands in this area. Vegetables that mature during the summer are grown on the fine-textured lacustrine soils that are somewhat poorly drained to poorly drained.

Cash crops include potatoes, some late-maturing cabbage, and cauliflower. Late-maturing vegetables, potatoes, cabbage, and cauliflower are grown on the well drained or moderately well drained upland soils on glacial till in the interior part of the county.

Horticultural specialties.—Nursery products grown for sale are important in Erie County. Nearly 8 percent of the income from the sale of farm products is derived from the sale of nursery products. Trees, shrubs, vines, and ornamentals are the most important of these products, but cut flowers, potted plants, florist greens, and bedding plants are also grown for sale, as well as some vegetables grown under glass, flower seeds, vegetable seeds, vegetable plants, and bulbs.

Livestock and livestock products

Livestock and livestock products are less important as a source of income in Erie County than crops. Nevertheless, they accounted for 48.1 percent of the income derived from all farm products sold in 1954. In that year, the census of livestock in the county showed the following:

	Number
Cattle and calves	46,363
Horses and mules	1,743
Hogs and pigs	7,000
Sheep and lambs	2,543
Chickens, 4 months old and over	201,301
Turkeys raised	15,499
Ducks raised	4,082

Nearly half of the cattle are milk cows, principally Holsteins. There are few beef cattle in the county. Practically all of the beef produced for local use is from dairy breeds. The dairy farms are largely in the upland. Here, the growing season is about 5 months long.

In 1954, nearly 123 million pounds of whole milk and more than 89 thousand pounds of butterfat were sold. Other livestock products included 144,971 chickens and more than 1 million dozen eggs sold. In addition, 13,603 pounds of wool was shorn.

Sheep raising was once important in the county, but the number of sheep has decreased steadily since 1850 when there were 66,705 head in the county. Horses and swine have also decreased in number.

Agricultural improvement programs

As farming has become more complex and scientific, various programs have helped its advance in the county. The farmers of the county are served by most of the public soil and agricultural agencies. These agencies have carried on research and have taught and demonstrated many practices that will improve the soils and soil management. These include the following:

(1) The Pennsylvania Agricultural Experiment Station has a substation near North East. At this substation, research is conducted in horticulture.
(2) The Pennsylvania State College of Agriculture conducts research in the management of soils and crops, including the testing of crop varieties. Experiments are conducted on private farms throughout the county.
(3) The Pennsylvania Department of Forests and Water gives technical assistance in helping solve farm woodland problems.
(4) The Erie County Agricultural Extension Association collects local agricultural information, together with pertinent information from wider sources, and makes it available to the public.
(5) The Farmers Home Administration services the long-term agricultural credit needs of the county.
(6) The Federal Extension Service provides 4–H programs for rural youth, and the schools have vocational agricultural programs.
(7) An organized soil conservation program is carried out by the Erie County Soil Conservation District with the assistance of members of the Soil Conservation Service and other agencies.

[4] Does not include acreage for farms with less than 20 bushels harvested. Cabbage, green lima beans, sweet corn, cauliflower, and tomatoes are among the truck crops grown on the largest acreages.

Glossary

[Definitions were taken from glossaries published in the Journal of Soil and Water Conservation (*9*); Soil Science Society of America Proceedings (*10*); Soil, the 1957 Yearbook of Agriculture (*11*); and Soils and Men, the 1938 Yearbook of Agriculture (*12*)]

Aeration, soil. The process by which air and other gases in the soil are renewed. The rate of soil aeration depends largely on the size and number of soil pores and on the amount of water clogging the pores.

Aggregate, soil. Many fine soil particles held in a single mass or cluster, such as a clod, crumb, block, or prism. Many properties of the aggregate differ from those of an equal mass of unaggregated soil.

Catena, soil. A group of soils within a soil zonal region developed from similar parent material but with unlike soil characteristics because of differences in drainage or relief.

Cation-exchange capacity. A measure of the adsorptive capacity of a soil for bases, or the amount of bases that can be absorbed by a given amount of soil, expressed in terms of milliequivalents of monovalent cation absorbed from a neutral solution by 100 grams of soil. Generally speaking, a soil with a fairly high exchange capacity is preferred to one with a low exchange capacity because it will retain more plant nutrients and will be less subject to leaching. (Formerly called base-exchange capacity.)

Clay. (1) Small mineral particles of the soil, less than 0.002 millimeters in diameter. (2) Soil material containing 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Colluvial soil material. Soil material that has moved downhill and has accumulated on lower slopes and at the bottom of the hill. Colluvial material is moved downhill by the force of gravity and, to some extent, by soil creep, frost action, and local wash.

Consistence. The combination of properties of soil material that determine its resistance to crushing and its ability to be molded or changed in shape. Consistence depends mainly on the forces of attraction between soil particles. Terms commonly used to describe consistence are as follows:

Cemented. Soil is hard and brittle and is little affected by moistening.

