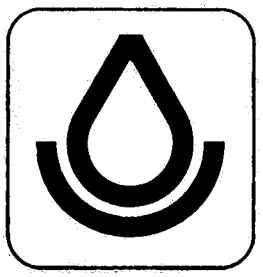
SOIL SURVEY

Erie County Ohio



Issued February 1971

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
OHIO DEPARTMENT OF NATURAL RESOURCES
Division of Lands and Soil
and
OHIO AGRICULTURAL RESEARCH AND DEVELOPMENT CENTER

Major fieldwork for this soil survey was done in the period 1963–65. Soil names and descriptions were approved in 1969. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1965. This survey was made cooperatively by the Soil Conservation Service, the Ohio Department of Natural Resources, Division of Lands and Soil, and the Ohio Agricultural Research and Development Center. It is part of the technical assistance furnished to the Erie Soil and Water Conservation District.

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

HOW TO USE THIS SOIL SURVEY

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

Locating Soils

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

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

Finding and Using Information

The "Guide to Mapping Units" can be used to find information in the survey. This guide lists all of the soils of the county in alphabetic order by map symbol. It shows the page where each kind of soil is described and the page for the capability unit.

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

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

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

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

Engineers and builders can find, under "Engineering Uses of the Soils," tables that give engineering descriptions of the soils in the county and that name soil features that affect engineering practices and structures.

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

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

U.S. GOVERNMENT PRINTING OFFICE: 1971

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

Contents

Issued February 1971

SOIL SURVEY OF ERIE COUNTY, OHIO

BY C. E. REDMOND, T. J. F. HOLE, C. H. INNIS, AND M. WACHTMAN, SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE OHIO DEPARTMENT OF NATURAL RESOURCES, DIVISION OF LANDS AND SOIL, AND THE OHIO AGRICULTURAL RESEARCH AND DEVELOPMENT CENTER

ERIE COUNTY is in north-central Ohio (fig. 1). It has an area of 168,960 acres, or 264 square miles.

The northern edge of the county is on the shore of Lake Erie, and Kelleys Island, which is the second largest island in Lake Erie, is part of the county. Most of the county is on the lake plain, but the southwestern third is on glaciated uplands.

In 1960 the population was about 68,000, of which, according to the 1960 census, about 66 percent was urban, 28 percent was rural nonfarm, and 6 percent was rural farm.

About 67 percent of the land area is farmland, and the rest is used for urban, industrial, recreational, and other nonfarm purposes. Grain, dairy products, and vegetables are the main farm products. Sugar beets, popcorn, nursery and greenhouse plants, crop seeds, and fruit are grown also.

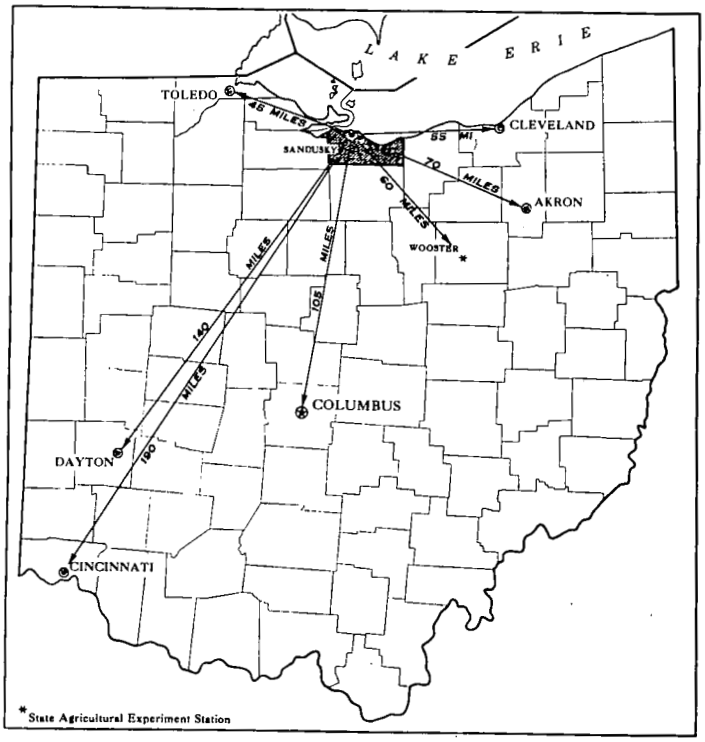


Figure 1.—Location of Erie County in Ohio.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soils are in Erie County, where they are located, and how they can be used.

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

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide uniform procedures. To use this publication efficiently, it is necessary to know the kinds of groupings most used in a local soil classification (*13*).[1]

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

Soils of one series can differ in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Sisson silt loam, 2 to 6 percent slopes, is one of several phases of the Sisson soils, which, in this county, have three different surface textures and a slope range of 2 to 25 percent.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew boundaries of

[1] Italic numbers in parentheses refer to Literature Cited, p. 164.

the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from the aerial photographs.

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

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

A soil complex consists of areas of two or more soils, so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. The name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Bennington-Pyrmont silt loams, limestone substratum, 0 to 2 percent slopes, is an example.

An undifferentiated group is made up of two or more soils that could be delineated individually but are shown as one unit because, for the purposes of the soil survey, there is little value in separating them. The pattern and proportion of soils are not uniform. An area shown on the map may be made up of only one of the dominant soils, or of two or more. The name of an undifferentiated group consists of the names of the dominant soils, joined by "and." Ellsworth and Chili soils, 18 to 50 percent slopes, is an example.

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

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

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

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

General Soil Map

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

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

The 12 soil associations in Erie County are discussed in the following pages.

1. Toledo-Fulton association

Deep, nearly level, very poorly drained to somewhat poorly drained soils that have a subsoil of clay or silty clay; on old lakebeds

This association is in the northwestern part of the county. It consists mostly of nearly level soils but has some sloping soils along the sides of stream valleys. The soils in this association are 2 to 10 feet above the average level of Lake Erie. They formed in limy silty clay sediments laid down when the level of Lake Erie was higher.

This association makes up about 6 percent of the county. It is about 70 percent Toledo soils and 30 percent Fulton and other soils.

Toledo soils are nearly level, dark colored, and clayey. About 10 percent of the acreage has a limy surface layer. Fulton soils are somewhat poorly drained, light colored, and clayey. They occur on small rises.

The minor soils are Shinrock and Warners soils. Shinrock soils are on the sides of stream valleys; they are sloping to very steep and moderately well drained. Warners soils occur as small mucky areas north of the limestone outcrop near the village of Crystal Rock.

Nearly all of this association is cropland. The principal general crops are corn, soybeans, wheat, and alfalfa, and the important special crops are tomatoes, sweet corn, cabbage, and sugar beets. Corn is likely to be damaged by the blackbirds from the adjacent marshes.

The soils are productive, and the crops respond well to fertilization. The Toledo soils that have a limy surface layer are low in available phosphorus. Poor drainage is the main limitation. Some areas adjacent to Sandusky Bay are only a foot or two above the level of Lake Erie. Drainage of these areas is difficult, because there

are no adequate outlets. Some areas have been diked and are pump drained.

2. *Del Rey-Lenawee association*

Deep, nearly level, somewhat poorly drained to very poorly drained soils that have a subsoil of silty clay to silty clay loam; on old lakebeds

This association occurs as four areas in the county. It consists mostly of nearly level soils but has some gently sloping to very steep soils along the sides of stream valleys. The soils formed in limy silt and clay that were deposited when the level of Lake Erie was higher.

This association makes up about 10 percent of the county. It is about 60 percent Del Rey soils, 30 percent Lenawee soils, and 10 percent minor soils.

Del Rey soils are somewhat poorly drained and light colored. Lenawee soils are nearly level to depressional, very poorly drained, and dark colored.

The minor soils are Shinrock, Darroch, Bennington, Kibbie, Tuscola, Arkport, Galen, Rimer, and Mahoning soils. Shinrock soils occupy the flat areas between closely adjacent streams and the gently sloping to very steep valley sides along the streams. The dark-colored, nearly level Darroch soils are on lake plains. Bennington and Mahoning soils are nearly level to gently sloping. Arkport, Galen, and Rimer soils occupy small ridges.

Nearly all of this association is cropland. The principal general crops are corn, soybeans, and wheat. Among the important special crops are tomatoes, sugar beets, sweet corn, peas, lima beans, and cabbage. The soils are productive, and the crops respond well to fertilization. Poor drainage is the main limitation.

3. *Kibbie-Tuscola-Colwood association*

Deep, level to gently sloping, moderately well drained to very poorly drained soils that have a subsoil of silt loam to silty clay loam; on old lakebeds

The two most extensive areas of this association are in the central part of the county. Three smaller areas are in the western part. This association consists mostly of level soils but has some gently sloping to very steep soils on the sides of stream valleys. The soils formed in limy silt and fine sand deposited when the level of Lake Erie was higher.

This association makes up about 15 percent of the county. It is about 35 percent Kibbie soils, 35 percent Tuscola soils, 20 percent Colwood soils, and the rest minor soils.

Kibbie soils are nearly level, somewhat poorly drained, and light colored. Tuscola soils are nearly level to gently sloping and moderately well drained. Colwood soils are level to depressional, very poorly drained, and dark colored.

The minor soils are Bennington, Pewamo, Del Rey, Shinrock, Lenawee, Arkport, Galen, Rimer, and Metea soils and Darroch soils, coarse subsoil variant.

Nearly all of this association is cropland. The principal crops are corn, soybeans, and wheat. Special crops are well suited, and among the important special crops are potatoes, tomatoes, sugar beets, sweet corn, cabbage, and pumpkins. The soils are productive, and the crops respond well to fertilization. Seasonal wetness is the main limitation.

4. *Sisson-Tuscola association*

Deep, nearly level to very steep, well drained to moderately well drained soils that have a subsoil of silt loam to silty clay loam; on uplands

This association is in the central part of the county, along the Huron River. It consists mostly of strongly dissected rolling uplands, but there are some nearly level valley bottoms (fig. 2). The major soils formed in stratified limy silt and very fine sand deposited when the level of Lake Erie was higher.

This association makes up about 5 percent of the county. It is about 50 percent Sisson soils, 25 percent Tuscola soils, and the rest minor soils.

Sisson solis are gently sloping to very steep, well drained, and in some places moderately to severely eroded. Tuscola soils are nearly level to gently sloping and moderately well drained.

The minor soils are Eel, Shoals, Sloan, and Washtenaw soils. Eel, Shoals, and Sloan soils are on flood plains; Washtenaw soils are in low areas and drainageways.

About 85 percent of this association is cropland. The principal crops are corn, soybeans, and wheat. Among the important special crops are potatoes, tomatoes, sweet corn, cabbage, and pumpkins. The soils are productive, and the crops respond well to fertilization. Erosion is the principal hazard if these soils are cultivated. The valley bottoms are subject to flooding and seasonal wetness.

5. *Arkport-Galen association*

Deep, nearly level to moderately sloping, well drained to moderately well drained soils that have a subsoil of loamy fine sand and fine sand; on hills and ridges

The largest area of this association is in the northwestern part of the county. The two smaller areas are in the south-central part. This association consists of nearly level soils and gently sloping to moderately sloping soils on sandhills and ridges. The soils formed in very fine sand deposited by wind and water as beaches, sandbars, and dunes.

This association makes up about 10 percent of the county. It is about 40 percent Arkport soils, 30 percent Galen soils, and 30 percent minor soils.

Arkport soils are mostly gently sloping to moderately sloping and well drained. Galen soils are mostly nearly level and moderately well drained.

The minor soils are Colwood, Del Rey, Gilford, Kibbie, and Lenawee soils. Gilford, Colwood, and Lenawee soils are in level to depressional areas, and Kibbie and Del Rey soils are in flat areas between the sandhills and ridges. All the minor soils are either somewhat poorly drained or very poorly drained.

Nearly all of this association is cropland. The principal general crops are corn, soybeans, and wheat. Among the important special crops are tomatoes, sugar beets, sweet corn, peas, lima beans, cabbage, and pumpkins. The soils are productive, and the crops respond well to fertilization. Wind erosion is a hazard in cultivated areas.

This association is an important source of molding sand.

Figure 2.—**Part of association 4. Sisson and Tuscola soils in the rolling areas, and Washtenaw soils in the low areas. The light-colored hilltops are severely eroded.**

6. Pewamo-Bennington association

Deep, nearly level, very poorly drained to somewhat poorly drained soils that have a subsoil of clay loam to light clay; on uplands

The largest area of this association is in the southwestern part of the county. Smaller areas are in the northwestern and north-central parts of the county and on Kelleys Island. Almost all of this association is nearly level, but there are gently sloping to moderately steep soils along the drainageways. The soils formed in limy clay loam glacial deposits.

This association makes up about 7 percent of the county. It is about 75 percent Pewamo soils, 20 percent Bennington soils, and 5 percent minor soils.

Pewamo soils are nearly level to depressional and very poorly drained. Bennington soils are nearly level to gently sloping, somewhat poorly drained, and light colored.

The minor soils are Pyrmont, Alexandria, Cardington, Haskins, Belmore, Digby, and Mermill soils. The Pyrmont soils are nearly level; Cardington soils are nearly level to gently sloping and moderately well drained. Alexandria soils occur along stream valleys and are moderately sloping to very steep and well drained. Belmore soils occur on gravelly beach ridges and are gently sloping. In nearly level areas adjacent to the Belmore soils are Haskins, Digby, and Mermill soils.

Nearly all of this association is cropland. Corn, soybeans, and wheat are the important crops. The soils are very productive, and the crops respond well to fertilization. Poor drainage is the main limitation.

7. Warners association

Deep, level, very poorly drained soils that are underlain by marl or clay

This association is in the northwestern part of the county. Except for some depressional areas, all of this association is level. The soils formed in marl deposited by underground streams that have outlets in the area.

This association makes up about 3 percent of the county. It consists mostly of Warners soils.

Some areas of the Warners soils are muck; others are loam. They are underlain by marl at a depth of about 12 inches. The loams are 1 foot to 2 feet higher in elevation than the mucks.

About 90 percent of this association is used for public hunting and fishing and as wildlife habitat. Use for crops is limited by the high lime content, a high water table, and a lack of suitable drainage outlets. About half the association has been mined to obtain marl for use in making cement.

8. Allis-Fries association

Shallow to moderately deep, nearly level to gently sloping, very poorly drained to somewhat poorly drained soils that have a subsoil of silty clay or clay; on uplands

This association is in the northeastern part of the county. It consists of nearly level soils, some areas of

gently sloping soils along drainageways, several ridges of shaly outcrop, and some gravelly beach ridges. The dominant soils formed in thin glacial deposits underlain by shale.

This association makes up about 4 percent of the county. It is about 70 percent Allis soils, 20 percent Fries soils, and 10 percent minor soils.

Allis soils are nearly level to gently sloping and poorly drained to somewhat poorly drained. They are less than 40 inches deep over hard shale in most places. Fries soils are nearly level to depressional, very poorly drained, and dark colored. They are generally 20 to 40 inches deep over shale.

The minor soils are Bogart, Chili, Colyer, Jimtown, and Prout soils. Colyer soils, in steeper areas where there are shale outcrops, are very shallow and well drained. Prout channery loam is nearly level and somewhat poorly drained. Bogart and Chili soils are gently sloping and occur on gravelly beach ridges. Bogart soils are moderately well drained, and Chili soils are well drained. Jimtown soils are near the beach ridges. They are nearly level and somewhat poorly drained.

Nearly all of this association is wooded or idle. The soils are generally poorly suited to field crops. Grapes were grown extensively at one time. In general, the soils are very low in productivity. The main limitations are poor natural drainage and acidity.

9. Mahoning-Bogart-Haskins-Jimtown association

Deep, nearly level to gently sloping, somewhat poorly drained to moderately well drained soils that have a subsoil of sandy loam to clay; on uplands, terraces, and beach ridges

This association occurs mostly in the eastern part of the county. It consists mostly of nearly level areas, but it also has gently sloping to very steep areas along the sides of stream valleys; several parallel gently sloping beach ridges; and, in the eastern part of the county, some sandstone knobs and escarpments.

This association makes up about 19 percent of the county. It is about 40 percent Mahoning, 15 percent Bogart, 10 percent Haskins, and 10 percent Jimtown soils and about 25 percent minor soils.

Mahoning soils are nearly level to gently sloping and somewhat poorly drained. They formed in moderately calcareous clay loam glacial material. Bogart soils are on beach ridges and terraces. They are mostly gently sloping and are moderately well drained. Haskins and Jimtown soils are sandy and gravelly, are mostly nearly level, and are somewhat poorly drained.

The minor soils are the Berks, Dekalb, Chili, Colwood, Ellsworth, Lenawee, Loudonville, Mermill, Miner, Millgrove, and Vaughnsville soils. Loudonville, Dekalb, and Berks soils occur in relatively higher areas where sandstone bedrock is close to the surface. Miner soils occur in depressions and drainageways. Lenawee, Millgrove, Mermill, and Colwood soils are in the nearly level areas between the beach ridges. Chili soils are on gently sloping to moderately sloping beach ridges. Vaughnsville soils occur in seepy areas along the sides of the beach ridges.

About 70 percent of this association is cropland. Corn, wheat, oats, and meadow are important crops. Orchard crops, soybeans, and some vegetables are grown on the beach ridges. If limed, the soils are moderately productive. Lime is needed to get the maximum response from fertilizer. The main limitations are inadequate drainage, seasonal wetness, and low fertility.

10. Lewisburg, moderately shallow variant-Castalia-Millsdale association

Level to moderately sloping, well-drained to very poorly drained soils that are shallow to limestone rubble and soils that are moderately deep to bedrock; subsoil of clay loam or silty clay loam; on uplands

This association occurs in the western half of the county and on Kelleys Island. This association consists of level areas, limestone ridges, and old beach ridges. Except for some small areas on Kelleys Island, areas of this association are considerably higher in elevation than surrounding areas. They were probably islands when the level of Lake Erie was higher.

This association makes up about 11 percent of the county. It is about 30 percent Lewisburg soils, 20 percent Castalia soils, 20 percent Millsdale soils, and the rest minor soils.

Lewisburg soils, moderately shallow variant, are level to moderately sloping, well drained to moderately well drained, and moderately deep to limestone. Castalia soils are nearly level to gently sloping, well drained, and less than 10 inches thick over limestone rubble. Millsdale soils are level to depressional, very poorly drained, and dark colored. They occur in areas surrounding the limestone ridges.

The minor soils are Romeo soils, Joliet soils, and Pyrmont and Arkport soils, moderately shallow variants. Arkport soils are in areas where sandy material was deposited near the tops of the limestone ridges. Romeo soils and the very poorly drained Joliet soils are nearly level and are underlain by limestone at depths ranging from less than 10 inches to 20 inches.

About 60 percent of this association is idle or in pasture. The rest is cropland. The principal crops are corn, wheat, oats, and soybeans. The soils are productive, and the crops respond well to fertilization. Poor drainage and limited depth to limestone are the main limitations.

11. Marsh and Beaches association

Level marsh and well-drained beaches adjacent to Lake Erie

This association occurs as scattered areas adjacent to Lake Erie. It makes up about 6 percent of the county.

Marsh is slightly below the level of the lake most of the year. Fluctuations in the level of the lake result in the growth of cattails, willows, and other marsh vegetation. Marsh is suitable for wildlife habitat.

Beaches are on Cedar Point and along the lake front. The sandy material is likely to be shifted by wind and water. Controlling wind erosion and wave erosion along the shore is the main problem. The vegetation consists mostly of willows and horsetail. Beaches are used mainly for recreation.

12. Prout association

Moderately deep to deep, nearly level to gently sloping, somewhat poorly drained soils that have a subsoil of heavy silt loam to silty clay loam; on uplands

This association is in the western part of the county. It consists of nearly level to gently sloping soils along the sides of stream valleys and along drainageways, several ridges of shale outcrops, and some steeper areas.

This association makes up about 4 percent of the county. It is about 30 percent Prout soils, 40 percent Prout soils, deep variant, and 30 percent Fries soils and other minor soils.

Prout soils are nearly level to gently sloping, somewhat poorly drained, and dark colored. Shale bedrock underlies Prout soils at a depth of 20 to 40 inches and Prout soils, deep variant, at a depth of 40 to 60 inches.

Among the minor soils are Fries, Colyer, Allis, Pewamo, and Mahoning soils. Fries soils are nearly level to depressional, very poorly drained, and dark colored. Colyer soils are nearly level to sloping and well drained. They are very shallow and are associated with shale outcrops. Allis soils are nearly level, somewhat poorly drained, and shallow to shale. Pewamo soils are nearly level to depressional, very poorly drained, and dark colored.

Nearly all of this association is cropland. Corn, soybeans, wheat, oats, and meadow are important crops. The soils are generally productive, and the crops respond well to fertilization. Lime is necessary to get maximum response to fertilizer. Poor drainage and acidity are the main limitations.

Use and Management of the Soils

This section explains the system of capability grouping used by the Soil Conservation Service and discusses the management of the soils in Erie County by capability units. Estimated yields of the principal crops are given. Also discussed are the management of soils for special crops, woodland, and wildlife. The properties and features affecting engineering and the limitations affecting land use planning are enumerated, mainly in tables.

General Management Practices

There are wide variations in the use and management of the soils in Erie County. Among the field crops commonly grown at present are corn, soybeans, wheat, oats, and other small grain, and among the hay and pasture crops commonly grown are alfalfa, alsike clover, Ladino

Figure 3.—**Ponding on Lenawee silt loam. Surface drains would help to remove the standing water.**

Figure 4.—**A large drainage ditch and tile outlet on soils in association 1.**

clover, red clover, timothy, orchardgrass, and bromegrass. Specific information on suitable crop varieties and management practices can be obtained from the nearest office of the Soil Conservation Service or the Ohio Agricultural Extension Service.

There are some general management practices that have wide applications. Some of these practices are discussed in the following paragraphs.

MAINTENANCE OF FERTILITY.—Many soils of the county, particularly the light-colored ones, are acid and have less than optimum supplies of plant nutrients. These soils need applications of lime and fertilizer in amounts based on the results of soil tests, on the needs of the crop grown, and on the yield expected.

UTILIZATION OF CROP RESIDUE.—In many soils of the county, particularly the light-colored ones, the organic-matter content is below optimum. In Bennington, Fulton, and other light-colored soils, the content of organic matter in the surface layer is 1 to 3 percent. In Colwood, Lenawee, and other dark-colored soils, it commonly is 4 to 6 percent. All crop residue and all available animal residue should be used. Cover crops or sod crops should be used to supplement the residue from soybeans and other crops that leave only a small amount of residue.

DRAINAGE.—Wetness is a hazard on approximately 72 percent of the acreage that is suited to cultivated crops (fig. 3). Land smoothing, tile drainage, surface drainage (fig. 4), or a combination of these measures is needed on the somewhat poorly drained or very poorly drained soils. In general, few or no drainage practices are needed on moderately well drained soils.

CONTROL OF EROSION.—Erosion is a hazard on approximately 10 percent of the acreage that is suitable for cultivation. Control of erosion is a major problem on the gently sloping to very steep soils. Erosion is severe on some of the complex slopes of the Sisson and Tuscola soils. Wind erosion is a severe hazard on Arkport, Galen, and Metea soils. Among the measures commonly used to control erosion are terrace and waterway systems, diversions, contour stripcropping, contour tillage, minimum tillage, utilization of crop residue, and maintenance of close-growing crops for cover.

Special Crops

A sizeable acreage in Erie County is used to produce special field crops, vegetable crops, and fruit crops. Sugar beets and sweet corn are the main special field crops. Fruits and vegetables are grown for sale to canneries and for sale as fresh produce at roadside stands. Most of the acreage used for these special crops consists of a few kinds of soils. Yields depend as much on the weather as on any other single factor. Favorable weather that permits planting early in spring increases the returns from peas, early cabbage, sweet corn, snap beans, and sugar beets. Because of their high value per acre, these special crops warrant intensive management.

374-857—71——2

SUGAR BEETS.—In 1964 sugar beets were grown on 661 acres in Erie County. Sugar beets are grown on various soils, ranging from the sandy Arkport and Galen soils to the clayey Toledo soils, but the largest acreage is grown on medium-textured to fine-textured, poorly drained soils. Such soils are well supplied with organic matter and plant nutrients, including manganese, boron, and zinc, all of which are minor elements that are critical for beets.

SWEET CORN.—Sweet corn is the vegetable grown on the largest acreage in Erie County. In 1964 it was harvested from 2,265 acres. Most of the corn is grown for the canning factory, but a considerable amount is also sold as fresh produce. A small amount is used for seed. Sweet corn can be grown about anywhere that field corn can be grown. The largest acreage used for sweet corn consists of Arkport, Galen, Kibbie, Sisson, and Tuscola soils. Because sweet corn is harmed by extended periods of dry weather, good yields cannot be expected on Berks, Castalia, or Casco, very flaggy subsoil variant, soils or on other shallow, droughty soils. Good drainage, either natural or artificial, is needed. Sandy soils are most suitable for early varieties, but soil texture is less important for late varieties.

POPCORN.—In 1964 more than 403 acres was used to grow popcorn. Popcorn needs soil much like that on which field corn is grown, but because of the smaller size of the plant, it extracts a smaller amount of nutrients from the soil. It is grown on various soils but mainly near the towns of Milan and Huron.

TOMATOES.—In 1960 tomatoes were grown on 352 acres in Erie County. Part of the crop is canned, and part is sold as fresh produce. Tomatoes are grown on various soils, ranging from sandy, light-colored Arkport soils to the clayey, dark-colored Toledo soils. The sandier soils are the most suitable for early varieties, but soil texture is relatively unimportant for the late varieties. Good drainage, either natural or artificial, is needed because the root system is not moisture tolerant. In the sandy area around Milan, protecting early tomatoes from damage by blowing sand is a major problem.

MELONS.—In 1964 melons were grown on 98 acres in Erie County. Melons are grown mainly on Arkport, Galen, Oakville, and Oshtemo soils and other well-drained, coarse-textured soils. They can be grown on fairly acid soils. Their needs for fertilizer are not greatly different from those of field crops. All the well-drained, sandy soils in the county are suited to melons. Milan is the center of the melon-growing area.

LIMA BEANS.—In 1964 lima beans were grown on 153 acres. Lima beans are grown on various soils but most extensively on the medium-textured soils that are high in content of organic matter. They are a late crop and can be grown on wetter soils than the early vegetable crops.

CABBAGE.—In 1964 cabbage was grown on 517 acres in Erie County. Almost the entire crop was made into sauerkraut. Cabbage is grown on various soils but most extensively on the Arkport, Galen, Metea, Sisson, and Tuscola soils and others that are nearly level, medium textured to coarse textured, and well drained to moderately well drained. They do best on soils that are nearly neutral. Sandy soils are the most suitable for early varieties, but other soil textures are as suitable for late varieties. Darroch and Wilmer soils and other wet soils that are high in organic-matter content are well suited if adequately drained. Yields from Bogart, Chili, and other acid soils are good if large amounts of lime are applied. The response to irrigation is good.

POTATOES.—In 1960 potatoes were grown on 246 acres in Erie County. Potatoes need loose, friable soils that are well supplied with plant nutrients. They are well suited to most of the sandy and gravelly, well-drained soils in the county and are successfully grown on Sisson and Tuscola soils, Warners muck, and other soils. Scab-resistant varieties can be grown on the calcareous Warners muck. Generally, yields are not good on Allis or Mahoning soils or others that are dense and compact.