Firm. When moist, soil crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Friable. When moist, soil crushes easily under moderate pressure between thumb and forefinger and coheres when pressed together.

Hard. When dry, soil is moderately resistant to pressure; it is barely breakable between thumb and forefinger.

Loose. When dry or moist, soil is noncoherent.

Nonplastic. When wet, soil cannot be formed into the shape of a wire.

Nonsticky. When wet, soil does not adhere to thumb or forefinger after release of pressure.

Plastic. When wet, soil is readily deformed by moderate pressure but is cohesive; wire formable.

Sticky. When wet, soil adheres to thumb and forefinger; it tends to stretch somewhat and pull apart rather than pulling free from either digit.

Drainage, soil. (1) The removal of excess surface or ground water from land by means of surface or subsurface drains. (2) The effect of soil characteristics that regulate the ease or rate of natural drainage. Soil is said to be well drained when the excess water drains away rapidly and poorly drained when the excess water drains away so slowly that it interferes seriously with tillage or plant growth.

Mole drain. Underground tubular channel in the soil constructed with a mole plow consisting of a short, pointed cylinder of iron, 4 to 6 inches in diameter, and connected to the beam by a sharp shank 4 feet long. The plow is pulled along the course of the desired drain with the cylinder at a depth of 2 to 3 feet.

Tile drain. Concrete or pottery pipe placed with suitable spacing and at suitable depths in the soil or subsoil to provide outlets for water in the soil.

Dune. A mound or ridge of loose sand piled up by the wind; common where sand is abundant and wind is usually strong as along the shores of lakes and the sea and in some desert and semidesert areas.

Eluviation. The removal of material from a soil horizon by downward or lateral movement in solution and, to a lesser extent, in colloidal suspension.

Erosion. The detachment and movement of the solid material of the land surface by wind, moving water, or ice, and by such processes as landslides and creep.

Normal (geologic). The erosion that takes place on the land surface in its natural environment undisturbed by human activity. It includes (1) rock erosion, or erosion of rocks on which there is little or no developed soil, as in stream channels and rocky mountains, and (2) normal soil erosion, or the erosion of the soil under its natural condition or native vegetative cover undisturbed by human activity.

Accelerated. Erosion of the soil or rock over and above normal erosion brought about by changes in the natural cover or ground conditions, including changes caused by human activity and those caused by lightning or by the invasion of rodents.

(a) Sheet—Removal of a more or less uniform layer of material from the land surface. The effects are less conspicuous than those of other types of erosion that produce large channels. Frequently, in sheet erosion, the eroding surface consists of numerous very small rills.

(b) Rill—Erosion by water, which produces small channels that can be obliterated by tillage.

(c) Gully—Erosion by water that produces channels larger than rills. Ordinarily, these channels carry water only during and immediately after rains or following the melting of snow. Gullies are deeper than rills and are not obliterated by normal tillage.

Glacial soil material. Material, transported and deposited by glacial action, from which soil may develop.

Humus. The plant and animal residues in the soil that have undergone some appreciable degree of decomposition.

Humus layer. The uppermost part of the soil, or the part that owes its characteristic features to its content of humus. The humus may be incorporated or unincorporated in the mineral soil.

Igneous rock. Rock that has been cooled from molten mineral material, such as granite, syenite, diorite, and gabbro.

Illuviation. The accumulation of material in a soil horizon by precipitation from downward or lateral movement in solution or, to a lesser extent, in suspension.

Infiltration. The downward entry of water into soil or other material.

Infiltration rate. The rate at which water is penetrating the surface of the soil at any given instant, usually expressed in inches per hour. May be limited by either the infiltration capacity of the soil or by the rate at which water is applied to the soil surface.

Lacustrine deposit. Material deposited in lake water and exposed by the lowering of the water level or elevation of the land.

Landslide. The rapid downhill movement of a mass of soil and loose rock, usually under wet or saturated conditions. The speed and distance of movement, as well as the amount of soil and rock materials involved, vary greatly.

Leached soil. A soil from which most of the soluble constituents have been removed throughout the entire profile or removed from one part of the profile and accumulated in another part.

Leaching. The romoval of soluble constituents from soils or other material by percolating water.

Lime concretion. An aggregate cemented by precipitation of $CaCO_3$.

Litter, forest. A surface layer of loose, organic debris in forests. It consists of freshly fallen or slightly decomposed organic materials.

Loam. (1) Soil containing a relatively even mixture of sand and silt and a somewhat smaller proportion of clay, generally a desirable quality. May be subdivided into textural classes, such as sandy loam, loam, silt loam, and clay loam. (2) Specifically, soil material containing 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand.

Marl. An earthy, unconsolidated deposit formed in fresh water lakes and consisting chiefly of calcium carbonate mixed with clay or other impurities in varying proportions.

Marsh. Flat, wet, treeless areas usually covered by standing water and supporting a native growth of coarse grasses, reeds, sedges, or rushes.

Mechanical analysis, soil. (1) The percentage distribution of the various sizes of individual mineral particles, or separates, in the soil. (2) A laboratory method of determining soil texture.

Mottled soil. Soil irregularly marked with spots of different colors. Mottling in soils usually indicates poor aeration and lack of good drainage.

Muck. An organic soil consisting of fairly well decomposed organic material relatively high in mineral content, finely divided, and dark in color.

Mull. A type of forest humus layer that consists of thoroughly mixed organic and mineral matter. This layer grades to the underlying mineral horizon without a sharp line of demarkation.

Pans. Horizons or layers in soils that are strongly compacted, indurated, or very high in clay content. Examples of pans are hardpans, fragipans, claypans, and siltpans.

Parent material, soil. The horizon of weathered rock or partly weathered soil material from which the soil is formed. Horizon C of the soil profile.

Parent rock. The rock from which the parent materials of soils are formed.

Peat. Soil material consisting primarily of raw, undecayed, or slightly decomposed organic matter.

Ped. An individual natural soil aggregate, such as a crumb, prism, or block, in contrast to a clod, which is a mass of soil brought about by digging or other disturbance.

Percolation. The downward movement of water through the soil, especially the downward flow of water in saturated or nearly saturated soil.

Permeability, soil. The quality or state of a soil or of any horizon in the soil profile relating to the transmittal of water or air to all parts of the mass.

Phase, soil. The subdivision of a soil type or other classificational soil unit having variations in characteristics not significant to the classification of the soil in its natural landscape but significant to the use and management of the soil. Examples of the variations recognized by phases of soil types include differences in slope, stoniness, and thickness because of accelerated erosion.

Porosity, soil. The percentage of the soil (or rock) volume that is not occupied by solid particles, including all pore spaces filled with air and water.

Reaction, soil. The degree of acidity or alkalinity of a soil mass, expressed in either pH value or in words, as follows:

	pH
Extremely acid	below 4.5
Very strongly acid	4.5–5.0
Strongly acid	5.1–5.5
Medium acid	5.6–6.0
Slightly acid	6.1–6.5
Neutral	6.6–7.3
Mildly alkaline	7.4–7.8
Moderately alkaline	7.9–8.4
Strongly alkaline	8.5–9.0
Very strongly alkaline	9.1 and higher

Sand. (1) Individual rock or mineral fragments in soils having diameters ranging from 0.05 millimeter to 2.0 millimeters. As a rule, sand grains consist chiefly of quartz, but they may be of any mineral composition. (2) The textural class name of any soil that contains 85 percent or more of sand and not more than 10 percent of clay.

Sedimentary rock. A rock largely composed of sediments more or less consolidated; the chief sedimentary rocks are sandstones, shales, limestones, and conglomerates.

Series, soil. A group of soils that have soil horizons similar in their differentiating characteristics and arrangement in the soil profile, except for the texture of the surface soil, and that are formed from a particular type of parent material. Soil series is an important category in detailed soil classification. Individual series are given proper names taken from the names of a place near the first recorded occurrence.

Silt. (1) Individual mineral particles of soil that range in diameter between the upper size of clay, 0.002 millimeter, and the lower size of very fine sand, 0.05 millimeter. (2) Soil of the textural class silt contains 80 percent or more of silt and less than 12 percent of clay. (3) Sediments deposited from water in which the individual grains are approximately of the size of silt, although the term is sometimes applied loosely to sediments containing considerable sand and clay.

Structure, soil. The arrangement of the soil particles into lumps, granules, or other aggregates. Structure is described by grade (weak, moderate, or strong), that is, the distinctness and durability of the aggregates; by the size of the aggregates (very fine, fine, medium, coarse, or very coarse); and by their shape (platy, prismatic, columnar, blocky, granular, or crumb). A soil is described as structureless if there are no observable aggregates. Structureless soils may be massive (coherent) or single grain (noncoherent).

Blocky (angular). Aggregates are block shaped; they may have flat or rounded surfaces that join at sharp angles.

Blocky, subangular. Aggregates have some rounded and some plane surfaces; vertices are rounded.

Columnar. Aggregates are prismatic and are rounded at the upper ends.

Crumb. Generally soft, small, porous aggregates that are irregular but are somewhat spherical in shape, as in the A_1 horizons of many soils. Crumb structure is closely related to granular structure.

Granular. Roughly spherical, firm, small aggregates that may be either hard or soft but are generally more firm than crumb and without the distinct faces of blocky structure.

Platy. Soil particles are arranged around a plane, usually horizontal.