OTHER VEGETABLES.—Peppers, asparagus, pumpkins, squash, snap beans, cucumbers, cauliflower, and peas are also grown in Erie County. Each one of these crops is grown on between 30 and 60 acres. Typically, the vegetables from one or two large acreages are grown for canning factories, and those from the numerous small acreages are marketed as fresh produce. Production is concentrated along Lake Erie from Huron west, and in the Milan area. The vegetables are grown mainly on Sisson, Tuscola, Kibbie, Oshtemo, Digby, Arkport, and Galen soils. Good drainage, either natural or artificial, and a reaction that is slightly acid to neutral are the main needs of these crops. Many need irrigation in a dry season.

FRUIT CROPS.—The number of fruit-producing trees and vines had been decreasing since 1930, but according to a tree census taken in 1964, there has been a slight increase in the number of fruit trees. Since dwarf trees and early varieties have been available, the acreage of fruit trees has been expanded and more old orchards have been replaced.

Deep, porous, well-drained soils are best suited, because fruit trees need a deep root zone. Good air drainage is a necessity. Orchards of apples, peaches, and cherries are concentrated on the gravelly beach ridges in the eastern part of the county and on the Chili, Oshtemo, Bogart, and Belmore soils. There were once large orchards on the Berks and Loudonville soils (fig. 5), and on others that are moderately deep over sandstone and have good air drainage, but most of these orchards either are now deteriorating or have been abandoned. Among the soils that are poorly suited to fruit trees are a few soils that are too acid; Romeo soils and other shallow soils; and Allis and Fries soils and other wet, dense soils that do not have adequate aeration.

A very large acreage in Erie County is well suited to grapes, a crop that does well on soils that, in general, are poorly suited to other crops. They can be grown on the poorly drained, acid Allis soils in the southern part of Vermilion Township; on Pyrmont soils on Kelleys Island; and on Fulton soils in the Venice area. Grape production has declined in the past ten years.

Strawberries are grown on about 50 acres in Erie County. Strawberries are suited to many soils but seem to do best on medium-textured to moderately coarse textured, acid soils. Intensive management is needed.

Figure 5.—**Apple orchard on well-drained Loudonville loam.**

Irrigation

Sprinkler irrigation is used successfully for vegetable crops and berry crops, which have a high per-acre value. The stability of the soil for these crops and the availability of water for irrigation are important considerations in determining whether irrigation is feasible. Only soils in Erie County that have slopes of less than 6 percent are well suited to irrigation. The features affecting the use of soils for irrigation are discussed in the section "Engineering Interpretations" and are shown for each soil in table 5, which begins on page 42.

The lack of good sources of water limits irrigation in some parts of the county. Most irrigation water comes from farm ponds or from deep wells. Using stream water would increase pumping costs. Streams that have a dependable flow at the time of year when the need for water is greatest are either in areas where the soils are not suitable for irrigation or at elevations considerably lower than those of the soils that could be irrigated.

Soils that are suitable for irrigation and need only a minimum of artificial drainage are Arkport, Bogart, Chili, Eel, Lobdell, Metea, Oakville, Oshtemo, and Sisson soils. Also suitable are Belmore soils that have loam texture; Galen soils, except for those that have a limestone substratum or a shale substratum; and Tuscola soils.

Soils that can be used for irrigation if adequate artificial drainage is provided are Darroch, Del Rey, Digby, Gilford, Haskins, Jimtown, Orrville, Rawson, Rimer, Shinrock, Shoals, and Wilmer soils. Also suitable if adequately drained are Colwood soils that have fine sandy loam and silt loam texture; Kibbie soils that have fine sandy loam and silt loam texture, but not the moderately shallow variant; and Millgrove soils that have loam texture.

Fulton and Toledo soils and some other fine textured to moderately fine textured soils can be irrigated if good structure is maintained. Some sandy soils that have slopes of as much as 12 percent can be irrigated successfully if erosion is controlled. Some soils that have slopes of more than 6 percent can be made suitable for irrigation by reshaping.

Capability Grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The groups

are made according to the limitations of the soils when used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive land-forming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to horticultural crops or other crops requiring special management.

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

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

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

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture, woodland, or wildlife. (There are no class V soils in Erie County.)

Class VI soils have severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture, woodland, or wildlife.

Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture, woodland, or wildlife.

Class VIII soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife, or water supply, or to esthetic purposes. (There are no class VIII soils in Erie County.)

Capability Subclasses are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

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

Capability Units are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. A capability unit is generally designated by adding an Arabic numeral to the subclass symbol, for example, IIw–4 or IIIe–3. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in a foregoing paragraphs; and the Arabic numeral specifically identifies the capability unit within each subclass.

The total area of Erie County is nearly 169,000 acres. Of this total, about 13,000 acres is not suitable for cultivation. About 8,000 acres is made up of land types, and about 5,000 acres is in capability classes VI and VII because the soils are steep and have a severe hazard of erosion. The rest is cropland in capability classes I through IV. About 4 percent, or 6,000 acres, of the cropland is in class I, and about 57 percent is in class II. About three-fourths of the acreage in class II has a wetness hazard.

On about 72 percent of the cropland acreage, wetness is the main hazard, and on about 10 percent, erosion is the main hazard. On about 14 percent, droughtiness is a hazard.

Management by Capability Units

In the following pages each of the capability units in Erie County is described, and suggestions for the use and management of the soils in each unit are given. The names of the soil series represented are mentioned in the description of each unit, but this does not mean that all the soils in a given series are in the unit. The capability classification of each individual soil is given in the Guide to Mapping Units. Beaches, Beaches, wet, Borrow pits, Gravel pits, Made land, Marsh, Quarries, and Sand pits are not in capability units.

Capability unit I–1

This unit consists of deep, nearly level, medium-textured, moderately well drained soils of the Cardington, Lewisburg, Rawson, Shinrock, and Tuscola series. These soils are on uplands adjacent to slopes or valleys that provide drainage outlets. They have a surface layer of loamy fine sand, fine sandy loam, loam, or silt loam. The underlying material is firm, limy glacial till of clay loam texture or water-laid material of fine sand, silt, and clay texture.

The surface layer is friable and easily worked. Generally, the subsoil does not restrict the growth of roots or the movement of water. The underlying compact glacial till in the Cardington, Lewisburg, and Rawson soils

tends to limit the growth of roots and the movement of water. Limestone bedrock is at a depth of 40 to 60 inches in some areas of the Tuscola fine sandy loam. The other soils have no restricting layers within 60 inches of the surface.

The available moisture capacity is high to medium, and water relationships are very good. Seldom is the moisture supply inadequate for field crops, except possibly in the Tuscola loamy fine sand in very dry years.

Artificial drainage is not needed in most of the larger areas. Water seeps naturally to adjacent slopes or drains into cracks in underlying rock, but there are local wet spots. If artificial drainage is needed, tile works well. Small areas that occur in fields with wetter soils are generally drained along with the wetter soils.

The Tuscola fine sandy loam and the Tuscola loamy fine sand are as well suited to irrigation as any soils in the county.

Because these soils are nearly level, water erosion is not a hazard, but there is a risk that gullies forming on adjacent slopes may cut back into these soils in some places. Early in spring, there is a little wind erosion in some areas of the Tuscola loamy fine sand.

The soils in this unit are neutral to medium acid in the root zone of most crops; there is natural lime within 30 inches of the surface in most of these soils but within only 20 inches of the surface in the Lewisburg soil. The Lewisburg soil seldom needs lime. The Rawson loam in the southeastern part of the county is generally more acid than that in the western and central parts.

The potential productivity is high or moderate. The organic-matter content is low. Nitrogen fertilizer is generally needed for good yields of corn, small grain, and sugar beets. The supply of minor elements is generally adequate.

The soils in this unit are well suited to all the field crops common in this area. They can be used intensively or even continuously for row crops if fertility and organic-matter content are maintained. The Tuscola soils and, to a lesser extent, the Shinrock soils are well suited to vegetables. Cabbage and sweet corn are the vegetables most commonly grown. These vegetables can replace other row crops in 1 year or 2 years of a crop rotation, depending upon the importance of vegetables in the farming operation.

These soils are well suited to forage and pasture crops, but the acreage of these crops is small because not much livestock is raised on soils of this unit.

Capability unit IIe–1

This unit consists of deep, gently sloping, moderately coarse textured to medium-textured, well drained to moderately well drained soils of the Cardington, Lewisburg, Rawson, Shinrock, Sisson, and Tuscola series. These soils are on uplands and on the side slopes of small natural drainageways. They have a surface layer of fine sandy loam or silt loam.

The surface layer is friable and easily worked. The subsoil does not restrict the growth of roots. An underlying layer of dense compact till in the Cardington, Rawson, and Lewisburg soils does restrict the growth of roots. The other soils have no layers that restrict the growth of roots within 60 inches of the surface.

The available moisture capacity is medium to high. The moisture supply is adequate for crops, except in a few areas of the Sisson fine sandy loam.

Natural drainage is adequate in most of the larger areas, but there are local wet spots that require some artificial drainage. Tile drains work well. Small areas, especially small areas of the Cardington and Lewisburg soils, that occur in fields with wetter soils are generally drained along with the rest of the field.

The erosion hazard is the chief limitation. Comparison with eroded areas suggests that erosion considerably reduces the productivity of the Cardington, Lewisburg, and Shinrock soils but that it seems to have little effect on the productivity of the Sisson and Tuscola soils. The effect of erosion is most severe on the Lewisburg soil, in which good structure extends to a depth of less than 20 inches.

The soils in this unit are neutral to medium acid in the root zone of most crops; there is natural lime within 30 inches of the surface in most of these soils and within 20 inches of the surface in the Lewisburg soil. The Lewisburg soil seldom needs lime.

The soils in this unit are productive. They are well suited to all the field crops and special crops grown in the county. They can be cultivated frequently, or even continuously, if fertility and tilth are maintained and erosion is controlled. Corn, soybeans, sugar beets, and other vegetables can be grown. The Shinrock, Sisson, and Tuscola soils are well suited to vegetable crops as well as to field crops. These soils are suitable for irrigation, but they should not be irrigated, unless erosion is controlled.

These soils are well suited to hay and pasture crops, but there are only a few acres of these crops because little livestock is raised on soils of this unit.

Capability unit IIe–2

This unit consists of deep, gently sloping, moderately coarse textured to medium-textured, well drained to moderately well drained soils of the Belmore, Bogart, Chili, and Sisson series. These soils occupy low beach ridges, terraces, and other upland areas. They have a surface layer of loamy fine sand, sandy loam, or loam. The Sisson soil is underlain by stratified silt and fine sand. The rest of the soils have sandy and gravelly subsoil and underlying material.

The surface layer of these soils is friable and easy to work. The subsoil is porous enough that the growth of roots is not restricted and the movement of water is moderately rapid. These soils have no layers that restrict the growth of roots within 60 inches of the surface, but the low available moisture capacity of the coarse sand and gravel underlying most of the soils tends to limit the growth of roots.

The available moisture capacity is high in the Sisson soil and in some areas of the Bogart soil in Oxford Township, but it is medium in the other soils. The moisture supply is commonly inadequate for shallow-rooted crops in dry years, especially in the Belmore sandy loam.

Artificial drainage is needed only in local wet spots or seep spots. Random tile can be used. The narrow ridge-like areas are not suitable for systematic tiling.

The erosion hazard is the chief limitation.

The Bogart and Chili soils are acid throughout the profile; the Sisson soil is slightly acid to neutral; the Belmore soils are limy at a depth of 24 to 40 inches.

These soils are used successfully to produce crops. They are well suited to vegetable and field crops. They are productive if fertility is maintained and erosion controlled. Since they generally occupy narrow ridges, their use in many places is governed by the use of surrounding soils. Crops respond well to fertilizer.

The Chili and Bogart soils are among the best orchard soils in Erie County. They are deep and porous and consequently allow the development of vigorous root systems. Large acreages, particularly in the eastern part of the county, are used for apple, peach, and cherry orchards. A cover of sod between the trees all but eliminates the erosion hazard, but it increases the requirement for plant nutrients.

Capability unit IIe–3

This unit consists of moderately deep, gently sloping, moderately coarse textured to medium-textured, well drained to moderately well drained soils of the Dekalb, Lewisburg, Loudonville, and Prout series. These soils are on the tops and sides of hills. They have a surface layer of fine sandy loam, loam, or silt loam. The Loudonville and Dekalb soils are underlain by sandstone; the Prout soil is underlain by shale; and the Lewisburg soil by solid, relatively unbroken limestone.

The surface layer is friable and easy to work. The subsoil generally does not restrict the growth of roots or the movement of water, but the underlying rock is a barrier to further root growth.

The available moisture capacity is low to medium, depending on the depth to rock. The moisture supply is inadequate for crops in dry years and, in the less deep soils, is inadequate in average years.

Natural drainage is adequate. There are local seep spots and small areas of springs within the areas of the Loudonville and Prout soils; these spots are hard to drain because the rock interferes with tiling.

The erosion hazard is the main limitation. Even a little erosion can seriously affect the productivity of these soils.

The Loudonville, Dekalb, and Prout soils are strongly acid and are low in natural fertility. The Lewisburg soil is moderately shallow over limestone, moderately alkaline, and, in some areas, deficient in minor elements.

The soils in this unit are not well suited to corn. Soybeans is preferred by many farmers as a main crop. A year of soybeans followed by 2 years of small grain is a cropping system used by some farmers. The Lewisburg soil is farmed more intensively than the other soils in the unit.

These soils are moderately well suited to hay and pasture, but the moderate depth to rock restricts the growth of alfalfa and other deep-rooted crops. Most areas of the Loudonville soil, which was once important as an orchard soil, are now used as meadow or pasture.

Capability unit IIw–1

This unit consists of deep, nearly level, medium-textured, somewhat poorly drained soils of the Orrville and Shoals series. These soils are on stream bottoms. They are flooded occasionally, and floodwater remains ponded in low areas. The texture of the surface layer varies within short distances but is mainly silt loam. The texture throughout the profile varies. Thin layers of sand and gravel are common below a depth of 3 feet.

Tilth is good. The surface layer is friable and easy to work. There are no layers that restrict the growth of roots within a depth of 60 inches.

The water table is high part of the year. Tile drains are effective, but suitable outlets are scarce. Open ditches work well but are likely to be clogged by debris during floods.

The Orrville soil is acid, and in some areas where it contains shale chips, it is strongly acid. The Shoals soil is generally not acid.

The content of organic matter and the supply of plant nutrients are moderately high.

The soils in this unit are suited to corn, soybeans, and other row crops, but they are of limited use for small grain and some hay crops. Row crops can be grown continuously if drainage is adequate and fertility and organic-matter content are maintained. Late vegetable crops are well suited, but there is always the possibility that they will be damaged by floods. Oats and wheat sometimes are stunted because of the high water table or are damaged by floods early in spring. Alfalfa heaves during winter and is sometimes damaged by floods. Old stream channels and oxbows make some areas difficult to work. Leveling would improve some areas now cultivated and would make more areas suitable for cultivation.

The soils in this unit are well suited to Ladino clover and Kentucky bluegrass.

Capability unit IIw–2

This unit consists of deep, nearly level, medium-textured soils of the Bennington, Del Rey, Ellsworth, Mitiwanga, and Pyrmont series. These soils are on lake plains and till plains. Most are somewhat poorly drained. The Ellsworth soil is moderately well drained, but it has a dense subsoil and consequently the water relationships are much like those in the somewhat poorly drained soils.

The surface layer is friable. Tilth is generally good, except possibly where spots of silty clay loam occur within areas of the Del Rey and Bennington soils. The dense subsoil of the Ellsworth soil restricts the growth of roots and the downward movement of water, but the subsoil of the other soils does not. Bedrock is at a depth of 40 to 60 inches in the Bennington and Pyrmont soils, limestone substratum, and at a depth of 20 to 40 inches in the Mitiwanga soils. In the other soils, there is no rock within 60 inches of the surface.

The available moisture is medium to high, and the moisture supply is almost always adequate for crops.

Wetness is the only limitation. The water table is near the surface during winter and spring. In most areas drainage is necessary for the successful production of crops. In the Bennington and Pyrmont soils, limestone substratum, the bedrock interferes with tile setting in some spots.

The control of erosion is not a problem.

The soils in this unit vary considerably in reaction. The Pyrmont soils have natural lime within a depth of

20 inches and seldom need additional lime. The Del Rey and Bennington soils are nonacid or only slightly acid in the root zone of most crops. The Mitiwanga soils are strongly acid. To raise the pH of any of the soils by a given amount, rather large applications of lime are needed.

If drained, the soils in this unit are moderately to highly productive. They are well suited to the row crops, grain, and hay crops grown in the county. A considerable acreage is used for small grain, especially in the southwestern part of the county. Row crops can be grown continuously if an adequate content of organic matter is maintained; the silt loams are highly susceptible to surface crusting. The Del Rey soils are well suited to vegetables, particularly late vegetables, and are the only soils in this unit that are used extensively for these crops. The Pyrmont soils are well suited to grapes. Because of wetness, the soils of this unit are not suitable for tree fruits.

All the soils in this unit are suited to hay and pasture crops, but little forage is grown because not much livestock is raised in these areas. Artificial drainage and, for all but the least acid soils, applications of lime are needed for alfalfa production. It is not practical to lime the most acid soils to the level that is optimum for alfalfa. On these soils, red clover can be grown instead of alfalfa.

Capability unit IIw–3

This unit consists of deep, nearly level, medium-textured to coarse-textured, somewhat poorly drained soils of the Digby, Haskins, Jimtown, Kibbie, Prout, Rimer, Vaughnsville, and Washtenaw series. These soils are on the lake plain, on deltas, and on the lower slopes of beach ridges. They have a surface layer of loamy fine sand, fine sandy loam, sandy loam, loam, or silt loam. Most of the soils are underlain by silt, fine sand, gravelly loam, or mixed sand and gravel, but the Haskins soil is underlain by firm glacial till or lake-laid clay at a depth of 18 to 40 inches.

The surface layer is friable and easy to work. The subsoil is porous and does not restrict the growth of roots or the movement of water. Clayey deposits underlying the Haskins soil do not restrict the growth of roots, but they do retard temporarily the downward movement of water. Limestone rock is at a depth of 40 to 60 inches in the Kibbie soil, moderately shallow variant. The other soils have no layers that restrict the growth of roots within a depth of 60 inches.

The available moisture capacity is medium to high, and rarely is the moisture supply inadequate for crops.

Wetness is the only limitation. The water table is at or near the surface in winter and spring, and artificial drainage is necessary for the successful production of most crops. Tile drainage is generally effective. The Vaughnsville soil, which is wet mainly as a result of seepage from gravel ridges, is less easily drained by tile than the other soils.

The control of erosion is not a problem. The Washtenaw soil is subject to overwash from adjacent slopes and occasionally carries streams of flowing water.

If adequately drained, the soils in this unit are highly productive. They are suited to and are used for various crops. They can be intensively cropped if drainage is adequate and if tilth, fertility, and organic-matter content are maintained. The Kibbie and Digby soils are well suited to all field crops and vegetables grown in the area. Corn, soybeans, sugar beets, various vegetables, and other row crops can be grown continuously on these soils if the organic-matter content is maintained. Crop rotations that include small grain and forage crops are suitable. The Haskins soil and the Vaughnsville soil are used and managed with surrounding soils. The Washtenaw soil and adjacent areas of the Sisson soils are farmed together. The Washtenaw soil is seldom used for vegetables or other high-value crops, because seedlings are likely to be washed out or buried during heavy rains. This hazard results from the position of the Washtenaw soil in low areas.

All the soils in this unit are suited to hay and pasture crops. Artificial drainage is needed for good alfalfa production. The Kibbie and Digby soils are not extensively used for hay and pasture because they are not in areas where much livestock is raised.

Capability unit IIw–4

This unit consists of nearly level, moderately coarse textured to moderately fine textured, somewhat poorly drained soils of the Darroch, Elliott, Haskins, and Wilmer series. These soils are on the lake plain, on till plains, and on narrow strips between beach ridges. They have a surface layer of fine sandy loam, loam, silt loam, or silty clay loam. Haskins loam, dark surface variant, is underlain by clayey lakebed deposits or glacial till; the Elliott soils are underlain by compact glacial till of clay loam texture; Darroch soils are underlain by alternate thin layers of silt, clay, and fine sand; and the Wilmer soil is underlain by gravel or loamy gravel.

The surface layer is friable, has good structure, and is high in organic-matter content. The subsoil is porous and does not restrict the growth of roots or the movement of water. In the Elliott and Haskins soils, at a depth of less than 40 inches, compact glacial till restricts the growth of roots.

The available moisture capacity is medium in the Wilmer soil and in Darroch fine sandy loam, coarse subsoil variant, but it is high in the other soils. Seldom is the moisture supply inadequate for crops.

The water table is at or near the surface in winter and spring. Artificial drainage is necessary for the successful production of most crops. Tile drains can be used.

The control of erosion is not a problem, because the soils are nearly level.

Most areas of the Darroch soils are nonacid. The areas of the Wilmer soil east of the Huron River are generally more acid than those west of the river. The Haskins and Elliott soils vary considerably in reaction within small areas.

These soils can be cropped continuously if drainage is provided, fertility is maintained, and the organic-matter content is replenished. Cover crops are not necessary for maintaining tilth because the content of organic matter is naturally high, but cover crops do help to reduce wetness in spring. Corn grown continuously and corn grown in rotation with soybeans are two common cropping systems. Sugar beets are well suited if drainage is adequate.

Sweet corn does well and is the vegetable most commonly grown, but cabbage, pumpkins, and melons are also grown successfully.

The soils in this unit are well suited to pasture and hay crops, but these crops are seldom grown because their value per acre is relatively low.

Capability unit IIw–5

This unit consists of nearly level, moderately coarse textured to moderately fine textured, very poorly drained soils of the Colwood, Gilford, Lenawee, Mermill, Millgrove, and Pewamo series. These soils are on broad plains and in small depressions and natural drainageways. They have a surface layer of fine sandy loam, loam, silt loam, or silty clay loam. Except for slope, color, and drainage, their characteristics are diverse.

A layer of light clay loam below the gravelly subsoil in the Mermill soils restricts temporarily the downward movement of water but does not restrict the growth of roots. Rock is at a depth of 40 to 60 inches in the Colwood and Pewamo soils, limestone substratum. The other soils have no layers that restrict the growth of roots within a depth of 60 inches.

Tilth is generally good, except in some areas of the Lenawee, Pewamo, and Millgrove silty clay loams, which become cloddy if plowed when too wet. In some areas of the Colwood and Lenawee silt loams, the surface layer is highly organic and is not easy to plow.

The available moisture capacity is high, and rarely is the moisture supply inadequate for crops. The organic-matter content is high.

The water table is at or near the surface for extended periods. Artificial drainage is necessary for the successful production of most crops. Many areas were swampy until artificially drained. All the soils can be drained by means of tile, but in the Gilford and Millgrove soils, trenches are likely to cave in if the soil material is wet, and sand washes into the tile. In the Gilford soil, some tile has been laid on boards to keep it from settling. The underlying limestone interferes with tile setting in some areas of the Colwood soils.

The soils in this unit are typically nonacid; there is natural lime within 3 feet of the surface in most areas of the Lenawee, Pewamo, Colwood, and Mermill soils. The silty clay loams need the most lime to change the pH by a given amount, and the fine sandy loams the least.

If drained, the soils in this unit are highly productive. They are well suited to all the commonly grown field crops and to Ladino clover, tall fescue, bromegrass, alfalfa, and various other forage crops. Row crops can be grown continuously if drainage is adequate and tilth and fertility are maintained. Vegetables can be grown successfully on the Colwood and Millgrove soils and on Lenawee silt loam. The Pewamo and Lenawee soils are especially well suited to sugar beets, which are also grown on the other soils in this unit.

Pastures are mostly narrow strips along natural drainageways, surrounded by steep slopes. These areas are difficult to drain artificially. The pastures can be harmed by trampling if used for grazing when the sod is too wet.

Capability unit IIw–6

This unit consists of gently sloping, medium-textured to moderately coarse textured, somewhat poorly drained soils of the Bennington, Del Rey, Haskins, and Kibbie series. These soils are on low knolls and ridges and on the side slopes of small natural drainageways. They have a surface layer of fine sandy loam, loam, or silt loam.

The surface layer is friable and easy to work. The subsoil, which has good structure, does not restrict the growth of roots or the movement of water, but the underlying material does.

The available moisture capacity is medium to high, and seldom is the moisture supply inadequate for crops.

Wetness is a limitation. The water table is at or near the surface in winter and early in spring. Artificial drainage is necessary for maximum production.

The erosion hazard is slight to moderate and has to be considered in management.

If drained and properly fertilized, these soils are productive. They are suited to the main crops grown in the area. Since few fields are made up entirely of soils of this unit and most individual areas are less than 10 acres in size, the use and management of these soils are governed by the use and management of surrounding, more extensive soils.

Capability unit IIw–7

This unit consists of deep, nearly level, medium-textured, moderately well drained soils of the Eel and Lobdell series. These soils are on the higher parts of flood plains along the major streams. They are flooded infrequently, perhaps once in 10 years. Many areas are inaccessible and are so dissected by old stream channels that their use for crops is severely limited. They have a surface layer of silt loam.

These soils are easily worked. No restricting layers and no rock occur within 60 inches of the surface.

The available moisture capacity is high, and seldom, if ever, are the soils droughty. They are suitable for irrigation and are close to reliable sources of water.

Artificial drainage is necessary only in a few local wet spots. Protective measures against flooding are not warranted, because the areas of these soils are so small.

Erosion is a hazard only during floods. Deposition is more likely than gullying or washing away.

Fertility is high, and the content of organic matter is fairly high throughout the profile. The Lobdell soil is strongly acid, and the Eel soil is nearly neutral.

The soils in this unit are well suited to vegetables and to all the field crops and special crops grown in the area. They are not commonly used for high-value or high-cost crops, because of the risk of flooding.

These soils are well suited to improved pasture, and several areas are used for this purpose.

Capability unit IIs–1

This unit consists of nearly level to gently sloping, sandy, well drained to moderately well drained soils of the Arkport, Galen, and Metea series. These soils are on beach ridges, on sand dunes, and on outwash plains. They have a surface layer of loamy fine sand. Below the sur-

face layer, the texture is variable, but the content of sand and gravel is considerable.

These soils have a friable surface layer and are easy to work. In the Metea soils, silty clay loam or clay loam at a depth of 20 to 40 inches restricts the movement of water. Rock is at a depth of 40 to 60 inches in the Galen loamy fine sand, limestone substratum. The other soils have no layers that restrict the growth of roots or the movement of water within 60 inches of the surface.

Inadequate available moisture capacity is the chief limitation. In the Metea soils the capacity is medium, but in the other soils it is low. In dry years the moisture supply is not adequate for crops. This limitation can be overcome by irrigation. The Arkport and Galen soils are as well suited to irrigation as any soils in the county.

Natural drainage is adequate, except in local seep spots. Some of these spots are difficult to drain because of their position and the instability of the sandy and gravelly soil material.

The control of water erosion is not a problem, because of the gentle slope and the rapid infiltration rate. Wind erosion is a moderate hazard on the Arkport and Galen soils. Blowing sand damages early vegetable crops on these and nearby soils. Protective strips of rye can be used in vegetable fields to intercept blowing sand until surrounding crops are high enough to keep it from blowing. Then the strips can be plowed and planted to late cabbage or some other suitable crop.

The organic-matter content is low. The supplies of nitrogen, phosphorus, and potassium are generally low. Manganese and other trace elements are low. Frequent testing of these sandy soils is desirable, because lime and plant nutrients are leached out rapidly. None of the soils in this unit are strongly acid.