Subsoil. The B horizons of soils with distinct profiles. In soils with weak profile development, the subsoil can be defined as the soil below the plowed soil (or its equivalent of surface soil), in which roots normally grow. Although a common term, it cannot be defined accurately. It has been carried over from early days when "soil" was considered to be only the plowed soil and that under the plowed soil, the "subsoil."

Subsoiling. Breaking of compact subsoils, without inverting them, with a special knifelike instrument, which is pulled through the soil at depths usually of 12 to 24 inches and at spacings of 2 to 5 feet.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness.

Texture, soil. The relative proportion of the various size groups of individual soil grains. Textural classes are based on the relative proportion of soil separates—sand, silt, and clay. The principal classes, in increasing order of the content of the finer separates, are as follows: Sand, loamy sand, sandy loam, loam, silt loam, clay loam, and clay. These may be modified, according to the relative size of the coarser particles, to fine sand, loamy fine sand, fine sandy loam, very fine sandy loam, coarse sandy loam, gravelly sandy loam, gravelly loam, cobbly loam, sandy clay, stony clay, silty clay, and stony loam. See also *Clay, Loam, Silt,* and *Sand.*

Tight soil. A compact, impervious, and tenacious, normally plastic soil.

Till. Unstratified glacial deposits.

Tilth. The physical condition of soil relative to its response to tillage machinery and its mechanical impedance to root penetration.

Type, soil. A subgroup or category under the soil series based on the texture of the surface soil. A soil type is a group of soils having horizons similar in differentiating characteristics and arrangement in the soil profile and developed from a particular type of parent material. The name of a soil type consists of the name of the soil series plus the textural class name of the upper part of the soil equivalent to the surface soil. Thus, Ottawa fine sandy loam is the name of a soil type within the Ottawa series.

Variant, soil. A soil whose properties are believed sufficiently different from other known soils to be placed in a new series but whose geographic area is so limited that creation of a new series is not believed to be justified.

Water table. The upper surface of ground water; locus of points in soil water at which the hydraulic pressure is equal to atmospheric pressure.

Weathering. All physical and chemical changes produced in rocks, at or near the earth's surface, by atmospheric agents, and that result in more or less complete disintegration and decomposition.

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GUIDE TO MAPPING UNITS

Symbol	Soils	Page	Capability unit
AaA	Allis silt loam, 0 to 3 percent slopes	59	IVws–2
AaA3	Allis silt loam, 0 to 3 percent slopes, severely eroded.	59	VIew–4
AaB	Allis silt loam, 3 to 8 percent slopes	59	IVws–1
AaB3	Allis silt loam, 3 to 8 percent slopes, severely eroded.	59	VIew–4
AaC	Allis silt loam, 8 to 15 percent slopes	59	IVws–1
AaC3	Allis silt loam, 8 to 15 percent slopes, severely eroded.	60	VIew–4
AaD	Allis silt loam, 15 to 25 percent slopes	60	VIew–4
AaD3	Allis silt loam, 15 to 25 percent slopes, severely eroded.	60	VIew–4
AaE	Allis silt loam, 25 to 45 percent slopes	60	VIIe–1
Ba	Beach and Riverwash	60	VIIIs–1
Bb	Beach sand, stabilized	60	VIIw–1
BcA	Berrien fine sandy loam, 0 to 2 percent slopes.	61	IIw–1
BcB	Berrien fine sandy loam, 2 to 8 percent slopes.	61	IIew–2
BcB3	Berrien fine sandy loam, 2 to 8 percent slopes, severely eroded.	61	IIIew–2
BcC	Berrien fine sandy loam, 8 to 15 percent slopes.	61	IIIew–2
BcC3	Berrien fine sandy loam, 8 to 15 percent slopes, severely eroded.	61	IVew–1
BcD	Berrien fine sandy loam, 15 to 25 percent slopes.	61	IVew–1
BcD3	Berrien fine sandy loam, 15 to 25 percent slopes, severely eroded.	62	VIIe–2
BdA	Birdsall silt loam, 0 to 2 percent slopes	62	IVw–1
BdB	Birdsall silt loam, 2 to 4 percent slopes	62	IVw–1
CaA	Canadice silt loam, 0 to 2 percent slopes	63	IVw–1
CaB	Canadice silt loam, 2 to 8 percent slopes	63	IVw–1
CaB3	Canadice silt loam, 2 to 8 percent slopes, severely eroded.	63	VIew–1
CbA	Caneadea silt loam, 0 to 2 percent slopes.	63	IIIw–5
CbB	Caneadea silt loam, 2 to 8 percent slopes.	63	IIIwe–1
CbB3	Caneadea silt loam, 2 to 8 percent slopes, severely eroded.	63	VIew–1
CbC	Caneadea silt loam, 8 to 15 percent slopes.	64	IVew–3
CbC3	Caneadea silt loam, 8 to 15 percent slopes, severely eroded.	64	VIew–1
CbD	Caneadea silt loam, 15 to 25 percent slopes.	64	IVew–3
CbD3	Caneadea silt loam, 15 to 25 percent slopes, severely eroded.	64	VIew–1
CcA	Chagrin fine sandy loam, 0 to 3 percent slopes.	64	I–3
CcA3	Chagrin fine sandy loam, 0 to 3 percent slopes, severely eroded.	64	VIe–2
CdA	Chagrin silt loam, 0 to 3 percent slopes	64	I–3
CeA	Chagrin silt loam, high bottom, 0 to 3 percent slopes.	65	I–3
CeB	Chagrin silt loam, high bottom, 3 to 6 percent slopes.	65	IIe–2
Cf	Chagrin very gravelly loam, fan, 0 to 6 percent slopes.	65	IIIe–2
CgB	Conotton coarse sandy loam, 0 to 8 percent slopes.	67	IIe–2
CgB3	Conotton coarse sandy loam, 0 to 8 percent slopes, severely eroded.	67	IIIe–2
CgC	Conotton coarse sandy loam, 8 to 15 percent slopes.	68	IIIe–2
CgC3	Conotton coarse sandy loam, 8 to 15 percent slopes, severely eroded.	68	VIe–1
CgD	Conotton coarse sandy loam, 15 to 25 percent slopes.	68	IVe–1
CgD3	Conotton coarse sandy loam, 15 to 25 percent slopes, severely eroded.	68	VIe–1
ChA	Conotton gravelly loam, 0 to 3 percent slopes.	66	I–1
ChB	Conotton gravelly loam, 3 to 8 percent slopes.	66	IIe–1
ChB3	Conotton gravelly loam, 3 to 8 percent slopes, severely eroded.	66	IIIe–1
ChC	Conotton gravelly loam, 8 to 15 percent slopes.	66	IIIe–1
ChC3	Conotton gravelly loam, 8 to 15 percent slopes, severely eroded.	66	IVe–1
CkB	Conotton gravelly sandy loam, 3 to 8 percent slopes.	66	IIe–2
CkB3	Conotton gravelly sandy loam, 3 to 8 percent slopes, severely eroded.	67	IIIe–2
CkC	Conotton gravelly sandy loam, 8 to 15 percent slopes.	67	IIIe–2
CkC3	Connotton gravelly sandy loam, 8 to 15 percent slopes, severely eroded.	67	VIe–1
CkD	Conotton gravelly sandy loam, 15 to 25 percent slopes.	67	IVe–1
CkD3	Conotton gravelly sandy loam, 15 to 25 percent slopes, severely eroded.	67	VIIe–3
CmA	Conotton gravelly sandy loam, moderately well drained variant, 0 to 3 percent slopes.	68	IIw–1
CmB	Conotton gravelly sandy loam, moderately well drained variant, 3 to 8 percent slopes.	69	IIew–2
CmB3	Conotton gravelly sandy loam, moderately well drained variant, 3 to 8 percent slopes, severely eroded.	69	IIIew–1
DaA	Dalton silt loam, 0 to 2 percent slopes	69	IIIw–1
DaB	Dalton silt loam, 2 to 8 percent slopes	69	IIIew–6
DaB2	Dalton silt loam, 2 to 8 percent slopes, moderately eroded.	70	IIIew–6
Ds	Dune sand	70	VIIIs–1
EaB	Ellery and Alden silt loams, 0 to 4 percent slopes.	70	IVw–1
EbA	Erie silt loam, 0 to 3 percent slopes	71	IIIw–1
EbB	Erie silt loam, 3 to 8 percent slopes	71	IIIew–6
EbB2	Erie silt loam, 3 to 8 percent slopes, moderately eroded.	72	IIIew–6
EbB3	Erie silt loam, 3 to 8 percent slopes, severely eroded.	72	VIew–2
EbC	Erie silt loam, 8 to 15 percent slopes	72	IIIew–6
EbC2	Erie silt loam, 8 to 15 percent slopes, moderately eroded.	72	IIIew–6
EbC3	Erie silt loam, 8 to 15 percent slopes, severely eroded.	72	VIew–2
EbD	Erie silt loam, 15 to 25 percent slopes	72	VIew–2
EbD2	Erie silt loam, 15 to 25 percent slopes, moderately eroded.	72	VIew–2
EbD3	Erie silt loam, 15 to 25 percent slopes, severely eroded.	72	VIIe–5
Ec	Escarpments	73	VIIe–2
FaA	Fredon loam, 0 to 3 percent slopes	73	IIIw–5
FaB	Fredon loam, 3 to 8 percent slopes	73	IIIew–4
Fm	Fresh water marsh	73	VIIIw–1
HaA	Halsey loam, 0 to 3 percent slopes	74	IIIw–3
HbA	Howard gravelly silt loam, 0 to 3 percent slopes.	74	I–1
HbB	Howard gravelly silt loam, 3 to 8 percent slopes.	74	IIe–1
HbB3	Howard gravelly silt loam, 3 to 8 percent slopes, severely eroded.	75	IIIe–1
HbC	Howard gravelly silt loam, 8 to 15 percent slopes.	75	IIIe–1
HbC3	Howard gravelly silt loam, 8 to 15 percent slopes, severely eroded.	75	VIe–1
HbD	Howard gravelly silt loam, 15 to 25 percent slopes.	75	IVe–1
HbD3	Howard gravelly silt loam, 15 to 25 percent slopes, severely eroded.	75	VIe–1
HbE	Howard gravelly silt loam, 25 to 40 percent slopes.	75	VIIe–3