These soils are suited to and are used for field crops and various other crops. Small grain, grass, and other shallow-rooted crops do not get enough moisture in dry weather. Alfalfa and other deep-rooted crops withstand dry periods better. Sweet corn, cabbage, tomatoes, and melons are the principal crops grown in the larger areas of the Arkport and Galen soils, which are among the chief vegetable-producing soils. The high value of these crops justifies irrigation. Cover crops are beneficial; they help to increase the content of organic matter and to decrease the wind erosion hazard. The Galen soil, limestone substratum, is less well suited to irrigation than the other Galen soils. Many areas of the soils in this unit, particularly areas of the Galen soil, limestone substratum, are too small to be managed separately.

Pastures cannot be depended upon through the dry periods late in summer. Deep-rooted pasture crops are most desirable.

Capability unit IIs–2

This unit consists of deep, nearly level, medium-textured, well drained to moderately well drained soils of the Belmore, Bogart, and Chili series. These soils are on the tops of beach ridges and on terraces. They have a surface layer of loam, a subsoil of clay loam, sandy clay loam, or gravelly clay loam, and a substratum of sand and gravel mixed with varying amounts of loamy material.

The soils in this unit have a friable surface layer and are easy to work. No layers that stop the growth of roots or the movement of water occur within 60 inches of the surface, but for field crops, the low available moisture capacity in the coarse-textured substratum does tend to inhibit the growth of roots.

The available moisture capacity is medium to low. Some areas of Bogart and Chili soils in Oxford Township contain considerable shale and have higher available moisture capacity than other areas.

The moderately well drained Bogart soil has a seasonally high water table. In some areas there are small wet spots, which can usually be drained by random tile lines.

The content of organic matter and the supply of plant nutrients are low.

The Belmore soil is slightly acid, and the Bogart and Chili soils are slightly acid to very strongly acid. The shaly areas of Bogart and Chili soils generally are more acid than other areas.

The control of erosion is not a problem, because of the nearly level topography and the rapid rate of infiltration.

The soils in this unit are moderately productive. They are well suited to fruit and are also suited to most of the field crops commonly grown. The good natural drainage and the porous nature of the soil permit the growth of vigorous tree-root systems. Not much lime is needed for fruit trees. Row crops can be grown continuously if the organic-matter content is maintained and the needs for lime and fertilizer are met. In dry years shallow-rooted grain crops are apt to get insufficient moisture.

These soils are suited to hay and pasture crops. Alfalfa, red clover, and other deep-rooted crops are the most desirable.

Capability unit IIs–3

This unit consists of moderately deep, nearly level, moderately coarse textured and medium-textured, well drained to moderately well drained soils of the Dekalb, Lewisburg, Loudonville, and Prout series. These soils are on the tops of hills. They have a surface layer of fine sandy loam, loam, or silt loam. At a depth of 20 to 40 inches the Lewisburg soil is underlain by solid limestone, the Dekalb and Loudonville soils by sandstone, and the Prout soil by shale.

All the soils in this unit have a friable surface layer and are easy to work. The subsoil does not restrict the growth of roots or the movement of water, but the underlying rock stops the growth of roots.

The available moisture capacity is medium to low. The main limitation is the inadequate supply of moisture for crops in dry years.

Natural drainage is adequate, except in local wet spots. These spots are difficult to drain because the underlying rock interferes with tile setting.

The control of erosion is not a problem, because the topography is nearly level.

The organic-matter content is low. All the soils are acid, the Prout soil more so than the others.

The soils in this unit vary in their suitability for crops. Sugar beets and vegetables are not usually grown, because of the risk of drought. The Lewisburg soil is suited to all the field crops grown in the area. Corn and soybeans are row crops that can be grown. The Loudonville

soil also is suited to the common field crops, but only a small acreage of this soil is now farmed. The use of this soil for orchards, once important, is declining. Most areas of the Prout soil are too small to warrant special management practices and consequently are used and managed in the same way as surrounding soils. Corn, small grain, and forage crops can be grown on this soil if enough lime and fertilizer are applied.

Capability unit IIIe-1

This unit consists of moderately sloping, coarse-textured to medium-textured, well drained to moderately well drained soils of the Arkport, Belmore, Chili, Metea, and Sisson series. These soils are on beach ridges and on the sides of valleys. They have a surface layer of loamy fine sand, fine sandy loam, sandy loam, loam, or silt loam.

These soils have a friable surface layer and are easy to work. The coarse-textured substratum of the Belmore and Chili soils inhibits the growth of roots. The other soils have no layers that restrict the growth of roots within 60 inches of the surface. Certain layers in the Metea soil and in the Sisson fine sandy loam restrict temporarily the downward movement of water. In the Belmore soil the downward movement of water is rapid, and in the Chili soil it is moderately rapid.

The available moisture capacity of the Sisson soils is high, that of the Metea soil is medium, and that of the Arkport, Belmore, and Chili soils is low to medium. In the Sisson and Metea soils, the moisture supply is seldom inadequate for crops. In the Chili soil it is inadequate in dry years, and in the Belmore soil in both dry and average years.

The control of wetness is a problem only in small seep spots, some of which are hard to drain because of the slope.

Erosion is a severe hazard if the soils have been cultivated and left bare. The hazard is more serious on the soils that have a surface layer of silt loam or loam than on the sandier soils. It is greater on Arkport soils than on Sisson soils. Erosion can greatly reduce the productivity of the Belmore, Chili, and Metea soils but does not appear to affect seriously the productivity of the Sisson and Arkport soils. It also damages crops on adjacent soils.

The only acid soil in this unit is the Chili soil. All the soils are low in nitrogen content and in organic-matter content.

The Belmore soil in this unit is not well suited to the common field crops, because it is droughty. It is poor for corn and small grain in both dry and average years. A large proportion of the acreage is used for hay and pasture, because the raising of livestock is important where this soil occurs. Alfalfa-bromegrass mixtures are suitable hay or pasture crops.

The Chili soil is used mostly for orchards or for hay and pasture. It is well suited to fruit and to field crops, but it is poor for corn and small grain in dry years. The good natural drainage and the porous nature of the soil permit the development of vigorous tree-root systems. Permanent sod between the trees reduces the erosion hazard to a minimum.

The Metea soil and the Sisson fine sandy loam are suited to all the common field crops. They are highly productive if fertility is maintained. Corn, soybeans, and various vegetable crops can be grown. Vegetables are usually grown in the second year of the crop rotation. Various hay and pasture crops are also suitable. Droughtiness is not a hazard. Cultivation across the slope helps to reduce erosion, but it is impractical in many areas because of the complex slopes.

Capability unit IIIe-2

This unit consists of gently sloping to moderately sloping, medium-textured, well drained to moderately well drained soils of the Alexandria, Ellsworth, and Shinrock series. These soils are on the sides of valleys and on hillsides in all parts of the county. They have a surface layer of friable silt loam. The Shinrock soil is moderately eroded. The Ellsworth and Shinrock soils have a clayey subsoil that tends to restrict the growth of roots.

These soils erode rapidly if not protected by vegetation. They do not take in water rapidly enough to prevent runoff during heavy rains, and the slope makes it difficult to control erosion by contouring, stripcropping, and terracing. The water that does enter the soil moves downward slowly but is not held for extended periods. Erosion substantially reduces the productivity of the Alexandria and Ellsworth soils, and these soils have poor tilth if a considerable amount of subsoil is mixed into the plow layer. Erosion has less effect on the productivity of the Shinrock soil.

The available moisture capacity is high to medium, and there are periods when there is not enough moisture for crops.

The control of wetness is a problem only in small seep spots. Some of these spots can be drained with a single line of tile, but others are difficult to drain because of slope or underlying rock.

The content of organic matter is low, particularly in eroded areas.

The Ellsworth and Alexandria soils are acid in the root zone. The Shinrock soil is naturally high in lime.

If erosion is controlled and fertility maintained, these soils are suited to the main field crops grown in the area: corn, soybeans, wheat, oats, and forage crops.

Capability unit IIIe-3

This unit consists of moderately deep, moderately sloping, medium-textured, well-drained soils of the Lewisburg and Loudonville series. These soils are on hillsides. They have a surface layer of loam or silt loam. At a depth of 20 to 40 inches, the Lewisburg soil is underlain by solid limestone and the Loudonville soil by sandstone.

The soils in this unit have a friable surface layer and are easy to work. The subsoil has good structure and does not retard the growth of roots or the movement of water, but the underlying bedrock is a barrier to root growth.

The available moisture capacity is low to medium, depending on the depth to bedrock. There are periods when the moisture supply is not adequate for crops. Moderate runoff reduces the supply of available moisture.

Natural drainage is adequate, but there are a few small seep spots in some areas of the Loudonville soil.

The erosion hazard is severe. Even a small amount of erosion seriously affects productivity.

Only a little of the Loudonville soil is cultivated, although it too is suited to field crops. It is well suited to a number of hay and pasture crops. Because only a few of the individual areas are more than 10 acres in size, the use of soils in this unit is governed by the use of surrounding soils. Special erosion control practices for small areas surrounded by nearly level soils are not generally feasible.

Capability unit IIIw–1

This unit consists of deep, nearly level, medium-textured, poorly drained to very poorly drained soils of the Sloan and Wayland series. These soils are on stream bottoms and are subject to flooding. Some areas are dissected by old stream channels. The surface layer is silt loam.

These soils have a friable surface layer and no layer that restricts the growth of roots within 60 inches of the surface.

The available moisture capacity is high.

Wetness is a severe limitation. The soils have a high water table and are subject to ponding and flooding. Tile can be installed easily, but many areas lack outlets, and the tile can be washed out during a flood.

The Wayland soil is acid; the Sloan soil is not.

The Sloan soil is productive if it can be drained. Most areas are in permanent pastures. Birdsfoot trefoil and timothy are suitable for seeding in pastures. The Wayland soil is less fertile. Most areas of it are in woods or unimproved pastures, and only a small part of the acreage is cultivated. Artificial drainage of the Wayland soil generally is not feasible, and heavy application of lime and fertilizer are generally not practical.

Capability unit IIIw–2

This unit consists of deep, nearly level to gently sloping, moderately fine textured, somewhat poorly drained soils of the Fulton series. These soils are on the lake plain in the northwestern part of the county. They have a surface layer of silty clay loam and a subsoil of silty clay.

The surface layer is hard when dry and becomes cloddy if plowed when wet. The subsoil retards the movement of water, although it has good structure. No layer that stops the growth of roots occurs within 60 inches of the surface, but the underlying clay limits root development.

Wetness is a severe limitation. The subsoil remains saturated for extended periods, and artificial drainage is necessary for the successful production of most crops. A system of deep drainage ditches provides outlets for tile and surface drains, but the water level in these ditches is governed by the water level in Lake Erie and at times is so high that the outlets do not function.

The control of erosion is a problem in gently sloping areas.

These soils are not acid. Infrequent applications of lime are sufficient in most areas.

Corn, sugar beets, small grain, hay crops, tomatoes, and other crops are grown where drainage has been provided. There are a few orchards and a decreasing acreage of vineyards. Farm enterprises vary and include dairying and growing cash crops.

These soils are less well suited to pasture than to field crops. They are likely to puddle if pastures are grazed early in spring, while the soils are still wet.

Capability unit IIIw–3

This unit consists of deep, nearly level to gently sloping, medium-textured, somewhat poorly drained soils of the Mahoning and Pyrmont series. These soils are on till plains. They have a surface layer of loam or silt loam.

In general the soils in this unit are friable and easy to work, but those that have a surface layer of silt loam are subject to crusting, and the Mahoning stony silt loam contains numerous large boulders that interfere with cultivation. In the subsoil, the downward movement of water is slow, and roots do not readily grow into the soil mass but concentrate in the cracks. The underlying shale in the Mahoning silt loam, shale substratum, is a barrier to root growth. Rather dense clay in the other soils restricts the growth of roots.

Wetness is a severe limitation. The water table is at or near the surface in winter and spring. Artificial drainage is necessary for the successful production of most crops. Shallow surface drains can be constructed to remove surface water, but some of the large areas lack good outlets for tile drains and surface drains.

Erosion is a hazard in gently sloping areas.

The soils in this unit are acid, and applications of lime are necessary for the successful production of most crops.

Most of the soils in this unit are suited to the common field crops. Corn, soybeans, oats, wheat, and forage crops are grown. The Mahoning stony silt loam is generally not suited to crops unless it has been cleared of stones. It is used for woods or permanent pasture.

All the soils are suitable for pasture. Among the suitable pasture plants are Ladino clover, birdsfoot trefoil, orchardgrass, and timothy.

Capability unit IIIw–4

This unit consists of moderately deep, nearly level to gently sloping, medium-textured, somewhat poorly drained soils of the Prout series. These soils have a surface layer of loam or channery loam and are underlain by shale at a depth of 20 to 40 inches.

The Prout loam has a friable surface layer and is easy to work. The Prout channery loam contains many rock fragments. The subsoil does not restrict the growth of roots, but the downward movement of water is rather slow. Rock, at a depth of 20 to 40 inches, is a barrier to the growth of roots and restricts the downward movement of water.

Wetness is a severe limitation. The water table is at or near the surface in winter and spring. Artificial drainage is necessary for the production of most crops. In most areas the underlying shale can be dug into with a tiling machine, but in some areas the shale hampers the installation of tile.

The available moisture capacity is low to medium, depending on the depth to rock. Late in summer the moisture supply is frequently inadequate for crops.

The control of erosion is not a problem.

The soils in this unit are acid, and frequent applications of lime are necessary for the successful production of most crops. The need for lime is greatest where the shale is nearest the surface.

Most of the larger areas of the Prout loam are farmed. Corn, small grain, and various hay crops are grown. Lime and fertilizer requirements are high. Alfalfa is poorly suited because of the moderate depth and strong acidity of the soils. Red clover is better suited than alfalfa. The Prout channery loam is not suitable for most farm crops, but it is used successfully for orchards and for woodland.

Capability unit IIIw-5

This unit consists of nearly level, fine textured to moderately fine textured, very poorly drained soils of the Pewamo and Toledo series. These soils have a surface layer of silty clay or silty clay loam.

Tilth depends on the conditions under which the soils are plowed. Working the soils when they are too wet causes structures to deteriorate. Pewamo silty clay, which occurs as spots within large areas of Pewamo silty clay loam, is usually plowed when it is too wet. Toledo silty clay, which occurs as large uniform areas, can usually be plowed at optimum moisture content. Some areas of the Toledo soils have a silty clay loam texture and have better structure and tilth than the other soils. The subsoil in all these soils restricts the downward movement of water.

Wetness is a severe limitation. The water table is at or near the surface in winter and for extended periods in spring. Ponding is common. Both surface drains and subsurface drains are needed. Shallow surface drains are effective. Outlets for the surface drains and tile drains in most areas are provided by a stream of large drainage ditches. The water level in the drainage ditches is governed by the water level in Lake Erie, and at times it is so high that the outlets do not function.

The control of erosion is not a problem because the topography is nearly level.

The soils in this unit are not acid. Pewamo silty clay and Toledo silty clay need occasional applications of lime. Toledo silty clay, calcareous variant, is limy at the surface. It needs no additional lime but is likely to need large amounts of phosphorus because lime ties up phosphorus in a form that plants cannot use.

If drained and kept in good tilth, these soils are highly productive. All the common field crops are grown successfully. Sugar beets and late varieties of tomatoes and cabbage are grown on both Toledo soils. Growing row crops continuously causes deterioration of structure and makes drainage difficult. The roots of forage crops improve structure.

The soils in this unit are suited to pasture plants, but the surface puddles and the structure deteriorates if the pastures are grazed when too wet. Permanent pastures are few.

Capability unit IIIw-6

This unit consists of moderately deep, nearly level, medium-textured to moderately fine textured soils of the Millsdale series. These soils are underlain by limestone bedrock at a depth of 20 to 40 inches. The surface layer is silt loam or silty clay loam.

Millsdale silt loam is friable and easy to work, but Millsdale silty clay loam becomes cloddy if worked when too wet. The subsoil does not restrict the growth of roots, but it does restrict the movement of water. The limestone bedrock is a barrier to roots.

Wetness is a limitation. The water table is at or near the surface in winter and early in spring. There is occasional ponding, and in some areas along streams, there is flooding. Artificial drainage is necessary for the production of most crops, but it is difficult to establish. Tiling is hampered by the limestone, and where the limestone is near the surface, tiling is practically impossible.

Late in summer the supply of moisture is inadequate for crops, especially where the limestone is nearest the surface.

The content of organic matter is high.

If drained, these soils are productive. The common field crops can be grown continuously if adequate drainage is provided and tilth is maintained.

Most undrained areas are in permanent pasture. A good mixture for seeding pastures consists of birdsfoot trefoil and bluegrass.

Capability unit IIIw-7

This unit consists of moderately deep, nearly level, medium-textured to moderately fine textured, poorly drained to very poorly drained soils of the Colwood, Fries, Miner, and Trumbull series. These soils are in low areas on the lake plain and on till plains. They have a surface layer of silt loam or silty clay loam.

The Colwood, Fries, and Miner soils have better structure in the surface layer than the Trumbull soil. The silty clay loams tend to become cloddy if worked when too wet. The subsoil does not restrict the growth of roots, but the downward movement of water is very slow. Roots concentrate in the cracks between the soil structure units. Shale at a depth of 20 to 40 inches in the Fries soils is a barrier to the growth of roots and the movement of water.

Wetness is a severe limitation. The water table is at or near the surface in winter and early in spring. There is some ponding and occasional flooding. Artificial drainage is necessary for the successful production of most crops. In most places the shale underlying the Fries soils is soft enough to be dug through with a tiling machine, but in spots it is hard enough to interfere with tiling. The drainage of Miner and Trumbull soils is slow, if tile drains are used. Some areas lack suitable outlets for tile drains and surface drains.

The control of erosion is not a problem because the topography is nearly level.

The soils in this unit are acid.

Most of the larger areas of these soils, especially those in the eastern part of the county, are not cultivated. Small areas that are parts of larger fields are farmed with other soils. Some areas that were once farmed have been abandoned because of the high cost of drainage and of lime and fertilizer. The Fries soils are fair for corn, small grain, and hay; the Miner soil is fair for corn and small grain and good for hay; the Trumbull soil is poor

for corn, soybeans, oats, wheat, and forage crops; and the Colwood soils are good for corn, small grain, and hay.

Some areas are used as permanent pasture. Only water-tolerant and acid-tolerant plants are suitable for seeding.

Capability unit IIIs–1

This unit consists of nearly level to gently sloping, well-drained soils of the Oshtemo series. These soils are on old glacial terraces. They have a surface layer of loamy sand or sandy loam and are underlain by sand and gravel.

The surface layer is very friable and easy to work. No layers that restrict the movement of water or the growth of roots occur within 60 inches of the surface.

The lack of available moisture is a severe limitation. In both dry and average years, the moisture supply is inadequate for crops.

Only a few local spots lack adequate natural drainage. Once outlets are provided, most of the spots can be drained readily by random tile lines.

The control of water erosion is not a problem, even in gently sloping areas. Water enters the soils rapidly, and little of it runs off. Wind erosion is a serious hazard. Blowing sand damages young vegetable plants on these and adjacent soils. Strips of rye or other cover crops can be used to protect the young crops.

The organic-matter content is very low, and the supply of plant nutrients is low.

Field crops do well on these soils only in wet years. Vegetables can be grown successfully if irrigated, fertilized, and protected from blowing sand. Sweet corn, melons, pumpkins, cabbage, tomatoes, and lima beans are among the vegetable crops.

Pastures can be grazed early in spring but do not hold up late in summer. Alfalfa and other deep-rooted, drought-resistant plants are the best for pasture. Overgrazing can result in blowouts.

Capability unit IIIs–2

This unit consists of shallow, nearly level to gently sloping, medium-textured soils of the Casco, Castalia, and Ritchey series. These soils have a surface layer of loam or very channery silt loam. The Castalia soils are underlain by broken rock at depths of less than 10 inches, and the Ritchey soil is underlain by solid rock at depths of less than 20 inches. The Castalia soils contain many limestone fragments.

The available moisture capacity is low to very low. The moisture supply is inadequate for row crops in most years. The Castalia soils are less droughty than the other soils; evidently some moisture in the broken underlying rock is available to plants.

Natural drainage is adequate. Water drains into cracks in the underlying rock.

Erosion is a hazard on the gently sloping soils. The loss of even a small amount of soil through erosion seriously affects productivity because there is so little soil material.

The Castalia soils have natural lime in the surface layer; the others have lime within 20 inches of the surface. The supply of nitrogen and potassium is medium to low, and that of phosphorus is low.

Corn is not generally grown. Soybeans and small grain do well only in wet years. Even though the root zone is shallow, alfalfa is better suited than any other forage crop. In most years alfalfa can be cut only once.

Pastures can be grazed early, but they provide little feed late in summer and in fall.

Capability unit IVe–1

This unit consists of deep, moderately steep, medium-textured, moderately well drained soils of the Ellsworth and Shinrock series. These soils are moderately eroded. They are on the sides of stream valleys and other natural drainageways. They have a surface layer of silt loam.

Water moves slowly through these soils, and the growth of roots is generally restricted to a depth of less than 36 inches.

Erosion has removed part of the original surface layer, and the present plow layer is partly material from the original subsoil. Erosion has caused loss of plant nutrients and deterioration of tilth. A considerable amount of water runs off, and the hazard of erosion is very severe unless a protective cover of vegetation is maintained. Gullies form on these soils and cut back into higher, level soils. The topography is not suitable for terracing and contouring.

The available moisture capacity is medium in most places.

Generally, natural drainage is adequate, but in the valleys there are some seeps and springs that are difficult to drain.

Most cropped areas of these soils are in fields dominated by more gently sloping soils. The size of the cropped area determines whether special erosion control practices are used.

Most of the larger areas are used for permanent pasture. Even though the slopes are moderately steep, improvement and reseeding of pastures are possible. Among the suitable pasture crops are alfalfa, birdsfoot trefoil, bromegrass, timothy, and bluegrass. Small grain can be grown occasionally and is a convenient means of establishing pasture seedings.

Capability unit IVe–2

This unit consists of deep, moderately steep, medium-textured, well-drained soils of the Arkport, Chili, and Sisson series. These soils are on beach ridges and the sides of valleys. They have a surface layer of loamy fine sand, loam, or silt loam.

Both Sisson soils are eroded to the extent that the present plow layer is composed partly or entirely of original subsoil. The severely eroded phase has lost as much as 2 feet of soil material. Erosion of these soils has resulted in a slower rate of water intake and, consequently, an increase in runoff, but it has not affected productivity significantly.

No layers that restrict the growth of roots or the movement of water occur within 60 inches of the surface.

All the soils of this unit erode easily. When bare, they offer little resistance to running water, and small gullies form quickly. The topography does not lend itself to contouring and terracing for control of erosion.

The available moisture capacity of these soils is medium in most areas but low in some areas. The organic-matter content is low. Natural drainage is adequate, except in some small seep spots.

The soils in this unit are used to produce corn, small grain, soybeans, sweet corn, cabbage, and pumpkins. A limited acreage is in forage crops. The Chili soil is used mainly for orchards or permanent pasture.

All the soils are well suited to hay and pasture crops. Among the suitable crops are alfalfa, bromegrass, birdsfoot trefoil, and timothy.

Capability unit IVw-1

This unit consists of moderately deep, nearly level to gently sloping, medium-textured to moderately fine textured, somewhat poorly drained to poorly drained soils of the Allis series. These soils have a surface layer of silty clay loam or stony silt loam and are underlain by shale at a depth of 20 to 40 inches. On the surface of Allis stony silt loam are glacial boulders and sandstone flagstones.

The surface layer has poor tilth. It clods if plowed when too wet or too dry. Downward movement of water is very slow in the clayey subsoil, and roots concentrate between the soil structure units. The underlying shale is a barrier to the growth of roots and the movement of water.

Wetness is a very severe limitation. The water table is at or near the surface for extended periods, and there are small areas where surface water ponds. Artificial drainage is necessary for the successful production of most crops. Tiling is expensive and, in some areas, not practical, because only the uppermost foot of the underlying shale can be dug into with a tiling machine. A system of surface drains removes surface water, but good outlets are difficult to find in some of the larger areas.

The available moisture capacity is low. There are periods when the moisture supply is not adequate for crops.

The control of erosion is a slight problem in gently sloping areas.

The soils in this unit are strongly acid.

In general, these soils are poorly suited to crops, because of poor drainage, strong acidity, low fertility, and poor tilth. The cost of producing crops is high. A large acreage that was once farmed has been abandoned and now is in brush or is being used for housing developments. Grapes can be grown successfully, but the acreage in vineyards is declining rapidly. Applying enough lime to make these acid soils suitable for alfalfa is generally not practical.

In the central part of the county are a few areas of Allis silty clay loam that contains a little more organic matter than that in the larger areas in the eastern part and is more productive. Most areas of the Allis stony silt loam have not been cleared.

Capability unit IVw-2

This unit consists only of Joliet silt loam, which is shallow, nearly level, and very poorly drained. This soil is in low areas in parts of the county where the bedrock is limestone. It is underlain by solid limestone at a depth of less than 20 inches. This soil has a subsoil of silt loam or silty clay loam.

The surface layer is friable and is high in organic-matter content. Where the limestone is nearest the surface, the plow layer contains numerous small fragments of limestone. The subsoil does not limit the growth of roots or the downward movement of water, but the underlying solid limestone is a barrier to the growth of roots and the downward movement of water.

Wetness is a very severe limitation, and the removal of excess water is difficult. The water table is at or near the surface, and there is some ponding. Tiling is not practical because of the difficulty of digging into the limestone, and even surface drains cannot be installed successfully in the shallower areas.

The available moisture capacity is very low. This shallow soil is too wet to be worked early in spring but dries out rapidly and is droughty later in summer in dry years.

This soil contains natural lime, and no additional lime is necessary.

This soil is poorly suited to row crops and grain because it is alternately too wet and too dry. Winter grain is likely to be damaged by frost heaving.

This soil is moderately well suited to permanent pasture. Birdsfoot trefoil is a suitable legume, and bluegrass can be expected to seed in naturally. The pastures can be damaged if used for grazing when the soil is too wet. Little production can be expected in dry periods.

Capability unit IVw-3

This unit consists of nearly level, very poorly drained soils of the Tawas and Warners series. The Tawas soils are in small depressions in sandy areas, and the Warners soils are in a broad basin north of Castalia. The Tawas soil has a surface layer of limy muck and a substratum of sand. The Warners soils have a surface layer of limy muck or limy loam and a substratum of marl.

In the clayey subsoil variant of the Warners soils, a layer of lake-laid clayey material within 30 inches of the surface retards the downward movement of water and keeps the water table at or near the surface for extended periods. Roots grow into the clayey layer only if the water table is lowered.

The Tawas soil is easily drained if outlets can be found. The Warners soil, clayey subsoil variant, can be drained by tile if outlets can be found, but tile placed in the muck or in the marl is likely to settle. Rather deep ditches are needed for outlets because the soils are in depressions.

The Warners and Tawas soils contain natural lime and do not need additional lime. But they are generally very low in available phosphorus and potassium and deficient in iron, manganese, and other trace elements.

Warners soils are poor for crops, but potatoes, corn, sweet corn, and small grain are grown in some areas. The muck is a little more productive than the marl and loam. Drained areas of Tawas soil are farmed with surrounding soils; undrained areas are idle.

A considerable acreage of Warners soils is used for hay and pasture crops. Alfalfa and bromegrass are as suitable for hay as any other crop, but stands are not good. Birdsfoot trefoil and bluegrass are suitable for pasture. In areas where the surface layer is muck, pas-

tures can be damaged by trampling if grazing is allowed when the soil is wet.

Capability unit IVs–1

This unit consists of gently sloping to steep, well-drained soils of the Oakville series. These soils are on sand ridges. They are sandy throughout the profile.

These soils have a friable surface layer and have no layers that restrict the downward movement of water or the growth of roots within 60 inches of the surface.

The lack of available moisture is a very severe limitation. Water moves rapidly through these soils, and they are dry much of the time. In most years the moisture supply is not adequate for crops. The soils that have slopes of more than 6 percent are poorly suited to irrigation.

The control of water erosion is a minor problem because there is little runoff, but the control of wind erosion is a moderate problem. The ridges on which these soils occur protrude above surrounding soils and are exposed to the winds. Blowing sand can damage crops, especially early vegetables, growing in nearby areas.

These soils are slightly acid to neutral. The content of organic matter and the supply of plant nutrients are low.

The soils in this unit are generally poorly suited to crops, because of droughtiness and the slope. Most areas are in pasture or hay or are idle.

Alfalfa and bromegrass are well-suited hay and pasture crops. Only one good cutting of hay can be expected, and pasture production is low late in summer and in fall.

These soils are sources of molding sand. If molding sand is to be taken out, the surface layer can be removed first and stockpiled and later replaced in the leveled area. Observations indicate that productivity improves after the sand has been removed.

Capability unit IVs–2

This unit consists of shallow to moderately deep, nearly level to moderately steep, medium-textured, well-drained soils of the Berks, Casco, and Colyer series. These soils have a surface layer of loam, shaly loam, or channery silt loam. They have numerous coarse fragments on the surface and in the surface layer. The Berks soils are underlain by broken sandstone at a depth of less than 20 inches and by solid sandstone at a depth of less than 40 inches; the Casco soil is underlain by broken limestone at a depth of 10 to 20 inches; and the Colyer soils are underlain by shale at a depth of less than 20 inches.

The surface layer is friable. The subsoil does not restrict the growth of roots or the downward movement of water. The shale substratum of the Colyer soils retards the growth of roots more than the broken sandstone and broken limestone that underlie the other soils. Water seeps into cracks in the rock.

The available moisture capacity is very low. In most years the moisture supply is inadequate for crops. The soil is too shallow to store enough water to supply crops through extended dry periods. The slope and the limited depth make irrigation impractical.

The control of erosion is a problem in sloping areas. Because there is so little soil material to start with, even small losses can seriously reduce productivity.

Some areas of the Berks soils have large boulders on the surface, but generally the surface stones are too small to interfere with cultivation.

The supply of plant nutrients is generally low. There is considerable lime in the Casco soil, but the Berks and Colyer soils are acid.

The soils in this unit are generally poorly suited to crops because of droughtiness, an erosion hazard, and low fertility. Most areas of the Casco soil are used for permanent pasture, but a few are used as cropland. Corn, small grain, vegetables, and hay are grown with moderate success. Large areas of the Colyer soils are used for cropland. Corn, soybeans, small grain, and hay are grown but usually with less than average success, even though large amounts of lime and fertilizer are used. Most areas of the Berks soils are in pasture or woodland or have been abandoned; few areas are farmed.

Fair pastures can be developed in the deeper, less sloping areas of Berks soils, but most pastures on all the soils produce little late in summer. Birdfoot trefoil is a suitable pasture plant.

Capability unit VIe–1

This unit consists of deep, moderately steep to steep, medium-textured, well drained to moderately well drained soils of the Ellsworth, Shinrock, and Sisson series. These soils are on valley sides. They have a surface layer of silt loam. Most are moderately eroded.

The present surface layer is either silt loam or silt loam mixed with part of the subsoil material. There is considerable runoff, mostly because of the slope but partly because infiltration is slower as a result of erosion. Unprotected areas are very susceptible to erosion. The soils offer little resistance to the cutting action of flowing water. Gullies that form in these soils can cut back into the level soils above.

The Ellsworth soil has a dense subsoil that slows the downward movement of water and a dense till substratum that restricts the growth of roots and the downward movement of water. The other soils have no layers that restrict the growth of roots and the downward movement of water.

The available moisture capacity is medium to high.

The Ellsworth soil is acid in the root zone of most crops; the Shinrock and Sisson soils are slightly acid and generally need less lime than the Ellsworth soil. The content of organic matter and the supply of nitrogen are low.

The soils in this unit are generally not suitable for cultivation, but small areas in fields with less sloping soils are cropped. Many such areas are not large enough to warrant special erosion control practices, and continuing erosion is a hazard.

The larger areas of these soils are used for permanent pastures or woodland. The pastures can be grazed early, and they hold up fairly well in dry periods. Occasional plowing or disking and reseeding are possible. Alfalfa, birdsfoot trefoil, bluegrass, orchardgrass, and bromegrass are among the suitable pasture plants.

Capability unit VIs–1

This unit consists of very shallow, nearly level to moderately steep, medium-textured, well-drained soils of the Romeo series. These soils are on hills in the northwestern part of the county and on Kelleys Island. They

have a surface layer of silt loam and are underlain by limestone at depths of less than 10 inches.

The surface layer is high in content of organic matter, dark colored, and friable. The underlying solid limestone is a barrier to the growth of roots, and it holds up water temporarily, although water seeps into cracks within a short time after a rain.

The available moisture capacity is very low.

Erosion is a hazard in sloping areas. The loss of even a small amount of soil through erosion is serious because there is so little soil material.

Cultivation of these soils is not practical, and most areas either are in permanent pastures or are idle. The pastures dry up late in summer and produce little forage. White clover and bluegrass are suitable pasture plants.

Capability unit VIIe-1

This unit consists of deep, moderately steep to very steep, medium-textured, well-drained soils of the Alexandria, Chili, Ellsworth, Shinrock, and Sisson series. These soils are on the side slopes of valleys along the major streams. They have a surface layer of silt loam or loam.

The erosion hazard is very severe. The soils offer little resistance to the cutting action of running water. Gullies that form on these soils can cut back into level soils above.

These soils are generally too steep for farming. They are suitable for permanent pasture, but seeding and other management practices are difficult. Alfalfa, birdsfoot trefoil, bromegrass, bluegrass, timothy, and other pasture crops are suitable if a seeding can be established. Overgrazing can damage the sod and leave bare spots that will erode.

Capability unit VIIs-1

This unit consists of shallow to very shallow, steep to very steep, well-drained soils of the Berks, Colyer, and Romeo series. These soils are on rocky hillsides. They have a surface layer of loam or silt loam. The Berks soil is underlain by broken sandstone at a depth of 10 to 20 inches; the Colyer soil is underlain by shale at a depth of less than 20 inches; and the Romeo soil is underlain by solid limestone at a depth of less than 10 inches.

The Romeo soil is limy, and the other soils are acid.

These soils are generally too steep to be farmed and so droughty that they are not good for crops. They cannot carry either crops or pasture through dry periods, because there is not enough soil material to hold the needed moisture. Some of the less sloping areas are suitable for pasture early in spring. Seeding and other pasture improvement practices are difficult because of the slope.

Estimated Yields

Table 1 gives estimates of average acre yields of the principal crops of Erie County, under two levels of management. These estimates are based on observations, field trials, experiments conducted by the Ohio Agricultural Research and Development Center, and information supplied by farmers and other agricultural workers. They do not apply directly to any specified field in any particular year but are averages that reflect variations in soil characteristics from place to place, in management practices from farm to farm, and in weather conditions from year to year. These estimates are intended only as a general guide to relative productivity and as an indication of crop response under two levels of management. They can be expected to change as farming techniques improve.

In columns A are estimates of yields to be expected under the prevailing level of improved management, and in columns B are estimates of yields to be expected under optimum management.

Optimum management includes the following: Increasing the water-intake rate and the water-holding capacity of the soils; removing excess water; controlling erosion; plowing, preparing the seedbed, and cultivating by methods suited to the soil and the crop; controlling weeds and insects; applying fertilizer that contains needed trace elements and lime, according to the results of soil tests; conducting all farming operations at the proper time; and choosing improved crop varieties. Irrigation is not included, except as specified in table 1, footnote 1.

Under improved management, the level of management prevailing in the county, one or more of these practices is lacking or is not applied adequately.

TABLE 1.—*Estimated average acre yields of principal crops under two levels of management*

[Yields in columns A are those to be expected under present improved management; yields in columns B are those to be expected under optimum management. Dashes indicate that the crop is not well suited to the soil or that it is not commonly grown. Beaches, Beaches, wet, Borrow pits, Gravel pits, Made land, Marsh, Quarries, and Sand pits are not listed, because they are not suited to crops]

Soil	Corn		Oats		Wheat		Soybeans		Sugar beets		Mixed hay	
	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*
Alexandria silt loam, 6 to 18 percent slopes	70	90	50	70	24	32	22	27	------	------	2. 0	3. 0
Alexandria silt loam, 18 to 40 percent slopes, moderately eroded	------	------	------	------	------	------	------	------	------	------	1. 8	3. 0
Allis silty clay loam, 0 to 2 percent slopes	60	80	40	60	30	35	20	27	------	------	2. 5	3. 5
Allis silty clay loam, 2 to 6 percent slopes	58	75	38	55	28	35	20	27	------	------	2. 5	3. 5
Allis stony silt loam, 0 to 2 percent slopes	50	60	35	55	26	35	16	22	------	------	2. 0	2. 8
Arkport loamy fine sand, 0 to 2 percent slopes	85	95	52	68	28	45	22	31	15	[1] 20	2. 8	3. 6
Arkport loamy fine sand, 2 to 6 percent slopes	80	90	50	65	25	40	20	27	15	[1] 20	2. 5	3. 5
Arkport loamy fine sand, 6 to 12 percent slopes	70	80	45	60	22	35	16	22	------	------	2. 2	3. 0
Arkport loamy fine sand, 12 to 18 percent slopes	60	70	38	50	20	30	14	20	------	------	1. 5	2. 6

See footnote at end of table.

TABLE 1.—*Estimated average acre yields of principal crops under two levels of management*—Continued

Soil	Corn		Oats		Wheat		Soybeans		Sugar beets		Mixed hay	
	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*
Arkport loamy fine sand, moderately shallow variant, 0 to 2 percent slopes	90	100	45	68	28	42	20	28	------	------	2. 8	3. 8
Arkport loamy fine sand, moderately shallow variant, 2 to 6 percent slopes	85	95	45	65	26	40	18	27	------	------	2. 8	3. 8
Belmore sandy loam, 2 to 6 percent slopes	50	65	42	68	24	33	20	29	------	------	1. 5	2. 5
Belmore sandy loam, 6 to 12 percent slopes	45	65	40	58	23	32	16	22	------	------	1. 5	2. 5
Belmore loam, 0 to 2 percent slopes	65	90	48	72	28	38	20	36	------	------	2. 6	3. 5
Belmore loam, 2 to 6 percent slopes	60	85	45	70	25	35	20	32	------	------	2. 6	3. 5
Bennington loam, 0 to 2 percent slopes	85	105	60	80	35	45	25	32	14	20	2. 5	4. 0
Bennington silt loam, 0 to 2 percent slopes	85	105	60	80	35	45	25	32	14	20	2. 5	4. 0
Bennington silt loam, 2 to 6 percent slopes	80	100	58	78	32	44	22	28	13	18	2. 2	3. 8
Bennington-Pyrmont silt loams, limestone substratum, 0 to 2 percent slopes	75	90	58	78	35	44	20	29	13	18	2. 2	3. 8
Berks channery silt loam, 0 to 6 percent slopes	50	60	35	50	25	36	12	18	------	------	1. 7	2. 3
Berks channery silt loam, 6 to 18 percent slopes	------	------	25	40	22	30	10	18	------	------	1. 6	2. 2
Berks channery soils, 18 to 60 percent slopes	------	------	------	------	------	------	------	------	------	------	1. 2	1. 8
Bogart loam, 0 to 2 percent slopes	85	100	60	85	35	45	25	31	------	------	2. 8	3. 8
Bogart loam, 2 to 6 percent slopes	80	95	58	80	32	40	22	29	------	------	2. 8	3. 8
Cardington silt loam, 0 to 2 percent slopes	90	110	70	90	32	42	25	31	15	20	2. 5	3. 5
Cardington silt loam, 2 to 6 percent slopes	85	105	68	88	30	40	22	29	14	19	2. 5	3. 5
Casco loam, very flaggy subsoil variant, 0 to 2 percent slopes	48	75	50	65	32	48	25	30	------	------	2. 0	3. 0
Casco loam, very flaggy subsoil variant, 2 to 6 percent slopes	45	72	45	60	30	45	25	29	------	------	2. 0	3. 0
Casco loam, very flaggy subsoil variant, 6 to 18 percent slopes	40	70	35	48	20	32	16	21	------	------	1. 5	2. 4
Castalia very channery silt loam, 0 to 2 percent slopes	35	65	40	50	35	40	18	25	------	------	2. 0	2. 5
Castalia very channery silt loam, 2 to 6 percent slopes	32	60	40	48	30	38	16	23	------	------	2. 0	2. 5
Chili loam, 0 to 2 percent slopes	65	90	48	74	28	38	22	31	------	------	2. 6	3. 2
Chili loam, 2 to 6 percent slopes	60	85	45	70	25	35	20	30	------	------	2. 6	3. 2
Chili loam, 6 to 12 percent slopes	50	80	40	65	24	32	18	27	------	------	2. 4	3. 0
Chili loam, 12 to 18 percent slopes	------	------	36	60	22	30	18	23	------	------	2. 0	3. 0
Colwood fine sandy loam	90	115	70	90	34	46	32	38	16	22	3. 0	4. 5
Colwood silt loam	100	125	70	90	35	50	35	41	16	22	3. 0	4. 5
Colwood silt loam, limestone substratum	95	120	65	85	32	45	35	40	15	20	3. 0	4. 5
Colwood silt loam, acid variant	95	110	75	90	35	48	25	36	14	20	2. 5	3. 5
Colwood silty clay loam, acid variant	95	105	75	90	34	45	22	34	14	20	2. 5	3. 5
Colyer shaly loam, 0 to 2 percent slopes	45	60	45	60	24	36	18	25	------	------	1. 3	2. 0
Colyer shaly loam, 2 to 12 percent slopes	40	50	40	55	23	35	17	22	------	------	1. 3	2. 0
Colyer soils, 12 to 50 percent slopes	------	------	------	------	------	------	------	------	------	------	1. 0	1. 8
Darroch silt loam	100	125	75	90	40	50	35	45	17	23	3. 0	4. 5
Darroch fine sandy loam, coarse subsoil variant	95	120	75	85	38	48	32	42	16	22	3. 0	4. 5
Dekalb fine sandy loam, 0 to 2 percent slopes	60	80	35	50	25	35	18	27	------	------	2. 4	3. 0
Dekalb fine sandy loam, 2 to 6 percent slopes	55	75	30	45	22	32	16	25	------	------	2. 4	3. 0
Del Rey loam, 0 to 2 percent slopes	90	110	46	85	30	45	30	41	17	22	3. 4	4. 2
Del Rey silt loam, 0 to 2 percent slopes	90	110	50	90	30	45	30	41	17	22	3. 5	4. 5
Del Rey silt loam, 2 to 6 percent slopes	85	105	46	88	28	43	28	38	16	21	3. 4	4. 2
Digby sandy loam, 0 to 2 percent slopes	85	110	70	85	32	42	28	34	------	------	3. 0	4. 0
Digby loam, 0 to 2 percent slopes	90	115	75	90	35	45	30	36	------	------	3. 2	4. 4
Eel silt loam	80	120	65	85	30	40	25	31	------	------	3. 0	4. 5
Elliott silt loam, 0 to 2 percent slopes	100	120	75	90	38	48	28	34	16	22	3. 4	4. 6
Elliott silty clay loam, 0 to 2 percent slopes	90	115	75	88	36	45	25	34	14	20	3. 4	4. 6
Ellsworth silt loam, 0 to 2 percent slopes	76	100	55	85	30	40	20	31	------	------	2. 5	4. 0
Ellsworth silt loam, 2 to 6 percent slopes	80	95	52	82	30	40	20	30	------	------	2. 5	4. 0
Ellsworth silt loam, 6 to 12 percent slopes, moderately eroded	65	88	48	75	25	35	20	27	------	------	2. 3	3. 5
Ellsworth silt loam, 12 to 18 percent slopes, moderately eroded	65	85	45	70	20	30	20	22	------	------	2. 0	3. 0
Ellsworth and Chili soils, 18 to 50 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Fries silt loam	50	85	40	65	28	40	20	27	------	------	3. 0	3. 8
Fries silty clay loam	60	70	40	60	25	38	20	25	------	------	3. 0	3. 8
Fulton silty clay loam, 0 to 2 percent slopes	85	100	65	85	25	35	35	41	16	20	3. 0	4. 4
Fulton silty clay loam, 2 to 6 percent slopes	80	95	62	80	25	33	32	37	16	20	3. 0	4. 4
Galen loamy fine sand, 0 to 2 percent slopes	95	105	60	75	30	45	25	31	18	[1]23	3. 0	4. 2
Galen loamy fine sand, 2 to 6 percent slopes	90	100	58	70	25	40	22	27	16	20	3. 0	4. 2
Galen loamy fine sand, limestone substratum, 0 to 6 percent slopes	55	70	40	50	22	34	16	22	------	------	1. 9	3. 0

See footnote at end of table.

TABLE 1.—*Estimated average acre yields of principal crops under two levels of management*—Continued

Soil	Corn		Oats		Wheat		Soybeans		Sugar beets		Mixed hay	
	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*
Galen loamy fine sand, shale substratum, 0 to 6 percent slopes	73	87	42	58	25	36	20	25	------	------	2. 6	3. 5
Gilford fine sandy loam	80	110	55	75	32	45	28	31	15	20	3. 5	4. 5
Haskins loam, 0 to 2 percent slopes	85	115	65	90	37	50	30	38	15	20	3. 5	4. 5
Haskins loam, 2 to 6 percent slopes	82	105	62	90	35	45	26	31	15	20	3. 3	4. 2
Haskins loam, dark surface variant, 0 to 2 percent slopes	100	125	75	90	35	50	35	41	18	22	3. 3	4. 5
Jimtown loam, 0 to 2 percent slopes	78	95	75	90	35	45	20	27	------	------	3. 0	4. 0
Joliet silt loam	45	70	30	50	20	30	14	20	------	------	1. 8	2. 5
Kibbie fine sandy loam, 0 to 2 percent slopes	100	120	60	90	35	45	35	41	16	20	3. 2	4. 2
Kibbie fine sandy loam, 2 to 6 percent slopes	95	105	56	90	32	42	32	38	15	19	3. 2	4. 2
Kibbie silt loam, 0 to 2 percent slopes	105	125	62	90	35	50	36	44	17	21	3. 5	4. 5
Kibbie fine sandy loam, moderately shallow variant, 0 to 2 percent slopes	90	110	55	85	32	42	32	38	15	19	3. 0	4. 0
Kibbie silt loam, acid variant, 0 to 2 percent slopes	92	110	70	90	35	50	28	41	15	20	2. 5	3. 5
Lenawee silt loam	95	125	70	90	35	50	35	44	18	23	3. 8	4. 5
Lenawee silty clay loam	95	120	70	90	35	46	35	43	18	22	3. 8	4. 7
Lewisburg silt loam, 0 to 2 percent slopes	80	100	60	80	32	42	25	31	------	------	2. 5	3. 5
Lewisburg silt loam, 2 to 6 percent slopes	75	95	60	80	30	40	22	29	------	------	2. 5	3. 5
Lewisburg silt loam, moderately shallow variant, 0 to 2 percent slopes	70	90	45	75	30	45	20	27	------	------	2. 5	3. 6
Lewisburg silt loam, moderately shallow variant, 2 to 6 percent slopes	65	85	42	72	28	42	20	25	------	------	2. 5	3. 6
Lewisburg silt loam, moderately shallow variant, 6 to 12 percent slopes	60	75	36	65	25	38	18	23	------	------	2. 2	3. 2
Lobdell silt loam	80	105	65	85	35	45	25	31	------	------	3. 5	4. 5
Loudonville loam, 0 to 2 percent slopes	65	95	40	70	30	42	20	27	------	------	2. 5	3. 8
Loudonville loam, 2 to 6 percent slopes	60	90	35	68	28	40	20	27	------	------	2. 5	3. 8
Loudonville loam, 6 to 12 percent slopes	55	80	34	65	25	35	16	22	------	------	2. 2	3. 5
Mahoning loam, 0 to 2 percent slopes	74	100	50	85	28	38	28	34	------	------	2. 5	4. 2
Mahoning silt loam, 0 to 2 percent slopes	65	90	44	70	22	32	20	30	------	------	2. 5	3. 6
Mahoning silt loam, 2 to 6 percent slopes	62	86	44	68	22	30	20	28	------	------	2. 5	3. 6
Mahoning stony silt loam, 0 to 2 percent slopes	60	86	44	68	21	30	20	25	------	------	2. 0	3. 0
Mahoning loam, sandstone substratum, 0 to 2 percent slopes	65	85	45	80	22	30	20	30	------	------	2. 5	3. 5
Mahoning silt loam, shale substratum, 0 to 2 percent slopes	65	88	44	68	21	30	20	28	------	------	2. 2	3. 5
Mermill silt loam	100	125	70	90	35	45	30	36	16	21	3. 5	4. 5
Mermill silty clay loam	100	120	68	90	32	42	30	36	15	20	3. 5	4. 5
Metea loamy fine sand, 0 to 2 percent slopes	75	95	55	74	32	48	25	31	------	------	2. 8	4. 2
Metea loamy fine sand, 2 to 6 percent slopes	70	92	52	72	30	45	24	29	------	------	2. 8	4. 2
Metea loamy fine sand, 6 to 12 percent slopes	68	90	45	68	25	38	22	27	------	------	2. 6	3. 8
Millgrove loam	85	120	75	90	35	45	30	36	16	21	3. 5	4. 5
Millgrove silty clay loam	80	110	70	85	28	40	28	31	14	20	3. 2	4. 5
Millsdale silt loam	60	85	50	80	30	40	25	31	------	------	3. 0	4. 2
Millsdale silty clay loam	60	80	45	75	30	40	20	27	------	------	3. 0	4. 2
Miner silty clay loam	65	95	50	70	25	35	20	27	------	------	2. 5	4. 0
Mitiwanga loam, 0 to 2 percent slopes	65	90	45	70	26	38	25	31	------	------	2. 5	3. 6
Oakville loamy fine sand, 2 to 6 percent slopes	50	75	35	55	20	35	18	25	12	[1]18	2. 0	3. 0
Oakville loamy fine sand, 6 to 12 percent slopes	45	70	35	45	20	30	16	21	------	------	1. 8	2. 8
Oakville loamy fine sand, 12 to 25 percent slopes	40	60	30	40	18	28	14	19	------	------	1. 5	2. 0
Orrville silt loam	80	100	50	75	35	45	25	32	------	------	3. 0	4. 5
Oshtemo loamy sand, 0 to 2 percent slopes	60	80	35	60	25	35	18	27	------	------	2. 2	3. 0
Oshtemo loamy sand, 2 to 6 percent slopes	52	72	32	58	22	35	16	25	------	------	2. 2	3. 0
Oshtemo sandy loam, 0 to 2 percent slopes	60	85	55	80	30	40	30	36	------	------	2. 5	3. 8
Oshtemo sandy loam, 2 to 6 percent slopes	60	82	50	75	28	36	26	32	------	------	2. 5	3. 8
Pewamo silty clay loam	100	120	75	90	35	50	30	41	16	22	3. 5	5. 0
Pewamo silty clay	80	110	65	85	25	42	22	29	14	20	3. 2	4. 5
Pewamo silty clay loam, limestone substratum	95	115	75	90	35	48	28	36	16	22	3. 5	4. 8
Prout loam, 0 to 2 percent slopes	85	100	65	90	28	42	20	31	------	------	2. 4	3. 2
Prout channery loam, 0 to 2 percent slopes	------	------	------	------	------	------	------	------	------	------	2. 0	2. 8
Prout loam, brown subsoil variant, 0 to 2 percent slopes	70	90	55	80	25	35	18	27	------	------	2. 0	2. 8
Prout loam, brown subsoil variant, 2 to 6 percent slopes	60	85	50	75	22	32	18	27	------	------	2. 0	2. 8
Prout silt loam, deep variant, 0 to 2 percent slopes	85	105	70	85	35	45	25	36	14	19	2. 0	3. 0
Pyrmont silt loam, 0 to 2 percent slopes	80	100	60	75	35	45	25	31	------	------	2. 5	3. 5

See footnote at end of table.

TABLE 1.—*Estimated average acre yields of principal crops under two levels of management*—Continued

Soil	Corn		Oats		Wheat		Soybeans		Sugar beets		Mixed hay	
	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*
Pyrmont silt loam, moderately shallow variant, 0 to 2 percent slopes	75	90	50	70	30	40	25	31	------	------	2. 5	3. 3
Rawson fine sandy loam, 2 to 6 percent slopes	85	105	56	82	28	38	25	31	13	18	2. 5	4. 0
Rawson loam, 0 to 2 percent slopes	100	115	65	90	35	45	30	36	15	20	2. 8	4. 0
Rimer loamy fine sand	75	95	60	75	32	45	25	36	------	------	2. 8	4. 5
Rimer fine sandy loam	85	105	65	80	35	45	30	41	15	20	3. 0	4. 5
Ritchey loam, 0 to 6 percent slopes	58	70	40	55	22	35	20	27	------	------	2. 0	2. 8
Romeo silt loam, 0 to 6 percent slopes	------	------	------	------	------	------	------	------	------	------	1. 6	2. 0
Romeo silt loam, 6 to 18 percent slopes	------	------	------	------	------	------	------	------	------	------	1. 2	1. 8
Romeo silt loam, 18 to 50 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Shinrock loam, 0 to 2 percent slopes	90	110	60	90	32	45	30	38	17	22	3. 0	4. 5
Shinrock silt loam, 0 to 2 percent slopes	95	110	60	90	32	45	34	40	17	22	3. 0	4. 5
Shinrock silt loam, 2 to 6 percent slopes	90	105	60	85	30	45	30	36	17	22	3. 0	4. 5
Shinrock silt loam, 6 to 12 percent slopes, moderately eroded	80	92	52	75	27	37	25	31	14	18	2. 8	3. 5
Shinrock silt loam, 12 to 18 percent slopes, moderately eroded	70	90	45	65	25	35	25	30	------	------	2. 0	3. 0
Shinrock soils, 18 to 25 percent slopes	65	80	40	60	20	30	22	27	------	------	2. 0	3. 0
Shinrock soils, 25 to 40 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Shoals silt loam	85	100	50	75	35	45	25	32	------	------	3. 0	4. 5
Sisson loamy fine sand, 2 to 6 percent slopes	85	95	55	75	30	45	25	32	------	------	2. 8	3. 5
Sisson fine sandy loam, 2 to 6 percent slopes	100	120	60	90	35	45	30	36	14	19	3. 0	4. 0
Sisson fine sandy loam, 6 to 12 percent slopes, moderately eroded	95	110	50	82	32	42	28	32	------	------	2. 5	3. 5
Sisson silt loam, 2 to 6 percent slopes	105	120	62	92	35	48	32	36	15	20	3. 0	4. 0
Sisson silt loam, 6 to 12 percent slopes, moderately eroded	90	110	58	85	35	42	25	32	------	------	2. 8	3. 8
Sisson silt loam, 12 to 18 percent slopes, moderately eroded	75	90	54	74	35	41	26	31	------	------	2. 8	3. 5
Sisson silt loam, 12 to 18 percent slopes, severely eroded	70	85	50	70	35	40	25	30	------	------	2. 0	3. 0
Sisson silt loam, 18 to 25 percent slopes, moderately eroded	65	80	45	60	32	38	20	29	------	------	2. 0	3. 0
Sisson soils, 25 to 50 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Sloan silt loam	85	110	45	70	30	40	25	32	------	------	3. 2	4. 5
Tawas muck	70	90	------	------	------	------	20	36	------	------	2. 0	3. 5
Toledo silty clay loam	95	115	70	90	35	45	35	41	19	24	3. 5	5. 0
Toledo silty clay	90	110	65	85	30	40	30	36	18	23	3. 5	5. 0
Toledo silty clay, calcareous variant	88	110	65	85	30	40	28	36	16	22	3. 5	4. 6
Trumbull silt loam	50	75	40	66	20	30	18	28	------	------	2. 5	4. 0
Tuscola loamy fine sand, 0 to 2 percent slopes	85	100	60	80	32	45	26	34	------	------	2. 8	3. 5
Tuscola fine sandy loam, 0 to 2 percent slopes	100	125	60	85	35	50	30	40	16	20	3. 5	4. 5
Tuscola fine sandy loam, 2 to 6 percent slopes	100	120	60	85	35	50	30	40	16	20	3. 5	4. 5
Tuscola silt loam, 0 to 2 percent slopes	105	125	75	90	38	50	35	45	18	23	3. 5	4. 5
Tuscola silt loam, 2 to 6 percent slopes	102	120	75	85	36	50	32	40	17	22	3. 5	4. 5
Vaughnsville loam	75	95	40	75	32	40	22	31	------	------	2. 2	3. 0
Warners soils	60	80	60	80	25	35	20	27	------	------	3. 0	4. 0
Warners soils, clay subsoil variant	55	70	55	75	24	32	20	30	------	------	2. 5	3. 5
Washtenaw soils	100	115	50	85	35	50	20	32	------	------	3. 8	4. 5
Wayland silt loam	55	80	30	45	20	30	16	22	------	------	1. 8	3. 0
Wilmer loam	85	105	75	90	30	48	32	41	16	22	3. 0	4. 5

[1] Obtained only if soil is irrigated.