Symbol	Soils	Page	Capability unit
HbE3	Howard gravelly silt loam, 25 to 40 percent slopes, severely eroded.	75	VIIe–3
LaB	Langford silt loam, 0 to 8 percent slopes	76	IIew–1
LaB2	Langford silt loam, 0 to 8 percent slopes, moderately eroded.	76	IIew–1
LaB3	Langford silt loam, 0 to 8 percent slopes, severely eroded.	76	IVew–2
LaC	Langford silt loam, 8 to 15 percent slopes.	76	IIIew–1
LaC2	Langford silt loam, 8 to 15 percent slopes, moderately eroded.	76	IIIew–1
LaC3	Langford silt loam, 8 to 15 percent slopes, severely eroded.	77	IVew–2
LaD	Langford silt loam, 15 to 25 percent slopes.	77	IVew–2
LaD2	Langford silt loam, 15 to 25 percent slopes, moderately eroded.	77	IVew–2
LaD3	Langford silt loam, 15 to 25 percent slopes, severely eroded.	77	VIIe–4
LbE	Langford and Erie silt loams, 25 to 50 percent slopes.	77	VIIe–5
LbE3	Langford and Erie silt loams, 25 to 50 percent slopes, severely eroded.	77	VIIe–4
LcA	Lobdell silt loam, 0 to 3 percent slopes	77	IIw–2
LcA3	Lobdell silt loam, 0 to 3 percent slopes, severely eroded.	78	VIe–2
LdA	Lobdell silt loam, high bottom, 0 to 3 percent slopes.	78	IIw–2
LdB	Lobdell silt loam, high bottom, 3 to 6 percent slopes.	78	IIew–3
Ma	Made land	78	Unclassified.
MbB	Mahoning silt loam, 3 to 8 percent slopes.	79	IIIwe–1
MbB2	Mahoning silt loam, 3 to 8 percent slopes, moderately eroded.	79	IIIwe–1
MbC	Mahoning silt loam, 8 to 15 percent slopes.	79	IIIew–3
MbC2	Mahoning silt loam, 8 to 15 percent slopes, moderately eroded.	79	IIIew–3
MbC3	Mahoning silt loam, 8 to 15 percent slopes, severely eroded.	79	IVew–3
McC	Manlius and Lordstown soils, shallow, 8 to 25 percent slopes.	80	IVs–1
McE	Manlius and Lordstown soils, shallow, 25 to 80 percent slopes.	80	VIIe–4
MdB	Mardin gravelly silt loam, 3 to 8 percent slopes.	80	IIew–1
MdB3	Mardin gravelly silt loam, 3 to 8 percent slopes, severely eroded.	80	IIIew–1
MdC	Mardin gravelly silt loam, 8 to 15 percent slopes.	80	IIIew–1
MdC3	Mardin gravelly silt loam, 8 to 15 percent slopes, severely eroded.	80	IVew–2
MdD	Mardin gravelly silt loam, 15 to 25 percent slopes.	80	IVew–2
MdD3	Mardin gravelly silt loam, 15 to 25 percent slopes, severely eroded.	81	VIew–1
MeE	Mardin and Volusia gravelly silt loams, 25 to 45 percent slopes.	81	VIIe–5
MeE3	Mardin and Volusia gravelly silt loams, 25 to 45 percent slopes, severely eroded.	81	VIIe–4
MfA	Miner silt loam, 0 to 3 percent slopes	81	IVw–1
Mp	Muck and Peat	81	IVw–2
OaA	Ottawa fine sandy loam, 0 to 2 percent slopes.	83	IIIs–1
OaB	Ottawa fine sandy loam, 2 to 8 percent slopes.	83	IIIs–1
OaB3	Ottawa fine sandy loam, 2 to 8 percent slopes, severely eroded.	83	IIIs–1
OaC	Ottawa fine sandy loam, 8 to 15 percent slopes.	83	IIIs–1
OaC3	Ottawa fine sandy loam, 8 to 15 percent slopes, severely eroded.	83	VIs–1
OaD	Ottawa fine sandy loam, 15 to 25 percent slopes.	83	VIs–1
OaD3	Ottawa fine sandy loam, 15 to 25 percent slopes, severely eroded.	84	VIs–1