Woodland [2]

When the first settlers came, most of Erie County was woodland. Since that time, most of the timber has been removed and the land has been used for farming, industry, transportation, and related uses.

At present about 15 percent of the county is woodland. Most of this is east of the Huron River, in the valleys of the Huron River and the Vermilion River and their tributaries. Some is west of the river, mostly in the area shown on the general soil map as association 4. Generally, these are locations that, because the soils are steep, stony, droughty, wet, or low in fertility, are not suitable for farming. About 5 percent of the woodland is brush cover in areas where marl has been mined.

Table 2 shows the site indexes and the average yearly growth rates for upland oaks on soils of several different series. Site index is the average height, in feet, of the dominant and codominant trees in a stand at 50 years of age. Information pertaining directly to the soils of Erie County is limited, but plots of the same kinds of soils in other counties had been sampled and the data correlated to establish site indexes. The potential annual growth rates are based on data published in USDA Technical Bulletin 560 (*9*); they are for trees grown in an 80-year rotation in even-aged, fully stocked, unmanaged stands.

TABLE 2.—*Potential productivity of upland oaks on specified soils*

[Site indexes obtained by correlating data from plots in other counties in Ohio; yearly growth rates based on data published by USDA(*9*)]

Soil series	Number of plots sampled	Site index	Estimated average yearly growth per acre
			Board feet
Alexandria	2	81	250
Bennington	1	75	210
Cardington	3	80	246
Chili	1	84	274
Colyer	5	66	147
Dekalb	64	73	197
Ellsworth	1	71	183
Jimtown	1	95	350
Loudonville	1	83	267
Lobdell	2	88	302
Mahoning	5	92	330
Trumbull	6	84	274

Three forest types are represented in Erie County: the swamp forest type, the oak-hickory type, and the beech-sugar maple type. Differences in forest type are related to differences in the drainage characteristics of the soils.

The predominant species in the swamp forest type are pin oak, swamp white oak, soft maple, ash, and elm. Forests of this type grow on poorly drained and very poorly drained soils, such as Allis, Fries, Miner, Millgrove, Pewamo, and Toledo soils.

The predominant species in the oak-hickory type are red oak, black oak, white oak, and hickory. Associates are beech, maple, basswood, ash, and tulip-poplar. On the more moist sites, there are a few walnut trees. Forests of this type grow on moderately well drained and well drained soils, such as Sisson, Tuscola, Berks, Chili, Bogart, and Loudonville soils.

The principal species in the beech-sugar maple type are beech, sugar maple, red oak, white oak, ash, basswood, hickory, and tulip-poplar. There are a few black walnut trees. Forests of this type grow on moderately well drained and somewhat poorly drained soils, such as Ellsworth (fig. 6), Mahoning, Tuscola, Haskins, and Shinrock soils.

At present the woodland in Erie County is of more value for windbreaks, for recreational use, for esthetic effect, and for wildlife habitat than as a source of marketable wood products. There is a limited market for basket material, pulpwood, and saw logs. A small quantity of maple sirup is produced for sale.

For windbreaks, it is necessary to plan carefully and to select suitable conifers and broad-leaved shrubs. Assistance in planning and managing windbreaks can be obtained from the local office of the Soil Conservation Service, the Agricultural Stabilization and Conservation Service, and the Ohio Department of Natural Resources, Division of Forestry and Reclamation.

Wildlife [3]

The distribution of wildlife is closely related to land use. Wildlife can be attracted to an area if suitable cover, food, and water are provided.

Among the principal kinds of game in the county at present are ring-necked pheasant, cottontail rabbit, fox squirrel, white-tailed deer, opossum, striped skunk, muskrat, mink, and waterfowl. There are also many kinds of songbirds, marsh birds, birds of prey, reptiles, amphibians, and small mammals.

Discussed in the following paragraphs is the relationship of wildlife to present land use in each of the 12 soil associations in the county. The soil associations are described in the section "General Soil Map."

SOIL ASSOCIATION 1.—Toledo and Fulton soils are dominant in association 1. About 95 percent of the acreage is cropland. The fields are large, and the soils are productive. Cover is limited to a few fence rows, a few woodlots, and abandoned orchards, but nearby are several large marshes in which waterfowl and pheasant nest. Waste grain is the most abundant wildlife food. The seeds of ragweed, smartweed, foxtail, and other weeds are also available. Drainage ditches, small streams, and Sandusky Bay provide an abundance of water.

Among the more abundant kinds of wildlife in this association are pheasant, bobwhite quail, waterfowl, and muskrat. Less abundant are fox squirrel, cottontail rabbit, woodchuck, raccoon, and skunk. After the harvest, waterfowl from the adjacent marshes feed in the cornfields. The drainage ditches are excellent habitat for muskrat.

SOIL ASSOCIATIONS 2, 3, 5, 6, AND 12.—Del Rey and Lenawee soils are dominant in association 2; Kibbie, Tuscola, and Colwood soils in association 3; Arkport and Galen soils in association 5; Pewamo and Benning-

[2] JACK W. BASINGER, farm forester, Division of Forestry, Ohio Department of Natural Resources, and A. N. QUAM, woodland conservationist, Soil Conservation Service, helped prepare this section.

[3] ALAN KALFUS, game protector, Division of Wildlife, Ohio Department of Natural Resources, helped prepare this section.

Figure 6.—**Stand of beech, sugar maple, and white oak in an area of Ellsworth and Chili soils.**

ton soils in association 6; and Prout soils in association 12. About 95 percent of the acreage is cropland, and less than 5 percent is woodland. The fields are large, and the soils are productive. East of the Huron River in associations 2 and 3, along streams leading into the river and into Lake Erie, are woodlots 1½ to 2 miles long that provide good cover near a source of food and water. These woodlots are adjacent to cropland. On the Plum Brook Ordnance Works, now a station of the National Aeronautics and Space Administration, is a large area of idle land and brushland that provides cover and nesting sites. Waste grain and weed seeds are most abundant, but among the other wildlife foods available are legumes, grass, a few wild berries, and on the Plum Brook station, an abundance of browse. Drainage ditches, small streams, and a few ponds provide an adequate supply of water.

Among the more abundant kinds of wildlife are pheasant and bobwhite quail. Less abundant are cottontail rabbit, fox squirrel, and woodchuck. White-tailed deer are most common on the Plum Brook station. Waterfowl from the marshes feed in the cornfields after the harvest.

Some of association 6 is on Kelleys Island, which is one of the best areas in the county for pheasant. Predators are few, and the nesting cover is excellent because the grass is not mowed until the nesting season is over. Little of the island is cropland, so waste grain is scarce, but grain is fed to maintain the pheasant through the winter. Other than pheasant, the principal kinds of wildlife on the island are cottontail rabbit, quail, raccoon, fox squirrel, eagles, and eastern chipmunk. Wild berries, weed seeds, grass, legumes, acorns, and hickory nuts are the principal foods available. Small intermittent streams, limestone quarries, and Lake Erie are sources of water.

Soil association 4.—Sisson and Tuscola soils are dominant in this association. About 70 percent of the acreage is cropland; 20 percent is woodland; and the rest consists of brushland, abandoned orchards, and idle grassland. About 20 percent of the field boundaries are fence rows, which provide cover and nesting places. The brushland, abandoned orchards, and idle grassland, which also offer cover, are well distributed. Waste grain and weed seeds are the most abundant wildlife food, but there are also wild berries, legumes, and grass in the fence rows, brushland, and idle grassland, as well as hickory nuts, beechnuts, and acorns in the woodlots. Mud Brook and the Huron River are the main sources of water.

Among the principal kinds of wildlife in this association are pheasant, bobwhite quail, cottontail rabbit, fox squirrel, raccoon, and woodchuck. Others are white-tailed deer, opossum, skunk, and red fox. Pheasant live in areas of cropland. Cottontail rabbit and bobwhite quail are most abundant in areas of brushland and idle land. Woodlots provide good cover and food for fox squirrel. Raccoon are most numerous in wooded areas along the Huron River.

SOIL ASSOCIATION 7.—Warners soils are dominant in this association. Most of the acreage is part of the State-owned Resthaven Wildlife Area. Also in the association are a private hunting preserve, which is a good nesting site for pheasant, and a private fishing club. The soils in this association are low in productivity, and farms are few. Mining for marl is one of the major factors affecting land use.

Among the more abundant kinds of wildlife are pheasant, quail, waterfowl, muskrat, raccoon, and rabbit. Less abundant are red fox and fox squirrel.

SOIL ASSOCIATION 8.—Allis and Fries soils are dominant in this association. About 50 percent of the acreage is woodland; 30 percent consists of orchards, vineyards, and cropland; and the rest consists of brushland and idle grassland. The fields typically are between 10 and 30 acres in size. About 50 percent of the field boundaries are fence rows, which provide cover for wildlife. Small intermittent streams and a few ponds are among the sources of water.

This association provides good habitat for fox squirrel, deer, ground squirrel, and red fox. Other wildlife include pheasant, rabbit, raccoon, and woodchuck. The woodland provides good cover for fox squirrel, white-tailed deer, and red fox.

SOIL ASSOCIATION 9.—Mahoning, Bogart, Haskins, and Jimtown soils are dominant in this association. About 60 percent is cropland; 25 percent consists of woodlots; and the rest consists of brushland, idle grassland, and orchards. The productivity of the soils ranges from low to high, and as a result, there are different kinds of farming enterprises, including grain production, general farming, dairies, and orchards. The fields typically are between 10 and 20 acres in size, and 25 percent of the field boundaries are fence rows, which provide good cover for wildlife. Woodlots, orchards, grassland, and bushland, which provide good cover and nesting sites, are well distributed through the association. Waste grain, browse, wild berries, weed seeds, grass, legumes, walnuts, hickory nuts, and acorns are the principal wildlife foods. Small animals and birds are food for carnivorous wildlife. Drainage ditches, Chappel Creek, Old Woman Creek, and the Vermilion River provide an adequate supply of water.

Pheasant inhabit mainly the more extensive areas of cropland. Bobwhite quail and cottontail rabbit are most abundant in areas of idle grassland and brushland that are near cropland. Deer, fox squirrel, red fox, and raccoon are found mainly in woodlots and brushland. Among the other kinds of wildlife are woodchuck, muskrat, opossum, and skunk.

SOIL ASSOCIATION 10.—Castalia and Millsdale soils and Lewisburg soils, moderately shallow variant, are dominant in this association. About 75 percent of the acreage is cropland, and the rest consists of woodlots, idle grassland, abandoned orchards, and brushland. Fields range from about 20 acres to 40 acres in size, and about 25 percent of the field boundaries are fence rows, which provide cover for wildlife. The woodlots, grassland, abandoned orchards, and brushland, which provide excellent cover, are well distributed through the association. Waste grain and weed seeds are the most abundant wildlife foods. The woodlands provide hickory nuts, walnuts, acorns, and beechnuts, and the brushland provides wild berries and browse. Small streams that, except for a few deep pools, are usually dry late in summer are the principal source of water.

Among the principal kinds of wildlife are pheasant, bobwhite quail, and rabbit. Others are fox squirrel and woodchuck. Pheasant are found mainly in areas of cropland. Cottontail rabbit and bobwhite quail are most abundant in areas of brushland and idle grassland that are adjacent to cropland.

Some of association 10 is on Kelleys Island, which is one of the best areas in the county for pheasant. The nesting cover is excellent because the grass is not mowed until the nesting season is over. Little of the island is cropland, so waste grain is scarce, but grain is fed to maintain the pheasant through the winter. Other than pheasant, the principal kinds of wildlife on the island are rabbit, quail, raccoon, fox squirrel, eagles, and ground squirrel. Wild berries, weed seeds, grass, legumes, acorns, and hickory nuts are the principal foods available. Small intermittent streams, limestone quarries, and Lake Erie are sources of water.

SOIL ASSOCIATION 11.—This association consists mainly of Marsh and Beaches. Sedge, burreed, cattail, arrowhead, and bulrush grow in the Marsh. Cattail is the most abundant. All these plants are sources of food for wildlife.

Among the principal kinds of wildlife inhabiting the Marsh areas are ducks, geese, muskrat, and pheasant. Others are eagles, redwing blackbirds, shore birds, and rails.

Beaches do not provide a significant amount of food and cover for wildlife.

Engineering Uses of the Soils [4]

Some soil properties are of particular interest to engineers, because they affect the construction and maintenance of roads, airports, pipelines, building foundations, facilities for water storage, erosion control structures, irrigation and drainage systems, and sewage disposal systems. Among the soil properties most important to engineers are permeability, shear strength, compaction characteristics, drainage, shrink-swell characteristics, dispersion, grain size, plasticity, and reaction. Depth to the water table, depth to bedrock, available water capacity, and topography are also important. Results of tests on soil samples from Erie County are given in table 3; estimates of the soil properties significant in engineering are given in table 4; and interpretations relating to engineering uses of the soils are shown in table 5. The estimates and interpretations of soil properties in these tables can be used in—

1. Planning and designing of agricultural drainage systems, farm ponds, irrigation systems, diversion terraces, and other structures for controlling water and conserving soil.
2. Selecting potential locations for highways, airports, pipelines, and underground cables.
3. Locating probable sources of sand, gravel, or rock suitable for use as construction material.

[4] Reviewed by LLOYD GILLOGLY, construction engineer, Soil Conservation Service, Columbus, Ohio.

4. Selecting potential industrial, commercial, residential, and recreational areas.

With the use of the soil map for identification, the engineering interpretations reported here can be useful for many purposes. They do not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads and excavations deeper than the depths of layers here reported. Even in these situations, the soil map is useful for planning more detailed field investigations and for suggesting the kinds of problems that may be expected.

Some terms used in soil science, for example, soil, sand, silt, clay, subsoil, and solum, have different meanings in engineering. These terms and others are defined in the Glossary.

Engineering classification systems

Two systems of classifying soils are in general use among engineers.

Most highway engineers classify soil materials according to the system approved by the American Association of State Highway Officials (AASHO) (*1*). This system of classification is based on grain-size gradation, liquid limit, plasticity index, and field performance in highways. In the AASHO system, soil materials are classified in seven principal groups. The groups range from A–1, which consists of gravelly soils having high bearing strength (the best soils for subgrade), to A–7, which consists of clayey soils having low strength when wet (the poorest soils for subgrade). Within each group, the relative engineering value of a soil is indicated by group index numbers that range from 0 for the best material to 20 for the poorest. The group index number is given in parentheses after the soil group symbol, for example, A–7–5(17) in table 3.

Some engineers prefer to use the Unified soil classification system established by the Corps of Engineers, U.S. Army (*18*). In this system the soils are identified according to texture and plasticity and are grouped according to their performance as engineering construction materials. Soil materials are identified as coarse grained (eight classes), fine grained (six classes), and highly organic.

Engineering test data

To help evaluate the soils for engineering purposes, samples from 12 profiles representing four of the principal soil series in Erie County were tested in accordance with standard procedures. Only selected layers of each soil were tested. The results of these tests are given in table 3. The engineering classifications in this table are based on data obtained by mechanical analysis and by tests to determine the liquid limit and the plastic limit.

Table 3 also gives moisture-density data for the tested soils. If a soil material is compacted at successively higher moisture content, and the compactive effort remains constant, the density of the compacted material increases until the optimum moisture content is reached. After that, the density decreases as the moisture content increases. The highest dry density obtained in the compaction test is termed maximum dry density, and the corresponding moisture content is the optimum moisture. Moisture-density data are important in earthwork, because, as a rule, soil is most stable if it is compacted to about the maximum dry density when it is at approximately the optimum moisture content.

The tests for liquid limit and plastic limit measure the effect of water on the consistence of the soil material. As the moisture content of a clayey soil increases from a very dry state, the material changes from semisolid to plastic. As the moisture content is further increased, the material changes from plastic to liquid. The plastic limit is the moisture content, expressed as a percentage of the ovendry weight of the soil, at which the soil material passes from semisolid to plastic. The liquid limit is the moisture content at which the material passes from plastic to liquid. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of mosture content within which the soil material is plastic. Some silty and sandy soils are nonplastic; that is, they do not become plastic at any moisture content.

Estimated properties

Table 4 shows estimates of some of the soil properties that affect engineering work. The data are based on laboratory tests, on field experience with the same kinds of soils in other counties (*15*, *16*), and on information in other parts of this soil survey. Some of the column headings in table 4 are discussed briefly in the following paragraphs.

The seasonally high water table, which may be a perched water table, is the highest level at which the soil is saturated in winter and early in spring. The water table is lower if precipitation has been less than normal during the wet season. From late in spring through fall, the water table is lower than is shown in table 4, particularly in sloping soils and on uplands.

The estimated rates of permeability, expressed in inches per hour, are based on the movement of water through saturated, undisturbed soils. The rates depend largely on texture, structure, and observations of drainage in the field. In soils that contain a large amount of clay or organic matter, the rates are considerably higher when soils are unsaturated (*6*).

Available moisture capacity refers to the amount of capillary water in a soil that is wet to field capacity. If the moisture content is at the wilting point for plants, this amount of water will wet the soil material described to a depth of 1 inch without deeper percolation. The factors considered in making the estimates are texture, structure, and organic-matter content.

Shrink-swell potential indicates the volume change to be expected when soil material changes in moisture content. In general, soils classed as CH and A–7, which contain a large proportion of plastic fines, have high shrink-swell potential, and those classed as SM or A–2 have low shrink-swell potential.

Engineering interpretations

Table 5 lists, for each soil in Erie County, interpretations of features that affect suitability for specific engineering purposes. These interpretations are based on the soil test data in table 3, on the estimates of properties in table 4, on mechanical analysis of other soils in the county, and on field experience. The column headings are discussed briefly in the following paragraphs.

TABLE 3.—*Engi-*

[Tests performed by the Ohio Department of Highways in accordance with standard

Soil name and location	Parent material	Report No.	Depth from surface	Moisture-density data [1]	
				Maximum dry density	Optimum moisture
			In.	*Lb. per cu. ft.*	*Pct.*
Allis stony silt loam:					
Lot 11, sec. 3, Vermilion Township (modal).	Glacial till or lacustrine material underlain by shale bedrock at a depth of 20 to 40 inches.	82617	4–11	88	30
		82618	13–27	92	26
		82619	27–33	92	26
Lot 11, sec. 3, Vermilion Township (coarser textured than modal).	Glacial till or lacustrine material underlain by shale bedrock at a depth of 20 to 40 inches.	82620	4–12	90	27
		82621	12–22	92	26
		82622	22–30	90	27
Allis silty clay loam:					
Lot 7, sec. 3, Vermilion Township (finer textured than modal).	Glacial till or lacustrine material underlain by shale bedrock at a depth of 20 to 40 inches.	82614	11–22	97	23
		82615	22–28	95	24
		82616	28–36	100	22
Arkport loamy fine sand:					
Lot 9, sec. 4, Perkins Township (modal).	Sand ridges consisting of fine sand, very fine sand, and loamy fine sand.	82608	9–19		
		82609	27–48	110	17
		82610	48–58	102	20
West and north of the corner of Knight and Barrows Roads, Huron Township (finer textured than modal).	Sand ridges consisting of fine sand, very fine sand, and loamy fine sand.	82623	12–17	105	19
		82624	20–32	110	17
		82625	42–50	112	16
600 feet west of State Highway 269 and 1,000 feet south of Rogers Road (coarser textured than modal).	Sand ridges consisting of fine sand, very fine sand, and loamy fine sand.	82633	1–9	115	15
		82634	20–30	112	16
		82635	48–58	112	16
Bogart loam:					
¾ mile west of Axtel, Vermilion Township (modal).	Beach ridges consisting of sandy and gravelly outwash.	82636	0–6	107	18
		82637	14–30	122	12
		82638	35–48		
¾ mile south of Axtel, Vermilion Township (finer textured than modal).	Beach ridges consisting of sandy and gravelly outwash.	82639	0–9	110	17
		82640	12–30	119	13
		82641	46–56	119	13
500 feet east of intersection of Cherry and Mason Roads, Vermilion Township (coarser textured than modal).	Beach ridges consisting of sandy and gravelly outwash.	82642	0–9	115	15
		82643	15–40	115	15
		82644	40–50	115	15
Sisson very fine sandy loam:					
West of Hoover Road, south of Huron-Avery Road, Milan Township (modal).	Lacustrine and deltaic deposits of stratified fine sand and silt.	82611	14–22	110	17
		82612	27–36	110	17
		82613	36–48	115	15
Avery Tract, sec. 3, Milan Township (finer textured than modal).	Lacustrine and deltaic deposits of stratified fine sand and silt.	82630	8–22	105	19
		82631	22–40	105	19
		82632	52–66	112	16
Sisson loamy fine sand:					
North of Knight Road and East of Berlin Road, Huron Township (coarser textured than modal).	Lacustrine and deltaic deposits of stratified fine sand and silt.	82626	8–14	107	18
		82627	14–22	110	17
		82628	25–36	117	14
		82629	45–55	110	17

[1] Based on AASHO Designation: T 99–57 Method A (*1*).

[2] Mechanical analysis according to AASHO Designation: T 88 (*1*). Results by this procedure differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure the fine material is analyzed by the pipette method and the material coarser than 2 millimeters

neering test data

procedures of the American Association of State Highway Officials (AASHO) (*1*)]

Mechanical analysis [2]								Liquid limit	Plasticity index	Classification		
Percentage passing sieve—							Percentage smaller than—			AASHO	Unified [3]	Ohio
1½-in.	¾-in.	⅜-in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.005 mm.					
								Pct.				
			100	100	99	98	72	57	25	A–7–5(17)	MH–CH	A–7–5
			100	100	100	99	79	66	37	A–7–6(20)	CH	A–7–6
[4] 90	73	70	67	58	57	56	39	52	18	A–7–5(9)	MH	A–7–5
			100	100	99	93	70	47	17	A–7–5(12)	ML	A–7–5
			100	100	100	100	80	74	37	A–7–5(20)	MH	A–7–5
			100	100	99	98	78	62	31	A–7–5(20)	CH–MH	A–7–5
			100	100	100	98	68	63	29	A–7–5(20)	MH	A–7–5
			100	100	100	100	77	65	31	A–7–5(20)	MH–CH	A–7–5
100	97	87	75	53	49	46	32	51	22	A–7–6(6)	SM–SC	A–7–6
			100	100	100	22	10	(5)	(5)	A–2–4(0)	SM	A–3a
			100	100	100	30	11	(5)	(5)	A–2–4(0)	SM	A–3a
			100	100	99	34	11	(5)	(5)	A–2–4(0)	SM	A–3a
			100	100	99	33	9	(5)	(5)	A–2–4(0)	SM	A–3a
			100	100	96	31	11	(5)	(5)	A–2–4(0)	SM	A–3a
			100	100	99	32	14	(5)	(5)	A–2–4(0)	SM	A–3a
			100	100	93	14	10	(5)	(5)	A–2–4(0)	SM	A–3a
			100	100	88	16	12	(5)	(5)	A–2–4(0)	SM	A–3a
			100	100	91	15	11	(5)	(5)	A–2–4(0)	SM	A–3a
			100	100	93	59	25	24	4	A–4(5)	ML–CL	A–4a
			100	100	91	48	23	(5)	(5)	A–4(3)	SM	A–4a
	100	84	70	50	38	17	10	(5)	(5)	A–1–b(0)	SM	A–1–b
			100	100	85	63	26	(5)	(5)	A–4(5)	ML	A–4a
100	96	87	81	70	46	30	22	27	12	A–2–6(0)	SC	A–2–6
	100	94	82	50	29	21	11	29	13	A–2–6(0)	SC	A–2–6
	100	83	68	59	47	37	15	27	3	A–4	GM	A–4a
100	96	91	69	49	36	31	19	31	12	A–2–6(0)	SC	A–2–6
	100	93	80	68	49	40	21	27	6	A–4(1)	SM–SC	A–4a
			100	100	100	98	41	30	11	A–6(8)	CL	A–6–a
			100	100	100	98	31	24	4	A–4(8)	ML–CL	A–4–b
			100	100	100	97	28	(5)	(5)	A–4(8)	ML	A–4–b
			100	100	100	98	44	39	19	A–6(12)	CL	A–6–b
			100	100	100	99	43	36	15	A–6(10)	CL	A–6–a
			100	100	98	95	26	(5)	(5)	A–4(8)	ML	A–4–b
			100	100	100	36	13	(5)	(5)	A–4(0)	SM	A–4–a
			100	100	100	49	20	(5)	(5)	A–4(3)	SM	A–4–a
			100	100	99	23	12	(5)	(5)	A–2–4(0)	SM	A–3–a
			100	100	100	97	39	31	10	A–4(8)	ML–CL	A–4–b

in diameter is excluded from calculations of grain-size fractions. The mechanical analysis data used in this table are not suitable for use in determining the textural classes of soils.

[3] SCS and BPR have agreed that any soil having a plasticity index within 2 points of the A-line is to be given a borderline classification. MH-CH is an example of a classification so obtained.

[4] 100 percent passed the 2-inch sieve. [5] Nonplastic.