ObA	Ottawa loamy fine sand, 0 to 2 percent slopes.	82	IIIs–1
ObB	Ottawa loamy fine sand, 2 to 8 percent slopes.	82	IIIs–1
ObB3	Ottawa loamy fine sand, 2 to 8 percent slopes, severely eroded.	82	IIIs–1
ObC	Ottawa loamy fine sand, 8 to 15 percent slopes.	82	IIIs–1
ObC3	Ottawa loamy fine sand, 8 to 15 percent slopes, severely eroded.	83	VIs–1
ObD	Ottawa loamy fine sand, 15 to 25 percent slopes.	83	VIs–1
ObD3	Ottawa loamy fine sand, 15 to 25 percent slopes, severely eroded.	83	VIs–1
PaA	Phelps gravelly silt loam, 0 to 3 percent slopes.	84	IIw–1
PaB	Phelps gravelly silt loam, 3 to 8 percent slopes.	84	IIew–1
PaB3	Phelps gravelly silt loam, 3 to 8 percent slopes, severely eroded.	84	IIIew–1
PaC	Phelps gravelly silt loam, 8 to 15 percent slopes.	84	IIIew–1
PaC3	Phelps gravelly silt loam, 8 to 15 percent slopes, severely eroded.	84	IVew–2
PbA	Platea silt loam, 0 to 2 percent slopes	85	IIIw–1
PbB	Platea silt loam, 2 to 8 percent slopes	85	IIIwe–2
PbB3	Platea silt loam, 2 to 8 percent slopes, severely eroded.	85	VIew–1
PbC	Platea silt loam, 8 to 15 percent slopes	85	IIIwe–2
PbC3	Platea silt loam, 8 to 15 percent slopes, severely eroded.	86	VIew–1
PbD	Platea silt loam, 15 to 25 percent slopes	86	IVew–3
PbD3	Platea silt loam, 15 to 25 percent slopes, severely eroded.	86	VIew–1
PcA	Platea silt loam, moderately well drained variant, 0 to 2 percent slopes.	86	IIw–1
PcB	Platea silt loam, moderately well drained variant, 2 to 8 percent slopes.	86	IIew–3
PcB3	Platea silt loam, moderately well drained variant, 2 to 8 percent slopes, severely eroded.	86	IVew–3
PcC	Platea silt loam, moderately well drained variant, 8 to 15 percent slopes.	86	IIIew–3
PcC3	Platea silt loam, moderately well drained variant, 8 to 15 percent slopes, severely eroded.	87	IVew–3
PcD	Platea silt loam, moderately well drained variant, 15 to 25 percent slopes.	87	IVew–2
PcD3	Platea silt loam, moderately well drained variant, 15 to 25 percent slopes, severely eroded.	87	VIew–1
RaA	Rimer fine sandy loam, 0 to 2 percent slopes.	88	IIIw–2
RaB	Rimer fine sandy loam, 2 to 8 percent slopes.	88	IIIew–4
RaB3	Rimer fine sandy loam, 2 to 8 percent slopes, severely eroded.	88	IIIew–4
SaA	Scio silt loam, 0 to 3 percent slopes	88	IIw–1
SaB	Scio silt loam, 3 to 8 percent slopes	89	IIew–3
SaC	Scio silt loam, 8 to 15 percent slopes	89	IIIew–3
SaC3	Scio silt loam, 8 to 15 percent slopes, severely eroded.	89	IVew–3
SbA	Sloan silty clay loam, 0 to 3 percent slopes.	89	VIw–1
ScA	Sloan silty clay loam, permanently wet, 0 to 3 percent slopes.	89	VIIIw–1
TaA	Trumbull silt loam, 0 to 3 percent slopes.	90	IVw–1
TaA3	Trumbull silt loam, 0 to 3 percent slopes, severely eroded.	90	VIew–1
TaB	Trumbull silt loam, 3 to 8 percent slopes.	90	IVw–1
TaB2	Trumbull silt loam, 3 to 8 percent slopes, moderately eroded.	90	IVw–1
TaB3	Trumbull silt loam, 3 to 8 percent slopes, severely eroded.	90	VIew–1
TaC	Trumbull silt loam, 8 to 15 percent slopes.	90	IVew–3