TABLE 4.—*Estimated*

Soil series and map symbols	Depth to—		Depth from surface	Percentage passing sieve [1]			Classification
	Seasonally high water table	Bedrock		No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)	Dominant USDA texture
	Feet	*Feet*	*Inches*				
Alexandria: AdD, AdF2	3½–4+	>5	0–11	100	85–95	80–90	Silt loam
			11–18	95–100	90–95	80–90	Clay
			18–30	90–100	90–100	80–90	Silty clay loam
			30–60	90–100	85–95	70–85	Silty clay loam
Allis: AlA, AlB, AoA	<1	1½–3½	0–4	95–100	90–95	75–90	Silty clay loam
The AoA unit is stony throughout and is occasionally flooded.			4–12	95–100	90–95	85–100	Silty clay loam
			12–24	100	95–100	90–100	Silty clay
			24–40	95–100	90–95	80–90	Silty clay loam and soft shale.
			40–60				Shale bedrock
Arkport: ArA, ArB, ArC, ArD	6+	>5	0–11	100	100	15–40	Loamy fine sand
			11–60	100	100	15–35	Loamy fine sand
Arkport, moderately shallow variant: AtA, AtB.	6+	1½–3½	0–28	100	100	15–40	Loamy fine sand
			28–40				Limestone.
Beaches:							
Bc	6+	>5	0–3	100	100	5–35	Medium sand
			3–60	100	100	5–15	Coarse sand
Be	<1	>5	0–9	100	100	5–35	Medium sand
			9–60	100	100	5–15	Coarse sand
Belmore: BlB, BlC, BmA, BmB	5+	>4	0–11	90–100	80–95	30–65	Loam or sandy loam
			11–24	75–85	70–85	40–60	Gravelly loam
			24–60	75–85	65–75	20–30	Gravelly sandy loam
Bennington:							
BnA, BoA, BoB	<1½	>5	0–6	90–100	85–95	70–85	Silt loam
			6–32	90–100	85–95	80–90	Silty clay loam
			32–60	90–100	85–95	70–90	Clay loam
BpA	<1½	3½–5	0–6	90–100	85–95	70–85	Silt loam
For Pyrmont part of this unit, see Pyrmont series.			6–32	90–100	85–95	80–90	Silty clay loam
			32–45	90–100	89–95	70–90	Clay loam
			45				Limestone bedrock.
Berks: BrB, BrD, BsF	1–1½	1½–3	0–6	60–75	60–70	45–60	Channery silt loam
			6–30	55–65	50–60	35–50	Channery silt loam
			30–60				Sandstone.
Bogart: BtA, BtB	3–4	>5	0–14	75–85	70–80	35–65	Loam
			14–26	80–85	65–75	30–50	Gravelly clay loam
			26–60	60–85	55–65	15–40	Gravelly sandy loam
Borrow pits: Bw.							
No estimates of properties.							
Cardington: CaA, CaB	2–3	>5	0–10	90–100	85–95	70–85	Silt loam
			10–16	95–100	90–95	65–85	Clay
			16–32	90–100	85–95	80–90	Silty clay loam
			32–60	90–95	85–90	70–75	Clay loam
Casco, very flaggy subsoil variant: CfA, CfB, CfD.	4–5	2–10	0–9	85–95	80–90	60–80	Loam
			9–14	85–95	65–75	50–70	Gravelly clay loam
			14–19	55–65	50–60	30–45	Gravelly loam
			19–48				Limestone rubble.
			48–60				Limestone bedrock.
Castalia: ChA, ChB	4–5	2–15	0–8	50–60	40–50	25–45	Very channery silt loam
			8–60				Limestone rubble

See footnotes at end of table.

engineering properties of soils

Classification—Continued		Permeability	Available moisture capacity	Reaction	Shrink-swell potential	Corrosion potential	
Unified	AASHO					Steel	Concrete
		Inches per hour	*Inches per inch of soil*	*pH*			
ML	A-4	0. 63–2. 0	0. 16–0. 20	6. 6–7. 4	Low to moderate		Moderate.
CH	A-7	0. 2–0. 63	0. 12–0. 15	5. 1–6. 5	High	Moderate	Moderate to high.
CL	A-6	0. 2–0. 63	0. 15–0. 18	6. 6–7. 4	High	Moderate	Low to moderate.
CL	A-6	0. 2–0. 63	0. 08–0. 12	(2)	Low to moderate	Low	Low.
CL, CH	A-6, A-7	0. 2–0. 63	0. 16–0. 22	5. 1–5. 8	Moderate		High.
MH–CH	A-6, A-7	0. 063–0. 2	0. 15–0. 18	4. 6–4. 8	Moderate	High	High.
MH, CH	A-7	<0. 063	0. 12–0. 15	4. 6–4. 8	Moderate	High	High.
MH, CH	A-6, A-7	0. 2–0. 63	0. 15–0. 18	4. 6–4. 8	Moderate	High	High.
						High	High.
SM	A-2, A-4	12. 0+	0. 08–0. 12	6. 6–7. 4	Low	Low	Low.
SM	A-2	12. 0+	0. 06–0. 08	6. 6–7. 4	Low	Low	Low.
SM	A-2, A-4	12. 0+	0. 08–0. 12	6. 6–7. 4	Low	Low	Low.
SP or SM	A-3, A-1	12. 0+	0. 02–0. 04	6. 6–7. 4	Low		
SP, SM	A-1	12. 0+	0. 02–0. 04	(2)	Low	Low	Low.
SP or SP–SM	A-3	12. 0+	0. 02–0. 04	6. 6–7. 4	Low		Low.
SP or SP–SM	A-1	12. 0+	0. 02–0. 04	(2)	Low	High	Low.
ML or SM	A-4, A-2	2. 0– 6. 3	0. 14–0. 17	6. 1–7. 4	Low		Moderate to low.
CL or SM	A-4	2. 0– 6. 3	0. 12–0. 15	6. 6–7. 4	Low	Low	Moderate to low.
SM	A-2, A-1	6. 3–12. 0	0. 06–0. 1	(2)	Low	Low	Low.
ML	A-4	0. 63–2. 0	0. 16–0. 20	6. 1–6. 5	Low		Moderate.
CL	A-6	0. 2–0. 63	0. 15–0. 18	5. 6–6. 1	Moderate	High	Moderate.
CL, CL–ML	A-6	0. 2–0. 63	0. 15–0. 18	(2)	Moderate	High	Low.
ML	A-4	0. 63–2. 0	0. 16–0. 20	6. 1–6. 5	Low		Moderate.
CL	A-6	0. 2–0. 63	0. 15–0. 18	5. 6–6. 1	Moderate	High	Moderate.
CL, CL–ML	A-6	0. 2–0. 63	0. 15–0. 18	(2)	Moderate	High	Low.
ML or GM	A-4	2. 0–6. 3	0. 12–0. 15	5. 6–6. 0	Low		Moderate to high.
GM	A-4, A-2	2. 0–6. 3	0. 08–0. 11	5. 1–5. 5	Low	Low	Moderate to high.
ML or SM, GM	A-4	2. 0–6. 3	0. 10–0. 14	5. 6–6. 5	Low		Moderate.
SM or SC	A-2 or A-4	2. 0–6. 3	0. 10–0. 14	6. 1–6. 5	Low	Moderate	Low.
SM, SC	A-1 or A-2, A-4	6. 3+	0. 05–0. 09	6. 1–6. 5	Low	Moderate	Low.
ML, ML–CL	A-4	0. 63–2. 0	0. 17–0. 22	5. 6–6. 5	Low		Moderate.
CL	A-6 or A-7	0. 2–0. 63	0. 12–0. 18	5. 6–6. 5	High	High	Moderate.
ML or CL	A-6	0. 2–0. 63	0. 12–0. 17	6. 1–7. 3	Moderate	High	Low.
CL	A-6	0. 2–0. 63	0. 10–0. 15	(2)	Moderate to low	Moderate to high	Low.
ML	A-4	0. 63–2. 0	0. 10–0. 14	6. 6–7. 4	Low		Low.
CL	A-6	2. 0–6. 3	0. 10–0. 12	6. 6–7. 4	Moderate	Moderate	Low.
GM	A-2, A-4	6. 3	0. 04–0. 10	(2)	Low		Low.
GM	A-2 or A-4	12. 0+	0. 04–0. 08	(2)	Low		Low.
						Low	Low.

TABLE 4.—*Estimated*

Soil series and map symbols	Depth to—		Depth from surface	Percentage passing sieve [1]			Classification
	Seasonally high water table	Bedrock		No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)	Dominant USDA texture
	Feet	*Feet*	*Inches*				
Chili: CIA, CIB, CIC, CID	6+	>5	0–7	75–90	65–80	30–60	Loam to gravelly sandy loam
			7–16	75–85	65–75	40–55	Gravelly loam
			16–26	80–85	55–65	35–50	Gravelly sandy clay loam
			26–60	50–60	40–50	5–15	Stratified gravelly loam and gravelly sandy loam to sand and gravel.
Colwood:							
Cm, Co	<1	>5	0–12	100	100	50–85	Fine sandy loam, silt loam, or silty clay loam.
			12–30	100	100	80–90	Silt loam
			30–60	100	100	55–65	Stratified silt loam and very fine sandy loam.
Cp	<1	3½–5	0–12	100	100	50–85	Fine sandy loam, silt loam, or silty clay loam.
			12–30	100	100	80–90	Silt loam
			30–45	100	100	55–65	Stratified silt loam and very fine sandy loam.
			45				Limestone bedrock.
Colwood, acid variant: Cr, Cs	<1	3½–5	0–12	100	100	85–95	Silt loam
			12–30	100	100	80–95	Silt loam
			30–45	100	100	50–65	Very fine sandy loam
			45–60				Sandstone bedrock.
Colyer: CtA, CtC, CyE	3+	1½	0–11	40–60	40–50	30–40	Shaly silt loam
			11–17				Weathered shale
			17–60				Shale bedrock
Darroch: Da	<1½	>5	0–14	100	100	80–90	Silt loam
			14–34	100	100	85–95	Silty clay loam
			34–60	100	100	80–95	Silty clay loam to silt loam
Darroch, coarse subsoil variant: Dc	<1½	>5	0–12	100	100	40–50	Fine sandy loam
			12–22	100	100	60–80	Fine sandy loam
			22–28	100	100	15–30	Loamy sand
			28–60	100	100	35–45	Stratified fine sandy loam to loamy fine sand.
Dekalb: DkA, DkB	3+	1½–3½	0–8	90–100	80–100	40–55	Fine sandy loam
			8–24	90–100	80–100	40–55	Fine sandy loam
			24–28	40–50	40–45	35–45	Stony fine sandy loam
			28–60				Sandstone.
Del Rey: DrA, DsA, DsB	<1½	>5	0–10	100	100	65–90	Silt loam or loam
			10–40	100	100	85–95	Silty clay loam
			40–60	100	100	65–85	Clay loam
Digby: DtA, DyA	<1½	>5	0–9	90–95	80–90	65–75	Loam
			9–25	85–95	80–90	35–55	Sandy clay loam
			25–60	70–85	50–65	15–25	Gravelly sandy loam
Eel: Ee	2–3	>5	0–9	95–100	90–95	75–95	Silt loam
			9–18	95–100	90–95	70–90	Silt loam
			18–60	95–100	90–95	75–95	Silt loam
Elliott: EhA, EkA	<1½	>5	0–16	90–100	85–95	70–80	Silt loam
			16–36	90–100	85–100	75–90	Silty clay loam
			36–60	90–100	85–95	75–90	Clay loam
Ellsworth: EIA, EIB, EIC2, EID2, EwF. For Chili part of EwF, see Chili series.	2–3	>5	0–7	100	100	100	Silt loam
			7–18	100	100	80–95	Silty clay loam
			18–28	85–95	85–90	85–95	Clay loam
			28–60	90–95	85–90	65–75	Clay loam

See footnotes at end of table.

engineering properties of soils—Continued

Classification—Continued		Permeability	Available moisture capacity	Reaction	Shrink-swell potential	Corrosion potential	
Unified	AASHO					Steel	Concrete
		Inches per hour	*Inches per inch of soil*	*pH*			
SM or ML	A–2 or A–4	2. 0–6. 3	0. 10–0. 15	4. 5–5. 0	Low		High.
ML or SM	A–4	2. 0–6. 3	0. 08–0. 10	4. 5–5. 5	Low	Low	High.
SC	A–6	2. 0–6. 3	0. 12–0. 15	5. 1–5. 5	Low	Low	Moderate.
GW, or GW–GM, SW or SW–SM	A–1, A–2	>12. 0	0. 02–0. 04	5. 1–5. 5	Low	Low	Moderate.
ML	A–4	0. 63–2. 0	0. 12–0. 17	6. 6–7. 3	Low		Low.
ML	A–4	0. 63–2. 0	0. 15–0. 19	6. 6–7. 4	Low	High	Low.
ML	A–4	0. 63–2. 0	0. 06–0. 10	6. 6–7. 4	Low	High	Low.
ML	A–4	0. 63–2. 0	0. 12–0. 17	6. 6–7. 3	Low		Low.
ML	A–4	0. 63–2. 0	0. 15–0. 19	6. 6–7. 4	Low	High	Low.
ML	A–4	0. 63–2. 0	0. 06–0. 10	6. 6–7. 4	Low	High	Low.
ML	A–4	0. 63–2. 0	0. 15–0. 21	<4. 5–6. 0	Low		Moderate to high.
ML	A–4	0. 63–2. 0	0. 15–0. 18	<4. 5–6. 0	Low	High	Moderate to high.
ML	A–4	0. 63–2. 0	0. 06–0. 10	<4. 5–6. 0	Low	High	Moderate to high.
GM	A–4, A–2	0. 63–2. 0	0. 08	4. 5–5. 0	Low		High.
				4. 5–5. 0	Low	Moderate	High.
				4. 5–5. 0			
ML	A–4	0. 63–2. 0	0. 16–0. 20	6. 6–7. 4	Low		Low.
CL	A–6	0. 2–0. 63	0. 15–0. 18	6. 6–7. 4	Moderate	High	Low.
ML, CL	A–4 or A–6	0. 2–0. 63	0. 14–0. 18	(2)	Low	High	Low.
SM	A–4	2. 0–6. 3	0. 12–0. 17	6. 6–7. 4	Low		Low.
ML	A–4	0. 63–2. 0	0. 13–0. 16	6. 6–7. 4	Low	High	Low.
SM	A–2	6. 3–12. 0	0. 04–0. 07	6. 6–7. 4	Low	High	Low.
SM	A–4	2. 0–6. 3	0. 06–0. 10	(2)	Low	High	Low.
SM or ML	A–4	6. 3–12. 0	0. 08–0. 12	6. 1–6. 5	Low		High.
SM or ML	A–4	6. 3–12. 0	0. 05–0. 08	5. 6–6. 0	Low	Low	High.
SM	A–4	6. 3+	0. 08–0. 10	5. 6–6. 0	Low	Low	High.
ML	A–4	0. 63–2. 0	0. 16–0. 22	6. 1–6. 5	Low		Low.
CL	A–6	0. 2–0. 63	0. 16–0. 19	6. 6–7. 4	Moderate	High	Low.
CL	A–6	0. 2–0. 63	0. 16–0. 19	(2)	Moderate	High	Low.
ML	A–4	0. 63–2. 0	0. 14–0. 18	6. 1–6. 5	Low		Low.
CL, SC	A–6	0. 63–2. 0	0. 12–0. 15	6. 6–7. 3	Moderate	High	Low.
SM	A–2	0. 63–2. 0	0. 10–0. 13	7. 4–7. 8	Low	High	Low.
ML, ML–CL	A–4, A–6	0. 63–2. 0	0. 16–0. 20	6. 6–7. 3	Low		Low.
ML, ML–CL	A–4, A–6	0. 63–2. 0	0. 14–0. 18	6. 4–7. 8	Low	Moderate	Low.
ML, ML–CL	A–4, A–6	0. 63–2. 0	0. 15–0. 18	[2] 6. 4–7. 8	Low	Moderate	Low.
ML	A–4	0. 63–2. 0	0. 18–0. 22	5. 6–6. 5	Low		Moderate.
CL	A–6, A–4	0. 2–0. 63	0. 16–0. 19	5. 6–6. 5	Moderate	High	Moderate.
CL–ML, CL	A–6	0. 2–0. 63	0. 08–0. 10	(2)	Moderate	High	Low.
ML	A–4	0. 63–2. 0	0. 14–0. 18	5. 1–5. 5	Low		Moderate.
CL	A–6, A–7	0. 2–0. 63	0. 13–0. 16	5. 1–5. 5	Moderate to high	High	Moderate.
CL	A–6	<0. 2	0. 14–0. 17	6. 6–7. 3	Moderate	High	Low.
CL	A–6	<0. 2	0. 08–0. 10	(2)	Moderate	High	Low.

TABLE 4.—*Estimated*

Soil series and map symbols	Depth to—		Depth from surface	Percentage passing sieve [1]			Classification
	Seasonally high water table	Bedrock		No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)	Dominant USDA texture
	Feet	*Feet*	*Inches*				
Fries: Fr, Fs	<1	1½–3½	0–8	100	100	100	Silty clay loam
			8–25	100	100	90–95	Clay
			25–48				Weathered shale
			48–60				Shale bedrock
Fulton: FuA, FuB	<1½	>5	0–7	100	100	85–95	Silty clay loam
			7–24	100	100	85–100	Silty clay
			24–60	100	100	85–100	Silty clay
Galen:							
GaA, GaB	3–4	>5	0–10	100	100	15–30	Loamy fine sand
			10–44	100	100	15–30	Loamy fine sand
			44–60	100	100	10–30	Fine sand
GfB, GlB	3–4	3½–5	0–10	100	100	15–30	Loamy fine sand
			10–44	100	100	15–30	Loamy fine sand
			44–60				Limestone or shale bedrock
Gilford: Go	<1	>5	0–16	100	100	45–65	Fine sandy loam
			16–30	100	100	40–55	Fine sandy loam
			30–60	100	100	15–30	Loamy fine sand
Gravel pits: Gp. No estimates of properties.							
Haskins: HsA, HsB, HtA	<1½	>5	0–13	100	90–100	60–70	Loam
			13–18	100	90–100	70–80	Silt loam
			18–28	90–100	90–100	70–80	Clay loam
			28–36	85–95	80–90	45–60	Stratified sandy clay loam and sandy loam.
			36–60	90–100	85–95	70–75	Clay loam
Jimtown: JtA	<1½	>5	0–14	75–85	70–80	65–75	Loam
			14–27	85–90	75–85	60–70	Sandy loam to gravelly sandy clay loam.
			27–40	60–80	40–50	25–40	Very gravelly loam
			40–60	60–85	55–65	15–25	Gravelly sandy loam
Joliet: Ju	<1	<2	0–8	90–95	85–90	70–85	Silt loam
			8–16	90–100	90–100	85–95	Channery silty clay loam
			16–60				Limestone.
Kibbie: KbA, KbB, KeA, KhA. The KhA unit is medium acid to strongly acid throughout.	1½	>5	0–14	100	100	30–45	Silt loam to fine sandy loam
			14–22	100	100	85–95	Silty clay loam
			22–40	100	100	80–95	Silt loam
			40–60	100	100	30–45	Very fine sandy loam
Kibbie, moderately shallow variant: KfA.	<1½	1½–3	0–14	100	100	30–45	Silt loam to fine sandy loam
			14–22	100	100	85–95	Silty clay loam
			22				Limestone bedrock.
Lenawee: La, Lc	<1	>5	0–8	100	100	85–95	Silty clay loam
			8–40	100	100	85–95	Silty clay loam to silty clay
			40–60	100	100	75–85	Silty clay loam
Lewisburg: LeA, LeB	2–3	>5	0–4	95–100	85–90	80–85	Silt loam
			4–17	95–100	85–90	80–85	Silty clay loam
			17–60	90–100	85–90	65–75	Clay loam
Lewisburg, moderately shallow variant: LgA, LgB, LgC.	2–3	1½–3½	0–4	95–100	85–90	80–85	Silt loam
			4–20	95–100	85–90	80–85	Silty clay loam
			20				Limestone bedrock.
Lobdell: Lm	2–3	>5	0–9	100	90–100	75–95	Silt loam
			9–60	100	90–100	70–90	Silt loam

See footnotes at end of table.

engineering properties of soils—Continued

Classification—Continued		Permeability	Available moisture capacity	Reaction	Shrink-swell potential	Corrosion potential	
Unified	AASHO					Steel	Concrete
		Inches per hour	*Inches per inch of soil*	*pH*			
CL	A-6	<0.2	0.15–0.20	6.1–6.5	Moderate		Moderate.
CH or CL	A-7	<0.2	0.13–0.15	4.5–5.5	High	High	High.
						High	High.
						High	
ML–CL, CH	A-6, A-7	0.20–0.63	0.16–0.18	6.1–6.5	High		Low.
CH, ML–CL	A-7	0.063–0.2	0.12–0.15	6.1–6.5	High	High	Low.
CH, ML–CL	A-7, A-6	0.063–0.2	0.12–0.15	(2)	High	High	Low.
SM	A-2	6.3–12.0	0.10–0.14	6.6–7.4	Low		Low.
SM	A-2	6.3–12.0	0.08–0.12	6.6–7.4	Low	Low to moderate	Low.
SP–SM, SM	A-2	6.3–12.0	0.05–0.08	(2)	Low	Low to moderate	Low.
SM	A-2	6.3–12.0	0.04–0.08	6.6–7.4	Low		Low.
SM	A-2	6.3–12.0	0.04–0.08	6.6–7.4	Low	Low to moderate	Low.
						Low to moderate	Low.
ML, SM	A-4	6.3–12.0	0.14–0.18	6.6–7.3	Low		Low.
SM, ML	A-4	2.0–6.3+	0.14–0.18	6.6–7.8	Low	High	Low.
SM	A-2	6.3–12.0	0.04–0.08	6.6–7.8	Low	High	Low.
ML–CL	A-4	0.63–2.0	0.16–0.22	6.1–6.5	Low		Low.
ML	A-4	0.63–2.0	0.16–0.19	6.1–6.5	Low	High	Low.
CL	A-6	0.63–2.0	0.12–0.15	6.1–6.5	Moderate	High	Low.
SC or ML	A-4 or A-6	0.63–2.0	0.14–0.17	7.3–8.4	Moderate	High	Low.
CL	A-6	0.063–2.0	0.12–0.14	(2)	Moderate	High	Low.
ML	A-4	0.63–2.0	0.16–0.20	5.6–6.0	Low		Moderate.
ML	A-6	0.63–2.0	0.12–0.16	5.1–6.5	Moderate	Moderate	Moderate.
SM	A-2, A-4	2.0–6.3	0.10–0.12	5.1–6.5	Low	Moderate	Moderate.
SM	A-2	6.3–12.0	0.10–0.12	5.1–6.5	Low	Moderate	Moderate.
ML	A-4	0.63–2.0	0.16–0.22	(2)	Low		Low.
CL, CH	A-6, A-7	<0.2	0.16–0.19	(2)	Moderate	High	Low.
SM	A-2 or A-4	0.63–2.0	0.15–0.19	6.6–7.3	Low		Low.
CL	A-6	0.63–2.0	0.14–0.18	6.6–7.3	Moderate	High	Low.
ML	A-4	0.63–2.0	0.14–0.18	7.3–8.5	Low	High	Low.
SM	A-2 or A-4	2.0–6.3	0.08–0.12	(2)	Low	High	Low.
SM	A-2 or A-4	0.63–2.0	0.15–0.19	6.6–7.3	Low		Low.
CL	A-6	0.2–0.63	0.14–0.18	6.6–7.3	Moderate	High	Low.
CL, ML–CL	A-6, A-7	0.63–2.0	0.16–0.22	6.6–7.4	Moderate		Low.
CL, ML–CL	A-6, A-7	0.2–0.63	0.14–0.18	6.6–7.4	Moderate	High	Low.
CL, ML–CL	A-6, A-7	0.2–0.63	0.13–0.17	(2)	Moderate	High	Low.
ML, ML–CL	A-4	0.63–2.0	0.15–0.18	6.6–7.4	Low		Low.
CL, ML–CL	A-6, A-7	0.2–0.63	0.14–0.17	6.6–7.4	Moderate	High	Low.
CL, ML–CL	A-6, A-7	0.2–0.63	0.14–0.17	(2)	Moderate	High	Low.
ML	A-4	0.63–2.0	0.15–0.18	6.6–7.4	Low		Low.
CL	A-6	0.2–0.63	0.14–0.17	6.6–7.4	Moderate	High	Low.
ML, CL	A-4, A-6	0.63–2.0	0.18–0.24	5.6–6.0	Low		Moderate.
ML or CL	A-4 or A-6	0.63–2.0	0.15–0.18	5.6–6.9	Low	Moderate	Moderate.

TABLE 4.—*Estimated*

Soil series and map symbols	Depth to—		Depth from surface	Percentage passing sieve [1]			Classification
	Seasonally high water table	Bedrock		No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)	Dominant USDA texture
	Feet	*Feet*	*Inches*				
Loudonville: LoA, LoB, LoC	3+	1½–3½	0–8	90–95	85–90	70–75	Loam
			8–20	90–95	85–90	70–75	Clay loam
			20–24	85–95	75–85	65–70	Channery loam
			24–60				Sandstone.
Made land: Ma. No estimates of properties.							
Mahoning: MfA, MgA, MgB, MhA, MkA, MlA. The MhA unit is stony throughout. In the MkA and MlA units, depth to bedrock is within 5 feet.	<1½	>5	0–14	95–000	90–100	75–90	Silt loam to loam
			14–22	95–100	90–100	80–90	Clay
			22–30	90–100	85–90	75–85	Clay loam
			30–60	90–100	85–90	70–85	Clay loam
Marsh: Mm. No estimates of properties.							
Mermill: Mn, Mo	<1	>5	0–14	90–95	80–90	65–80	Silt loam
			14–35	70–100	65–75	55–65	Gravelly clay loam
			35–60	90–95	85–90	75–80	Silty clay loam
Metea: MrA, MrB, MrC	2–3	>5	0–24	100	100	15–30	Loamy fine sand
			24–32	100	100	90–100	Silty clay loam
			32–60	100	100	90–100	Silty clay loam, stratified in lower part.
Millgrove: Ms, Mt	<1	>5	0–20	90–100	85–95	65–75	Loam
			20–38	85–95	80–90	35–55	Sandy clay loam
			38–60	60–100	40–50	20–30	Stratified gravelly sandy loam to gravelly sandy clay loam.
Millsdale: Mu, Mv	<1	1½–3½	0–12	100	100	70–80	Silt loam
			12–22	95–100	80–90	70–80	Clay loam
			22–60				Limestone.
Miner: Mw	<1	>5	0–8	100	100	85–95	Silty clay loam
			8–28	100	90–100	90–95	Silty clay
			28–60	100	90–100	85–95	Silty clay loam
Mitiwanga: MxA	<1½	1½–3½	0–11	90–100	80–90	65–80	Loam
			11–26	90–100	80–90	60–75	Clay loam
			26–40				Sandstone.
Oakville: OaB, OaC, OaE	6+	>5	0–10	100	100	15–30	Loamy fine sand
			10–60	100	100	15–30	Loamy fine sand
Orrville: Or	<1½	>5	0–30	100	85–95	75–85	Silt loam
			30–40	90–100	85–95	60–70	Loam
			40–60	90–100	85–95	30–40	Sandy loam
Oshtemo: OsA, OsB, OtA, OtB. The OsA and OsB units have coarser texture throughout than the other units.	6+	>5	0–27	95–100	90–95	25–35	Sandy loam
			27–32	70–90	50–75	40–55	Gravelly sandy clay loam
			32–60	60–90	50–60	15–25	Gravelly sandy loam
Pewamo:							
Pc, Pe	<1	>5	0–16	100	100	80–95	Silty clay loam
			16–24	100	95–100	80–95	Silty clay
			24–34	95–100	90–95	75–85	Clay loam
			34–60	90–100	80–95	70–85	Clay loam and silty clay loam.
Ph	<1	3½–5	0–16	100	100	80–95	Silty clay loam
			16–24	100	95–100	80–95	Silty clay
			24–40	95–100	90–95	75–85	Clay loam
			40				Limestone.

See footnotes at end of table.

engineering properties of soils—Continued

Classification—Continued		Permeability	Available moisture capacity	Reaction	Shrink-swell potential	Corrosion potential	
Unified	AASHO					Steel	Concrete
		Inches per hour	*Inches per inch of soil*	*pH*			
ML	A-4	0. 2–0. 63	0. 17–0. 19	5. 6–6. 0	Low		Moderate.
CL, ML–CL	A-6	0. 2–0. 63	0. 15–0. 18	5. 6–6. 0	Moderate	Moderate	Moderate.
ML	A-4	0. 2–0. 63	0. 14–0. 17	5. 1–5. 5	Low	Moderate	Moderate.
ML, ML–CL	A-4, A-6	0. 2–0. 63	0. 15–0. 19	5. 5–6. 0	Low		Moderate to high.
CL or ML–CL	A-6, A-7	0. 063–0. 2	0. 12–0. 15	5. 1–5. 6	Moderate to high	High	Moderate to high.
CL	A-6	0. 063–0. 2	0. 15–0. 17	6. 6–7. 4	Moderate	High	Low.
CL	A-6	<0. 063	0. 08–0. 10	(2)	Moderate	High	Low.
ML	A-4	0. 63–2. 0	0. 16–0. 21	6. 6–7. 3	Low		Low.
CL	A-4, A-6	0. 63–2. 0	0. 14–0. 17	6. 6–7. 3	Moderate	High	Low.
CL, CH	A-6, A-7	<0. 063	0. 15–0. 18	(2)	Moderate	High	Low.
SM	A-2	6. 3–12. 0	0. 08–0. 10	6. 6–7. 3	Low		Low.
CL	A-6	0. 63–2. 0	0. 15–0. 18	6. 6–7. 3	Moderate	Moderate	Low.
CL	A-6	0. 2–0. 63	0. 12–0. 15	(2)	Moderate	Moderate	Low.
ML	A-4	0. 63–2. 0	0. 16–0. 22	6. 6–7. 3	Low		Low.
CL, SC	A-4 or A-6	0. 63–2. 0	0. 14–0. 18	6. 6–7. 3	Moderate	High	Low.
SM	A-2	6. 3+	0. 06–0. 10	6. 6–7. 3	Low	High	Low.
ML, CL	A-4, A-6	0. 63–2. 0	0. 17–0. 22	6. 6–7. 3	Moderate		Low.
CL, CH	A-6, A-7	0. 2 –0. 63	0. 15–0. 18	(2)	High	High	Low.
CL	A-6	0. 2–2. 0	1. 17–0. 24	5. 6–6. 0	Moderate		Moderate.
CH	A-7	0. 063–0. 2	0. 13–0. 16	6. 1–6. 5	High	High	Low.
CL	A-6	0. 063–0. 2	0. 10–0. 15	[2] 6. 1–7. 8	Moderate	High	Low.
ML	A-4	0. 63–1. 0	0. 17–0. 22	5. 1–6. 0	Low		Moderate.
CL, ML–CL	A-6	0. 2–0. 63	0. 15–0. 18	5. 1–6. 0	Low t moderate	High	Moderate.
SM	A-2	6. 3+	0. 08–0. 12	6. 1–6. 6	Low		Low.
SM	A-2	6. 3+	0. 04–0. 10	6. 6–7. 3	Low	Low	Low.
ML	A-4	0. 63–2. 0	0. 16–0. 22	5. 6–6. 5	Low		Moderate.
ML	A-4	0. 63–2. 0	0. 15–0. 18	6. 1–6. 5	Low	High	Low.
SM	A-2 or A-4	2. 0–6. 3	0. 09–0. 12	6. 1–6. 5	Low	High	Low.
SM	A-2	2. 0–6. 3	0. 13–0. 16	6. 1–8. 5	Low		Low.
SC or CL, GC	A-4	2. 0–6. 3	0. 14–0. 18	5. 6–6. 0	Low	Low	Moderate.
SM	A-2	6. 3–12. 0	0. 06–0. 10	6. 1–6. 5	Low	Low	Low.
ML or MH	A-6 or A-7	0. 8–2. 5	0. 16–0. 22	6. 6–7. 4	Moderate		Low.
ML–CL or CH	A-6 or A-7	0. 2–0. 63	0. 13–0. 17	6. 6–7. 4	High	High	Low.
CL, ML–CL	A-6	0. 2–0. 63	0. 13–0. 17	6. 6–7. 4	Moderate	High	Low.
CL or ML–CL	A-6	0. 2–0. 63	0. 12–0. 15	(2)	Moderate	High	Low.
ML or MH	A-6 or A-7	0. 8–2. 5	0. 16–0. 22	6. 6–7. 4	Moderate		Low.
ML–CL or CH	A-6 or A-7	0. 2–0. 63	0. 13–0. 17	6. 6–7. 4	High	High	Low.
CL	A-6	0. 2–0. 63	0. 13–0. 17	6. 6–7. 4	Moderate	High	Low.

TABLE 4.—*Estimated*

Soil series and map symbols	Depth to—		Depth from surface	Percentage passing sieve [1]			Classification
	Seasonally high water table	Bedrock		No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)	Dominant USDA texture
	Feet	*Feet*	*Inches*				
Prout: PmA, PrA, PsA, PsB, PuA—In the PsA and PsB units, depth to a seasonal high water table is 2 to 3 feet. In the PuA unit, depth to bedrock is 3½ to 5 feet.	<1½	1½–3½	0–10	100	100	50–70	Loam or very sandy loam
			10–24	100	100	85–100	Silty clay loam
			24–30				Weathered shale
			30–60				Shale bedrock
Pyrmont: PyA	<1½	>5	0–5	100	90–100	75–85	Silt loam
			5–22	95–100	85–95	80–90	Silty clay loam
			22–60	95–100	85–90	65–75	Clay loam
Pyrmont, moderately shallow variant: PzA.	<1½	1½–3½	0–5	100	90–100	75–85	Silt loam
			5–22	95–100	85–95	80–90	Silty clay loam
			22				Limestone bedrock.
Quarries: Qu. No estimates of properties.							
Rawson: RcB, RdA	2–3	>5	0–14	85–90	80–90	65–75	Loam
			14–36	85–95	80–90	35–50	Sandy clay loam
			36–42	90–100	85–90	80–90	Silty clay loam
			42–60	95–100	85–90	65–75	Clay loam
Rimer: Rf, Rg	<1½	>5	0–6	100	100	40–55	Fine sandy loam
			6–14	100	100	15–30	Loamy fine sand
			14–22	100	100	45–55	Fine sandy loam
			22–60	100	100	90–100	Silty clay loam
Ritchey: RhB	>2	<2	0–10	85–95	75–85	75–85	Silt loam
			10–16	90–95	85–90	70–80	Clay loam
			16–60				Limestone bedrock.
Romeo: RsB, RsD, RsF	(3)	<1	0–6	85–95	75–85	70–80	Silt loam
			6–60				Limestone bedrock.
Sand pits: Sa. No estimates of properties.							
Shinrock: ShA, SkA, SkB, SkC2, SkD2, SlE, SlF.	2–3	>5	0–9	100	100	80–95	Silt loam
			9–27	100	100	85–95	Silty clay loam
			27–42	100	100	85–95	Silty clay loam
			42–60	100	100	70–80	Stratified clay loam, silt loam, and very fine sand.
Shoals: Sm	<1½	>5	0–29	100	100	60–80	Silt loam to fine sandy loam
			29–60	100	80–95	60–90	Silt loam to loam
Sisson: SnB, SoB, SoC2, SsB, SsC2, SsD2, SsD3, SsE2, StF.	2½–4	>5	0–40	100	100	70–90	Silt loam
			40–60	100	100	90–100	Stratified very fine sandy loam and silt loam.
Sloan: Sv	<1	>5	0–14	90–100	85–95	80–90	Silt loam
			14–22	90–100	85–95	40–55	Fine sandy loam
			22–38	95–100	80–95	50–65	Loam
			38–60	90–95	85–90	70–75	Silt loam
Tawas: Ta	<1	>5	0–27				Muck
			27–35	100	100	15–30	Loamy sand
			35–60	100	100	10–15	Sand
Toledo: Tc, To, Tp—The Tp unit is calcareous throughout.	<1	>5	0–9	100	100	85–100	Silty clay
			9–50	100	100	85–95	Clay
			50–60	100	100	85–100	Silty clay
Trumbull: Tr	<1	>5	0–15	100	90–100	75–85	Silt loam
			15–30	100	90–100	85–90	Silty clay
			30–60	100	90–100	75–80	Silty clay loam

See footnotes at end of table.

engineering properties of soils—Continued

Classification—Continued		Permeability	Available moisture capacity	Reaction	Shrink-swell potential	Corrosion potential	
Unified	AASHO					Steel	Concrete
		Inches per hour	*Inches per inch of soil*	*pH*			
ML	A-4	0. 63–2. 5	0. 14–0. 17	5. 1–5. 5	Low		Moderate.
CL, ML–CL	A-6, A-7	0. 2–0. 63	0. 14–0. 18	4. 5–5. 0	Moderate	High	High.
		0. 2–0. 63	0. 06–0. 10	4. 5–5. 0		High	High.
				4. 5–5. 0			
ML	A-4	0. 63–2. 0	0. 15–0. 20	6. 6–7. 3	Low		Low.
CL, ML–CL	A-6, A-7	0. 2–0. 63	0. 14–0. 18	[2] 7. 4–7. 8	Moderate	High	Low.
CL, ML–CL	A-4, A-6	0. 2–0. 63	0. 08–0. 10	[2]	Moderate	High	Low.
ML	A-4	0. 63–2. 0	0. 15–0. 20	6. 6–7. 3	Low		Low.
CL	A-6, A-7	0. 2–0. 63	0. 14–0. 18	[2] 7. 4–7. 8	Moderate	High	Low.
ML	A-4	0. 63–2. 0	0. 15–0. 20	5. 6–6. 0	Low		Moderate.
SC	A-2, A-4	0. 63–2. 0	0. 14–0. 17	5. 6–6. 0	Moderate	High	Moderate.
CL	A-6 or A-7	0. 2–0. 63	0. 15–0. 18	7. 4–7. 8	Moderate	High	Low.
CL	A-6	<0. 2	0. 08–0. 12	[2]	Moderate	High	Low.
ML or SM	A-4	6. 3–12. 0	0. 12–0. 16	6. 6–7. 4	Low		Low.
SP	A-2	6. 3–12. 0	0. 10–0. 14	6. 6–7. 3	Low	Moderate	Low.
SM or ML	A-4	6. 3–12. 0	0. 12–0. 15	7. 4–7. 8	Low	Moderate	Low.
CL, ML–CL	A-6, A-7	0. 2–0. 63	0. 19	[2] 7. 4	Moderate	High	Low.
ML	A-4	0. 63–2. 0	0. 15–0. 20	7. 4–7. 8	Low to moderate		Low.
CL	A-6	0. 2–0. 63	0. 14–0. 17	7. 4–7. 8	Moderate	Moderate	Low.
ML	A-4	0. 63–2. 0	0. 16–0. 22	[2]	Low	Low	Low.
ML	A-4	0. 63–2. 0	0. 16–0. 20	6. 1–7. 3	Low		Low.
CH	A-7	0. 63–2. 0	0. 15–0. 18	6. 6–7. 3	Moderate to high	High	Low.
CL	A-6	0. 2–0. 63	0. 15–0. 18	[2]	Moderate	High	Low.
CL, CH	A-6, A-7	0. 2–0. 63	0. 12–0. 15	[2]	Moderate	High	Low.
ML, CL	A-4, A-6	0. 63–2. 0	0. 12–0. 18	6. 6–7. 3	Low	High	Low.
ML	A-4	0. 2–2. 0	0. 15–0. 18	6. 6–7. 3	Low	High	Low.
ML, CL	A-4, A-6	0. 63–2. 0	0. 15–0. 20	6. 6–7. 3	Low	Low	Low.
ML	A-4	0. 63–2. 0+	0. 13–0. 16	[2]	Low	Low	Low.
ML, CL	A-4, A-6	0. 63–2. 0	0. 15–0. 20	6. 6–7. 3	Low	High	Low.
SM or ML, CL	A-4, A-6	0. 63–2. 0	0. 14–0. 18	6. 6–7. 3	Low	High	Low.
ML	A-4	0. 2–2. 0	0. 16–0. 18	[2]	Low	High	Low.
ML	A-4	0. 2–2. 0	0. 16–0. 19	[2]	Low	High	Low.
		6. 3+	0. 20–0. 25	5. 6–6. 0		High	Moderate.
SM	A-2	6. 3+	0. 05–0. 07	6. 1–6. 6	Low	High	Low.
SP or SM	A-2	6. 3+	0. 03–0. 05	6. 1–6. 6	Low	High	Low.
ML, MH–CH	A-7	0. 2–0. 63	0. 18–0. 22	6. 6–7. 3	High		Low.
CH or CL	A-7, A-6	0. 063–0. 2	0. 13–0. 15	6. 6–7. 8	High	High	Low.
CH or CL	A-7, A-6	0. 063–0. 2	0. 13–0. 15	[2]	High	High	Low.
ML, CL	A-4, A-6	0. 63–2. 0	0. 15–0. 18	5. 1–5. 5	Low		Moderate.
CH	A-7, A-6	0. 063–0. 2	0. 13–0. 16	6. 1–6. 5	High	High	Low.
CL, ML–CL	A-6 or A-7	0. 063–0. 2	0. 14–0. 17	6. 1–6. 5	Moderate to high	High	Low.

TABLE 4.—*Estimated*

Soil series and map symbols	Depth to—		Depth from surface	Percentage passing sieve [1]			Classification
	Seasonally high water table	Bedrock		No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)	Dominant USDA texture
	Feet	*Feet*	*Inches*				
Tuscola: TsA, TuA, TuB, TwA, TwB	2–3	>5	0–6	100	100	40–55	Fine sandy loam
			6–10	100	100	60–75	Loam
			10–32	100	100	85–95	Silty clay loam
			32–60	100	100	50–95	Stratified silt loam and very fine sandy loam.
Vaughnsville: Va	1½–32	>5	0–8	90–95	80–90	65–75	Loam
			8–26	85–90	80–90	45–60	Sandy clay loam
			26–40	85–90	80–85	30–45	Sandy loam
			40–60	75–90	60–85	20–30	Gravelly sandy loam
Warners: Wa, Wc. The Wc unit has clay at a depth of 20 to 40 inches.	<1	>5	0–11				Muck
			11–60				Marl
Washtenaw: Wh	<1½	>5	0–60	100	100	80–90	Silt loam
Wayland: Wn	<1	>5	0–4	100	90–100	80–90	Silt loam
			4–14	100	90–100	60–75	Loam
			14–60	100	90–100	80–90	Silt loam
Wilmer: Wo	<1½	>5	0–12	95–100	85–95	30–40	Loam
			12–32	85–90	80–90	35–55	Sandy clay loam
			32–40	90–95	80–90	65–75	Loam
			40–60	75–90	60–85	25–35	Gravelly sandy loam

[1] The estimates in this table are based on material less than 3 inches in diameter. Material coarser than 3 inches is shown in the profile descriptions.

TABLE 5.—*Engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as a source of—			Soil features affecting—
			Topsoil	Road fill		
				Subsoil	Substratum	Highway location
Alexandria: AdD, AdF2.	Poor: well drained; clayey.	Moderate	Fair	Fair	Fair	Good natural drainage; gently sloping to very steep.
Allis: AlA, AlB, AoA. The AoA unit is stony throughout and is subject to occasional flooding.	Poor: somewhat poorly drained; clayey.	Moderate	Poor	Poor	Unsuitable: shale bedrock.	Somewhat poor natural drainage; shale bedrock is at a depth of 1½ to 3½ feet; seasonally high water table.

See footnote at end of table.

engineering properties of soils—Continued

Classification—Continued		Permeability	Available moisture capacity	Reaction	Shrink-swell potential	Corrosion potential	
Unified	AASHO					Steel	Concrete
		Inches per hour	*Inches per inch of soil*	*pH*			
SM, ML	A-4	2. 0–6. 3+	0. 13–0. 16	6. 1–6. 5	Low		Low.
ML	A-4	2. 0–6. 3	0. 14–0. 18	6. 1–6. 5	Low	Low to moderate	Low.
CL	A-6	0. 63–2. 0	0. 17–0. 19	6. 6–7. 3	Moderate	High	Low.
ML	A-4	2. 0–6. 3+	0. 14–0. 18	(2)	Low	High	Low.
ML	A-4	0. 63–2. 0	0. 16–0. 19	6. 6–7. 3	Low		Low.
CL, SC	A-4 or A-6	0. 63–2. 0	0. 14–0. 17	6. 6–7. 3	Moderate	High	Low.
SM	A-2 or A-4	6. 3+	0. 13–0. 16	6. 6–7. 3	Low	High	Low.
SM	A-2	6. 3+	0. 06–0. 10	(2)	Low	High	Low.
		6. 3+	0. 20–0. 25	(2)		High	Low.
		0. 63–6. 3	0. 15–0. 19	(2)		High	Low.
ML	A-4	0. 63–2. 0	0. 15–0. 20	6. 6–7. 3	Low	Moderate	Low.
ML	A-4	0. 63–2. 0	0. 18–0. 22	6. 1–6. 5	Low		Low.
ML	A-4	0. 63–2. 0	0. 15–0. 18	6. 1–6. 5	Low	High	Low.
ML	A-4	<0. 2	0. 14–0. 18	5. 6–6. 5	Low	High	Low.
SM	A-2 or A-4	6. 3+	0. 12–0. 16	6. 6–7. 3	Low		Low.
CL or SC	A-6	0. 63–2. 0	0. 14–0. 17	6. 1–7. 3	Moderate	Moderate	Low.
ML	A-4	0. 63–2. 0	0. 15–0. 18	6. 6–7. 3	Low	Moderate	Low.
SM	A-2	6. 3+	0. 06–0. 10	6. 6–7. 3	Low	Moderate	Low.

[2] Calcareous.
[3] Not applicable.

interpretations

Soil features affecting—Continued						
Pipeline construction and maintenance	Farm ponds		Agricultural drainage	Irrigation	Terraces and diversions	Waterways
	Reservoir area	Embankment				
Some steep slopes	Slow rate of seepage.	Fair stability; slow permeability; fair compaction characteristics; good resistance to piping.	Not applicable	Moderately slow permeability; gently sloping to very steep.	Gently sloping to very steep; slopes generally short and irregular.	Slopes are generally short and irregular; moderate erodibility; gently sloping to very steep.
Limited depth to shale bedrock; somewhat poor natural drainage.	Shale bedrock is at a depth of 1½ to 3½ feet; very slow rate of seepage.	Limited quantity of soil material; fair stability; slow permeability; fair compaction characteristics; good resistance to piping.	Slow permeability; somewhat poor natural drainage; shale bedrock is at a depth of 1½ to 3½ feet.	Slow infiltration and permeability; somewhat poor natural drainage; low productivity.	Nearly level to gently sloping.	Moderate erodibility; nearly level to gently sloping; somewhat poor natural drainage.

TABLE 5.—*Engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as a source of—			Soil features affecting—
			Topsoil	Road fill		
				Subsoil	Substratum	Highway location
Arkport: ArA, ArB, ArC, ArD, AtA, AtB.	Good: well drained; sandy.	Low	Poor	Fair to good	For the ArA, ArB, ArC, and ArD units, fair to good. For the AtA and AtB units, unsuitable.	Good natural drainage. In the AtA and AtB units, limestone is at a depth of 1½ to 3½ feet.
Beaches:						
Bc	Good: well drained; sandy.	Low	Poor	Fair	Fair	Good natural drainage.
Be	Poor: high water table.	Moderate	Poor	Fair	Fair	High water table.
Belmore: BlB, BlC, BmA, BmB.	Good: well drained; gravelly.	Low	Good	Good to fair	Good	Good natural drainage.
Bennington: BnA, BoA, BoB, BpA. For Pyrmont part of BpA, see Pyrmont series.	Poor: somewhat poorly drained; clayey.	High	Fair	Poor to fair	For the BnA, BoA, and BoB units, poor to fair. For the BpA unit, unsuitable.	Somewhat poor natural drainage seasonally high water table. In the BpA unit, limestone is at a depth of 3½ to 5 feet.
Berks: BrB, BrD, BsF.	Fair: channery	Moderate	Unsuitable: channery.	Fair	Unsuitable: sandstone bedrock is at a depth of 1½ to 3 feet.	Sandstone bedrock is at a depth of 1½ to 3 feet. The BsF unit is steep.
Bogart: BtA, BtB	Fair: moderately well drained; sandy and gravelly.	Moderate	Good	Fair to good	Good	Seasonally high water table.
Borrow pits: Bw	(1)	(1)	(1)	(1)	(1)	(1)
Cardington: CaA, CaB.	Poor: moderately well drained; clayey.	High	Fair	Fair to poor	Fair to poor	Seasonally high water table.

See footnote at end of table.

interpretations—Continued

Soil features affecting—Continued						
Pipeline construction and maintenance	Farm ponds		Agricultural drainage	Irrigation	Terraces and diversions	Waterways
	Reservoir area	Embankment				
Unstable vertical cuts; subject to slumping. In the AtA and AtB units, limestone is at a depth of 1½ to 3½ feet.	Excessive rate of seepage. In the AtA and AtB units, limestone is at a depth of 1½ to 3½ feet.	Fair stability; rapid permeability; poor resistance to piping; fair to good compaction characteristics.	Not applicable	Rapid permeability and infiltration; low available moisture capacity.	Not applicable	Moderate erodibility; nearly level to moderately steep. In the AtA and AtB units, limestone is at a depth of 1½ to 3½ feet.
Unstable vertical cuts.	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable.
High water table; unstable vertical cuts.	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable.
Good natural drainage.	Excessive rate of seepage.	Fair stability; rapid permeability; fair compaction characteristics; poor resistance to piping.	Good natural drainage.	Moderate infiltration; moderate permeability; medium available moisture capacity.	Nearly level to sloping; moderate erodibility.	Moderate erodibility; nearly level to sloping.
Seasonally high water table. In the BpA unit, limestone is at a depth of 3½ to 5 feet.	Slow rate of seepage. In BpA unit, limestone is at a depth of 3½ to 5 feet.	Fair to good stability; slow permeability; fair to good compaction characteristics; good resistance to piping.	Moderately slow permeability; somewhat poor natural drainage. In the BpA unit, limestone is at a depth of 3½ to 5 feet.	Moderate infiltration; somewhat poor natural drainage; moderately slow permeability; medium available moisture capacity.	Nearly level to gently sloping; moderate erodibility.	Moderate erodibility; nearly level to gently sloping.
Sandstone bedrock is at a depth of 1½ to 3 feet; some steep slopes.	Not applicable	Not applicable	Not applicable	Not applicable	Sandstone at a depth of 1½ to 3 feet.	Sandstone at a depth of 1½ to 3 feet; droughty.
Trench walls subject to slumping; seasonal high water table.	Excessive rate of seepage.	Fair to good stability; moderate permeability; fair to good compaction characteristics; poor resistance to piping.	Seasonally high water table.	Moderate infiltration and permeability; medium available moisture capacity.	Moderate erodibility.	Moderate erodibility.
(1)	(1)	(1)	(1)	(1)	(1)	(1).
Seasonally high water table.	Slow rate of seepage.	Fair stability; slow permeability; fair compaction characteristics; possibility of piping.	Moderately good natural drainage; moderately slow permeability.	Moderate infiltration; medium available moisture capacity; moderately slow permeability.	Nearly level to gently sloping.	Moderate erodibility; nearly level to gently sloping.

TABLE 5.—*Engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as a source of—			Soil features affecting—
			Topsoil	Road fill		
				Subsoil	Substratum	Highway location
Casco: CfA, CfB, CfD.	Good: well drained; sandy and gravelly.	Low	Fair: contains some limestone cobblestones.	Unsuitable: limestone rubble is at a depth of 20 inches.	Unsuitable: limestone rubble is at a depth of 20 inches.	Limestone rubble is at a depth of 20 inches.
Castalia: ChA, ChB	Not applicable: soil material is less than 10 inches thick over bedrock.	Not applicable: soil material is less than 10 inches thick over bedrock.	Not applicable: soil material is less than 10 inches thick over bedrock.	Not applicable: soil material is less than 10 inches thick over bedrock.	Not applicable: soil material is less than 10 inches thick over bedrock.	Limestone rubble is at a depth of less than 10 inches.
Chili: ClA, ClB, ClC, ClD.	Good: well drained; sandy and gravelly.	Low	Fair	Good	Good	Cut slopes are droughty.
Colwood: Cm, Co, Cp, Cr, Cs.	Poor: very poorly drained.	High	Good	Fair to poor	Fair: wet	Very poor natural drainage; high water table. In the Cp, Cr, and Cs units, bedrock is at a depth of 3½ to 5 feet.
Colyer: CtA, CtC, CyE.	Fair: thin; shaly.	Moderate	Poor: shale fragments.	Poor to unsuitable.	Unsuitable: shale bedrock is at a depth of less than 1½ feet.	Adequate drainage; shale bedrock is at a depth of less than 1½ feet. The CyE unit is steep.
Darroch:						
Da	Poor: somewhat poorly drained.	High	Good	Fair to poor	Fair to poor	Somewhat poor natural drainage; seasonally high water table; may be soft and compressible.
Dc	Poor: somewhat poorly drained.	Moderate to high.	Good	Fair	Fair to good	Somewhat poor natural drainage; seasonally high water table.

See footnote at end of table.

interpretations—Continued

Soil features affecting—Continued						
Pipeline construction and maintenance	Farm ponds		Agricultural drainage	Irrigation	Terraces and diversions	Waterways
	Reservoir area	Embankment				
Shallow to limestone rubble; limestone at a depth of 2 to 10 feet.	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable.
Shallow to limestone rubble.	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable.
Trench walls subject to slumping.	Excessive rate of seepage.	Good stability; rapid permeability; poor resistance to piping; embankments can be droughty.	Not applicable	Rapid infiltration; low available moisture capacity; moderately rapid permeability.	Nearly level to moderately steep; slight erodibility.	Slight erodibility; nearly level to moderately steep.
High water table. In the Cp, Cr, and Cs units, bedrock is at a depth of 3½ to 5 feet.	Moderate rate of seepage when water table is lowered. In the Cp, Cr, and Cs units, bedrock is at a depth of 3½ to 5 feet.	Poor stability; moderate permeability; poor resistance to piping; poor compaction characteristics.	Moderate permeability; very poor natural drainage. In the Cp, Cr, and Cs units, bedrock is at a depth of 3½ to 5 feet.	Moderate infiltration and permeability; very poor natural drainage; high available moisture capacity.	Not applicable	Slight erodibility; nearly level.
Shale bedrock is at a depth of less than 1½ feet.	Not applicable	Not applicable	Not applicable	Rapid permeability; very low productivity; low available moisture capacity.	Not applicable	Moderate erodibility; shallow to bedrock; low fertility. The CyE unit is steep.
Seasonally high water table.	Layers of fine sand may cause some seepage.	Fair stability; slow permeability; fair compaction characteristics; possibility of piping.	Moderately slow permeability; somewhat poor natural drainage.	Moderate infiltration; moderately slow permeability; somewhat poor natural drainage; high available moisture capacity.	Nearly level; moderate erodibility.	Moderate erodibility; nearly level; seasonally wet.
Seasonally high water table; trench walls subject to slumping.	Moderate to rapid rate of seepage.	Poor to fair stability; moderate permeability; poor resistance to piping; fair compaction characteristics.	Moderate permeability; somewhat poor natural drainage.	Moderate infiltration; somewhat poor natural drainage; moderate permeability.	Nearly level	Slight erodibility; nearly level; seasonally wet.