Symbol	Soils	Page	Capability unit
TaC2	Trumbull silt loam, 8 to 15 percent slopes, moderately eroded.	91	IVew–3
TaC3	Trumbull silt loam, 8 to 15 percent slopes, severely eroded.	91	VIew–1
UaA	Unadilla fine sandy loam, 0 to 3 percent slopes.	91	I–2
UaB	Unadilla fine sandy loam, 3 to 8 percent slopes.	91	IIe–2
UaB3	Unadilla fine sandy loam, 3 to 8 percent slopes, severely eroded.	91	IIIe–2
UaC	Unadilla fine sandy loam, 8 to 15 percent slopes.	91	IIIe–2
UaC3	Unadilla fine sandy loam, 8 to 15 percent slopes, severely eroded.	91	VIe–1
VaA	Volusia gravelly silt loam, 0 to 3 percent slopes.	92	IIIw–4
VaB	Volusia gravelly silt loam, 3 to 8 percent slopes.	92	IIIew–5
VaB3	Volusia gravelly silt loam, 3 to 8 percent slopes, severely eroded.	92	VIew–2
VaC	Volusia gravelly silt loam, 8 to 15 percent slopes.	92	IIIew–5
VaC3	Volusia gravelly silt loam, 8 to 15 percent slopes, severely eroded.	92	VIew–2
VaD	Volusia gravelly silt loam, 15 to 25 percent slopes.	92	VIew–2
VaD3	Volusia gravelly silt loam, 15 to 25 percent slopes, severely eroded.	93	VIIe–5
VbA	Volusia silt loam, 0 to 3 percent slopes.	93	IIIw–4
VbB	Volusia silt loam, 3 to 8 percent slopes.	93	IIIew–5
VbB3	Volusia silt loam, 0 to 8 percent slopes, severely eroded.	93	VIew–2
VbC	Volusia silt loam, 8 to 15 percent slopes.	93	IIIew–5
VbC3	Volusia silt loam, 8 to 15 percent slopes, severely eroded.	93	VIew–2
VbD	Volusia silt loam, 15 to 25 percent slopes.	93	VIew–2
VbD3	Volusia silt loam, 15 to 25 percent slopes, severely eroded.	94	VIIe–4
WaA	Wallington fine sandy loam, 0 to 2 percent slopes.	95	IIIw–2
WaB	Wallington fine sandy loam, 2 to 8 percent slopes.	95	IIIew–4
WaB3	Wallington fine sandy loam, 2 to 8 percent slopes, severely eroded.	95	IIIew–4
WaC	Wallington fine sandy loam, 8 to 15 percent slopes.	95	IIIew–4
WaC3	Wallington fine sandy loam, 8 to 15 percent slopes, severely eroded.	95	VIew–3
WaD	Wallington fine sandy loam, 15 to 25 percent slopes.	95	VIew–3
WaD3	Wallington fine sandy loam, 15 to 25 percent slopes, severely eroded.	95	VIew–3
WbA	Wallington silt loam, 0 to 2 percent slopes.	94	IIIw–1
WbB	Wallington silt loam, 2 to 8 percent slopes.	94	IIIwe–2
WbB3	Wallington silt loam, 2 to 8 percent slopes, severely eroded.	94	VIew–1
WbC	Wallington silt loam, 8 to 15 percent slopes.	95	IIIwe–2
WcA	Wauseon fine sandy loam, 0 to 2 percent slopes.	96	IIIw–3
WdA	Wayland silt loam, 0 to 3 percent slopes.	96	VIw–1
WeA	Williamson and Collamer fine sandy loams, 0 to 2 percent slopes.	97	IIw–1
WeB	Williamson and Collamer fine sandy loams, 2 to 8 percent slopes.	97	IIew–2
WeB3	Williamson and Collamer fine sandy loams, 2 to 8 percent slopes, severely eroded.	97	IIIew–2
WeC	Williamson and Collamer fine sandy loams, 8 to 15 percent slopes.	97	IIIew–2
WeC3	Williamson and Collamer fine sandy loams, 8 to 15 percent slopes, severely eroded.	97	IVew–1
WeD	Williamson and Collamer fine sandy loams, 15 to 25 percent slopes.	97	IVew–1
WeD3	Williamson and Collamer fine sandy loams, 15 to 25 percent slopes, severely eroded.	97	VIew–3
WfA	Williamson and Collamer silt loams, 0 to 2 percent slopes.	98	IIw–1
WfB	Williamson and Collamer silt loams, 2 to 8 percent slopes.	98	IIew–3
WfC	Williamson and Collamer silt loams, 8 to 15 percent slopes.	98	IIIew–3
WgB	Wooster gravelly silt loam, 3 to 12 percent slopes.	98	IIe–1
WgC	Wooster gravelly silt loam, 12 to 20 percent slopes.	99	IIIe–1
WgD	Wooster gravelly silt loam, 20 to 30 percent slopes.	99	IVe–1
WgE	Wooster gravelly silt loam, 30 to 40 percent slopes.	99	VIIe–3
WgE3	Wooster gravelly silt loam, 30 to 40 percent slopes, severely eroded.	99	VIIe–3

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