TABLE 5.—*Engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as a source of—			Soil features affecting—
			Topsoil	Road fill		
				Subsoil	Substratum	Highway location
Dekalb: DkA, DkB	Good: well drained; sandy loam.	Low	Poor	Good	Unsuitable: sandstone bedrock is at a depth of 1½ to 3½ feet.	Good natural drainage; sandstone bedrock is at a depth of 1½ to 3½ feet.
Del Rey: DrA, DsA, DsB.	Poor: somewhat poorly drained; moderately clayey.	High	Good	Fair to poor	Fair to poor	Somewhat poor natural drainage; seasonally high water table; may be compressible.
Digby: DtA, DyA	Poor: somewhat poorly drained.	High	Good to fair	Fair	Fair	Somewhat poor natural drainage; seasonally high water table.
Eel: Ee	Fair: moderately well drained; loamy; subject to flooding.	Moderate	Good	Fair	Fair	Seasonally high water table; subject to flooding.
Elliott: EhA, EkA	Poor: somewhat poorly drained.	High	Good	Poor	Poor to fair	Somewhat poor natural drainage; seasonally high water table.
Ellsworth: ElA, ElB, ElC2, ElD2, EwF. For Chili part of EwF, see Chili series.	Fair: moderately well drained; clayey.	Moderate	Fair	Poor	Poor	Seasonally high water table; subject to seepage. The EwF unit is steep.
Fries: Fr, Fs	Poor: very poorly drained; clayey.	High	Fair to poor	Poor	Unsuitable: shale bedrock.	Very poor drainage; shale bedrock at a depth of 1½ to 3½ feet.

See footnote at end of table.

interpretations—Continued

Soil features affecting—Continued						
Pipeline construction and maintenance	Farm ponds		Agricultural drainage	Irrigation	Terraces and diversions	Waterways
	Reservoir area	Embankment				
Sandstone bedrock at a depth of 1½ to 3½ feet.	Not applicable	Not applicable	Not applicable	Rapid infiltration; low available moisture capacity; good natural drainage.	Nearly level to gently sloping; slight erodibility.	Slight erodibility; nearly level to gently sloping.
Seasonally high water table; trench walls subject to slumping.	Layers of fine sand may cause seepage.	Fair to good stability; slow permeability; fair to good compaction characteristics; good resistance to piping.	Moderately slow permeability; somewhat poor natural drainage.	Moderately slow permeability; somewhat poor natural drainage; moderate infiltration.	Nearly level to gently sloping; moderate erodibility.	Moderate erodibility; seasonally wet.
Seasonally high water table; trench walls subject to slumping.	Excessive rate of seepage through underlying material.	Fair stability; moderate permeability; fair compaction characteristics; possibility of piping.	Moderate permeability; somewhat poor natural drainage.	Moderate infiltration; somewhat poor natural drainage; moderate permeability.	Not applicable	Slight erodibility; nearly level; seasonally wet.
Seasonally high water table; subject to flooding.	Excessive rate of seepage; subject to flooding.	Fair stability; moderate permeability; fair compaction characteristics: possibility of piping.	Moderate permeability; moderately good natural drainage.	Moderate infiltration; moderately good natural drainage; high available moisture capacity; moderate permeability.	Not applicable	Slight erodibility; nearly level.
Seasonally high water table.	Slow rate of seepage.	Fair to good stability; slow permeability; fair compaction characteristics.	Moderately slow permeability; somewhat poor natural drainage.	Moderate infiltration; somewhat poor natural drainage; high available moisture capacity; moderately slow permeability.	Not applicable	Slight erodibility; nearly level, seasonally wet.
Seasonally high water table. The EwF unit is steep.	Slow rate of seepage.	Fair to good stability; slow permeability; fair to good compaction characteristics; good resistance to piping.	Moderately good natural drainage; seasonally high water table; slow permeability.	Moderate infiltration; moderately slow permeability; high available moisture capacity; nearly level to moderately steep.	Nearly level to moderately steep; moderate erodibility. The EwF unit is steep.	Moderate erodibility; nearly level to moderately steep. The EwF unit is steep.
Shale bedrock at a depth of 1½ to 3½ feet; seasonally high water table.	Limited depth to shale bedrock; very slow rate of seepage.	Fair stability; slow permeability; poor compaction characteristics; good resistance to piping.	Very slow permeability; very poor natural drainage; limited depth to shale bedrock.	Slow infiltration; slow permeability; very poor natural drainage.	Not applicable	Slight erodibility; nearly level; seasonally wet.

TABLE 5.—*Engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as a source of—			Soil features affecting—
			Topsoil	Road fill		
				Subsoil	Substratum	Highway location
Fulton: FuA, FuB	Poor: somewhat poorly drained; clayey.	High	Fair to poor	Poor	Poor	Poor natural drainage; slow runoff.
Galen: GaA, GaB	Fair to good: moderately well drained; sandy.	Low	Poor	Good to fair	Good to fair	Moderately good natural drainage; seasonally high water table.
GfB, GlB	Fair to good: moderately well drained; sandy.	Low	Poor	Good to fair	Unsuitable: limestone or shale bedrock at a depth of 3½ to 5 feet.	Moderately good natural drainage; limestone or shale at a depth of 3½ to 5 feet.
Gilford: Go	Poor: very poorly drained; sandy.	Moderate	Fair	Fair	Fair to good	Very poor natural drainage.
Gravel pits: Gp	(1)	(1)	(1)	(1)	(1)	(1)
Haskins: HsA, HsB, HtA.	Poor: somewhat poorly drained.	Moderate	Good	Fair	Poor to fair	Somewhat poor natural drainage.
Jimtown: JtA	Fair to poor: somewhat poorly drained; gravelly and sandy.	Moderate	Good	Fair	Good	Somewhat poor natural drainage.
Joliet: Ju	Poor: very poorly drained; clayey.	High	Fair	Poor	Unsuitable: limestone bedrock.	Very poor natural drainage; limestone at a depth of 10 to 20 inches.

See footnote at end of table.

interpretations—Continued

Soil features affecting—Continued						
Pipeline construction and maintenance	Farm ponds		Agricultural drainage	Irrigation	Terraces and diversions	Waterways
	Reservoir area	Embankment				
Seasonally high water table.	Very slow rate of seepage; seasonally high water table.	Fair to poor stability; slow permeability; fair to poor compaction characteristics; good resistance to piping.	Slow permeability; somewhat slow infiltration; poor natural drainage.	Slow permeability; poor natural drainage.	Nearly level to gently sloping.	Slight erodibility; nearly level to gently sloping; seasonally wet.
Unstable vertical cuts; seasonally high water table.	Excessive rate of seepage; seasonally high water table.	Poor stability; rapid permeability; fair compaction characteristics; fair to poor resistance to piping.	Not applicable	Rapid infiltration; rapid permeability; low available moisture capacity.	Nearly level to gently sloping.	Slight erodibility; nearly level to gently sloping.
Limestone or shale bedrock at a depth of 3½ to 5 feet.	Excessive rate of seepage; limited depth to underlying bedrock.	Good stability; rapid permeability.	Good natural drainage.	Rapid infiltration; rapid permeability; low available moisture capacity.	Gently sloping.	Slight erodibility; gently sloping.
Seasonally high water table; unstable vertical cuts.	Excessive rate of seepage; high water table; may be suitable for dug ponds.	Rapid permeability; fair stability; fair compaction characteristics; poor resistance to piping.	Very poor natural drainage; soil material can flow into and plug tile.	Rapid infiltration; medium available moisture capacity.	Not applicable	Slight erodibility; nearly level; seasonally wet.
(1)	(1)	(1)	(1)	(1)	(1)	(1).
Seasonally high water table.	Excessive rate of seepage in uppermost 1½ to 3 feet; slow rate of seepage in material below a depth of 1½ to 3 feet.	Substratum has fair stability and slow permeability; fair compaction characteristics; good resistance to piping.	Somewhat poor natural drainage; moderate permeability above the substratum and slow permeability in substratum.	Moderate infiltration; moderate permeability; somewhat poor natural drainage; high available moisture capacity.	Not applicable	Slight erodibility; nearly level to gently sloping; seasonally wet.
Seasonally high water table; trench walls tend to cave.	Excessive rate of seepage.	Fair stability; moderate permeability; fair compaction characteristics; poor resistance to piping.	Somewhat poor natural drainage; moderate permeability.	Moderate infiltration; moderate permeability; somewhat poor natural drainage.	Not applicable	Slight erodibility; nearly level; seasonally wet.
Limestone bedrock at a depth of 10 to 20 inches; seasonally high water table.	Not applicable	Not applicable	Very poor natural drainage; slow permeability; shallow to limestone bedrock.	Moderate infiltration; slow permeability; low available moisture capacity.	Not applicable	Slight erodibility; nearly level; seasonally wet.

TABLE 5.—*Engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as a source of—			Soil features affecting—
			Topsoil	Road fill		
				Subsoil	Substratum	Highway location
Kibbie: KbA, KbB, KeA, KhA.	Poor: somewhat poorly drained; loamy.	High	Good	Poor	Poor	Somewhat poor natural drainage; soft silty material.
Kibbie, moderately shallow variant: KfA.	Poor: somewhat poorly drained; loamy.	High	Good	Poor	Unsuitable: limestone bedrock at a depth of 1½ to 3½ feet.	Limestone bedrock at a depth of 1½ to 3½ feet; somewhat poor drainage.
Lenawee: La, Lc	Poor: very poorly drained; clayey.	High	Fair	Poor	Poor	Very poor natural drainage.
Lewisburg: LeA, LeB	Poor: moderately well drained; clayey.	High	Poor	Fair	Fair	Moderately good natural drainage; moderately slow permeability.
Lewisburg, moderately shallow variant: LgA, LgB, LgC.	Poor: moderately well drained; clayey.	High	Poor	Poor to fair: limited amount of material.	Unsuitable: limestone bedrock is at a depth of 1½ to 3½ feet.	Moderately good natural drainage; limestone is at a depth of 1½ to 3½ feet.
Lobdell: Lm	Fair: loamy; subject to flooding.	Moderate	Good	Fair	Fair	Moderately good natural drainage; subject to flooding.
Loudonville: LoA, LoB, LoC.	Fair: well drained.	Moderate	Good to fair	Fair	Unsuitable: sandstone bedrock at a depth of 1½ to 3½ feet.	Good drainage; sandstone bedrock at a depth of 1½ to 3½ feet.

See footnote at end of table.

interpretations—Continued

Soil features affecting—Continued						
Pipeline construction and maintenance	Farm ponds		Agricultural drainage	Irrigation	Terraces and diversions	Waterways
	Reservoir area	Embankment				
Seasonally high water table; unstable vertical cuts.	Moderate to excessive rate of seepage; seasonally high water table.	Fair to poor stability; moderate permeability; fair to poor compaction characteristics; possibility of piping.	Moderate permeability; somewhat poor natural drainage; poor resistance to piping.	Moderate infiltration; somewhat poor natural drainage; moderate permeability; high available moisture capacity.	Nearly level to gently sloping.	Slight erodibility; nearly level to gently sloping; seasonally wet.
Limestone bedrock at a depth to 1½ to 3½ feet.	Moderate to excessive rate of seepage; limited depth to limestone bedrock.	Poor to fair stability; moderate permeability.	Moderate permeability; somewhat poor natural drainage; limited depth to rock.	Moderate infiltration; somewhat poor natural drainage; medium to high available moisture capacity; moderate permeability.	Moderately shallow to bedrock.	Slight erodibility; nearly level; moderately shallow to bedrock.
Seasonally high water table.	Layers of fine sand may cause some seepage; seasonally high water table.	Fair to good stability; slow permeability; fair to good compaction characteristics; good resistance to piping.	Moderately slow permeability; very poor natural drainage.	Moderate infiltration; very poor natural drainage; moderately slow permeability.	Not applicable	Slight erodibility; nearly level, seasonally wet.
Clayey material; moderately good natural drainage.	Moderately slow permeability.	Fair to good stability; slow permeability; fair to good compaction characteristics; good resistance to piping.	Moderately good natural drainage; moderately slow permeability.	Moderate infiltration; medium available moisture capacity; moderately slow permeability; moderately good natural drainage.	Nearly level to gently sloping; moderate erodibility.	Moderate erodibility; nearly level to gently sloping.
Limestone bedrock is at a depth of 1½ to 3½ feet.	Limestone bedrock; seepage may occur through cracks in rock; limited depth to rock.	Fair to good stability; slow permeability; limited amount of material available.	Moderately good natural drainage; limited depth to rock.	Moderate infiltration; medium available moisture capacity; moderately slow permeability.	Nearly level to sloping; moderate erodibility.	Moderate erodibility; nearly level to sloping.
Subject to flooding.	Moderate to rapid rate of seepage; subject to flooding.	Fair stability; moderate permeability; fair compaction characteristics.	Moderately good natural drainage; subject to flooding.	Moderate infiltration; high available moisture capacity; moderate permeability; moderately good natural drainage.	Not applicable	Subject to flooding.
Sandstone bedrock at a depth of 1½ to 3½ feet.	Not applicable	Not applicable	Not applicable	Moderate infiltration; medium available moisture capacity.	Nearly level to sloping; sandstone bedrock interferes with installation; moderate erodibility.	Moderate erodibility; nearly level to sloping.

TABLE 5.—*Engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as a source of—			Soil features affecting—
			Topsoil	Road fill		
				Subsoil	Substratum	Highway location
Made land: Ma	(1)	(1)	(1)	(1)	(1)	(1)
Mahoning: MfA, MgA, MgB, MhA, MkA, MlA. The MhA unit is stony throughout.	Poor: somewhat poorly drained; clayey.	High	Good	Poor	Fair to poor	Somewhat poor natural drainage; subject to seepage; seasonally high water table. In the MkA and MlA units, sandstone or shale is at a depth of 3½ to 5 feet.
Marsh: Mm	(1)	(1)	(1)	(1)	(1)	(1)
Mermill: Mn, Mo	Poor: very poorly drained.	High	Good	Fair to poor	Poor	Very poor natural drainage.
Metea: MrA, MrB, MrC.	Fair to poor: moderately well drained; sandy; silty clay loam at a depth of 1½ to 3½ feet.	Moderate	Poor	Fair to good	Poor	Moderately good natural drainage; substratum is soft when wet.
Millgrove: Ms, Mt. Subject to local flooding.	Poor: very poorly drained.	High	Good	Fair to poor	Good to fair	Very poor natural drainage.
Millsdale: Mu, Mv	Poor: very poorly drained.	High	Good	Poor	Unsuitable: limestone bedrock.	Very poor natural drainage; limestone at a depth of 1½ to 3½ feet; seasonally high water table; clayey material.

See footnote at end of table.

interpretations—Continued

Soil features affecting—Continued						
Pipeline construction and maintenance	Farm ponds		Agricultural drainage	Irrigation	Terraces and diversions	Waterways
	Reservoir area	Embankment				
(1)	(1)	(1)	(1)	(1)	(1)	(1).
Seasonally high water table. In the MkA and MIA units, sandstone or shale is at a depth of 3½ to 5 feet.	Slow rate of seepage; seasonally high water table. In the MkA and MIA units, sandstone or shale is at a depth of 3½ to 5 feet.	Fair to good stability; slow permeability; fair to good compaction characteristics; good resistance to piping.	Slow permeability; somewhat poor natural drainage; seasonally high water table. In the MkA and MIA units, sandstone or shale is at a depth of 3½ to 5 feet.	Moderately slow infiltration; slow permeability; somewhat poor natural drainage; good available moisture capacity.	Nearly level to gently sloping; slight erodibility; clayey subsoil.	Slight erodibility; nearly level to gently sloping; seasonally wet.
(1)	(1)	(1)	(1)	(1)	(1)	(1).
Seasonally high water table.	Moderate rate of seepage above a depth of 3 feet; slow rate of seepage below a depth of 3 feet.	Fair stability; slow permeability; fair compaction characteristics; good resistance to piping.	Very poor natural drainage; moderate permeability in uppermost 3 feet; very slow permeability below a depth of 3 feet.	Moderate infiltration; medium available moisture capacity; very poor natural drainage; moderately slow permeability.	Not applicable	Slight erodibility; nearly level; seasonally wet.
Unstable ditch walls; seasonally high water table.	Layers of fine sand in underlying material can cause excessive seepage.	Fair stability; moderate permeability in uppermost 1½ to 3 feet, and moderately slow permeability at depths below 1½ to 3 feet; fair to good compaction characteristics.	Moderately good natural drainage; moderately slow permeability below a depth of 1½ to 3 feet.	Rapid infiltration; medium available moisture capacity.	Nearly level to sloping.	Moderate erodibility; nearly level to sloping; seasonally wet.
Seasonally high water table; unstable ditch walls.	Pervious substratum permits excessive seepage.	Fair stability; moderate permeability; very poor natural drainage; fair to good compaction characteristics; possibility of piping.	Moderate permeability; very poor natural drainage.	Moderate infiltration; medium to high available moisture capacity; very poor natural drainage.	Not applicable	Slight erodibility; nearly level; seasonally wet.
Limited depth to limestone bedrock; seasonally high water table.	Bedrock at a depth of 1½ to 3½ feet.	Not applicable	Very poor natural drainage; limestone bedrock at a depth of 1½ to 3½ feet.	Very poor natural drainage.	Not applicable	Slight erodibility; nearly level; seasonally wet.

TABLE 5.—*Engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as a source of—			Soil features affecting—
			Topsoil	Road fill		
				Subsoil	Substratum	Highway location
Miner: Mw	Poor: very poorly drained.	Moderate to high.	Fair	Poor	Poor	Very poor natural drainage; soft when wet.
Mitiwanga: MxA	Poor: somewhat poorly drained.	High	Good to fair	Fair to poor	Unsuitable: sandstone bedrock is at a depth of 1½ to 3½ feet.	Somewhat poor natural drainage; sandstone bedrock is at a depth of 1½ to 3½ feet.
Oakville: OaB, OaC, OaE.	Good: well drained; sandy.	Low	Poor	Good	Good	Good natural drainage; loose; sandy. The OaE unit is steep.
Orrville: Or	Poor: somewhat poorly drained; subject to flooding.	High	Good	Fair	Fair to poor	Somewhat poor natural drainage; subject to flooding.
Oshtemo: OsA, OsB, OtA, OtB.	Good: well drained; sandy and gravelly.	Low	Poor	Fair	Good to fair	Good natural drainage; sandy and gravelly.
Pewamo: Pc, Pe	Poor: very poorly drained; clayey.	High	For the Pc unit, fair. For the Pe unit, poor.	Poor	Poor	Very poor natural drainage; clayey material.
Ph	Poor: very poorly drained; clayey.	High	Fair	Poor	Unsuitable: limestone bedrock at a depth of 3½ to 5 feet.	Very poor natural drainage; limestone bedrock at a depth of 3½ to 5 feet.

See footnote at end of table.

interpretations—Continued

Soil features affecting—Continued						
Pipeline construction and maintenance	Farm ponds		Agricultural drainage	Irrigation	Terraces and diversions	Waterways
	Reservoir area	Embankment				
Seasonally high water table.	Slow rate of seepage.	Fair stability; slow permeability; fair compaction characteristics; good resistance to piping.	Very poor natural drainage; slow permeability; outlets may be lacking.	Moderately slow infiltration; very poor natural drainage.	Not applicable	Slight erodibility; nearly level; seasonally wet.
Sandstone bedrock is at a depth of 1½ to 3½ feet; seasonally high water table.	Limited depth to sandstone bedrock.	Not applicable	Sandstone bedrock is at a depth of 1½ to 3½ feet; somewhat poor natural drainage; moderately slow permeability.	Moderately slow infiltration; medium to low available moisture capacity; poor natural drainage.	Not applicable	Slight erodibility; nearly level; seasonally wet.
Loose sand subject to caving.	Excessive rate of seepage.	Fair to poor stability; rapid permeability; fair compaction characteristics; fair to poor resistance to piping.	Not applicable	Rapid infiltration; low available moisture capacity; good natural drainage; sandy.	Not applicable	Slight erodibility; nearly level to steep.
Seasonally high water table; subject to flooding.	Subject to flooding.	Fair to poor stability; fair compaction characteristics; moderate permeability; poor resistance to piping.	Moderate permeability; somewhat poor natural drainage.	Moderately slow infiltration; high available moisture capacity; somewhat poor natural drainage.	Not applicable	Subject to flooding.
No limitation	Excessive rate of seepage.	Fair stability; rapid permeability; fair compaction characteristics; possibility of piping.	Not applicable	Rapid infiltration; low to medium available moisture capacity.	Not applicable	Slight erodibility.
Seasonally high water table.	Slow rate of seepage; seasonally high water table.	Fair stability; slow permeability; fair compaction characteristics; good resistance to piping.	Moderately slow permeability; very poor natural drainage; outlets may be lacking.	Moderate infiltration; very poor natural drainage; high available moisture capacity.	Not applicable	Slight erodibility; nearly level; seasonally wet.
Seasonally high water table; limestone bedrock at a depth of 3½ to 5 feet.	Limited depth to limestone bedrock; seasonally high water table.	Fair stability; slow permeability.	Moderately slow permeability; very poor natural drainage; limestone bedrock at a depth of 3½ to 5 feet.	Moderate infiltration; very poor natural drainage; high available moisture capacity.	Not applicable	Slight erodibility; nearly level; bedrock at a depth of 3½ to 5 feet; seasonally wet.

TABLE 5.—*Engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as a source of—			Soil features affecting—
			Topsoil	Road fill		
				Subsoil	Substratum	Highway location
Prout: PmA, PrA	Poor: somewhat poorly drained.	High	For the PmA unit, fair. For the PrA unit, unsuitable: channery.	Fair to poor	Unsuitable: shale bedrock is at a depth of 1½ to 3½ feet.	Somewhat poor natural drainage; shale bedrock is at a depth of 1½ to 3½ feet.
Prout, brown subsoil variant: PsA, PsB.	Fair: moderately well drained.	Moderate	Fair to good	Fair	Unsuitable: shale bedrock is at a depth of 1½ to 3½ feet.	Moderately good drainage; shale bedrock is at a depth of 1½ to 3½ feet.
Prout, deep variant: PuA.	Poor: somewhat poorly drained.	High	Fair	Fair to poor	Unsuitable: shale bedrock is at a depth of 3½ to 5 feet.	Somewhat poor natural drainage; shale bedrock is in cuts more than 3½ feet deep.
Pyrmont: PyA	Poor: somewhat poorly drained; clayey.	High	Fair	Poor	Fair	Somewhat poor natural drainage: in the BpA unit, limestone is at a depth of 3½ to 5 feet.
Pyrmont, moderately shallow variant: PzA.	Poor: somewhat poorly drained; clayey.	High	Fair	Poor to fair	Unsuitable: limestone bedrock is at a depth of 1½ to 3½ feet.	Somewhat poor natural drainage; limestone bedrock is at a depth of 1½ to 3½ feet.
Quarries: Qu	(1)	(1)	(1)	(1)	(1)	(1)
Rawson: RcB, RdA	Fair to poor: moderately well drained; sandy clay loam.	Moderate	Good	Fair to poor	Poor	Moderately good natural drainage; seasonally high water table.

See footnote at end of table.

interpretations—Continued

Soil features affecting—Continued						
Pipeline construction and maintenance	Farm ponds		Agricultural drainage	Irrigation	Terraces and diversions	Waterways
	Reservoir area	Embankment				
Shale bedrock is at a depth of 1½ to 3½ feet; somewhat poor natural drainage.	Shale bedrock limits depth of excavation.	Limited amount of material available; fair stability; fair compaction characteristics; possibility of piping.	Moderately slow permeability; somewhat poor natural drainage; shale bedrock is at a depth of 1½ to 3½ feet.	Moderately slow permeability; moderate productivity; medium to low available moisture capacity.	Not applicable	Slight erodibility; seasonally wet.
Shale bedrock is at a depth of 1½ to 3½ feet.	Shale bedrock limits depth of excavation.	Poor stability; moderate permeability; fair compaction characteristics; possibility of piping.	Not applicable	Moderate permeability; moderate productivity; medium to low available moisture capacity.	Not applicable	Moderate erodibility; gently sloping in some areas; seasonally wet.
Shale bedrock is at a depth of 40 to 60 inches; somewhat poor natural drainage.	Limited depth to shale.	Limited amount of material available; fair compaction characteristics and stability; possibility of piping.	Moderately slow permeability; seasonally high water table.	Medium to high available moisture capacity.	Not applicable	Slight erodibility; seasonally wet and soft.
Seasonally high water table.	Slow rate of seepage.	Fair to good compaction characteristics; fair to good stability; slow permeability; good resistance to piping.	Somewhat poor natural drainage; moderately slow permeability.	Moderate infiltration; moderately slow permeability; somewhat poor natural drainage; medium available moisture capacity.	Not applicable	Slight erodibility; nearly level; seasonally wet.
Limestone bedrock is at a depth of 1½ to 3½ feet; seasonally high water table.	Not applicable	Not applicable	Poor natural drainage; limestone bedrock is at a depth of 1½ to 3½ feet.	Moderate infiltration; somewhat poor natural drainage; moderately slow permeability; medium available moisture capacity.	Not applicable	Slight erodibility; nearly level; seasonally wet.
[1]	[1]	[1]	[1]	[1]	[1]	[1].
Seasonally high water table.	Excessive rate of seepage in uppermost 2 to 3 feet, and slow rate of seepage below a depth of 2 to 3 feet.	Fair stability; slow permeability; fair compaction characteristics; good resistance to piping.	Moderately good natural drainage; slow permeability below a depth of 2 to 3 feet.	Moderate to rapid infiltration; medium available moisture capacity.	Nearly level to gently sloping.	Slight erodibility.

TABLE 5.—*Engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as a source of—			Soil features affecting—
			Topsoil	Road fill		
				Subsoil	Substratum	Highway location
Rimer: Rf, Rg	Poor: somewhat poorly drained; sandy.	Low	Fair	Fair to good	Poor	Somewhat poor natural drainage.
Ritchey: RhB	Poor: well drained; clayey; underlain by limestone at a depth of 10 to 20 inches.	Moderate	Poor	Poor	Unsuitable: limestone bedrock is at a depth of 10 to 20 inches.	Limestone bedrock is at a depth of 10 to 20 inches.
Romeo: RsB, RsD, RsF.	Not applicable: soil material is less than 10 inches thick over bedrock.	Not applicable: soil material is less than 10 inches thick over bedrock.	Not applicable: soil material is less than 10 inches thick over bedrock.	Not applicable: soil material is less than 10 inches thick over bedrock.	Not applicable: soil material is less than 10 inches thick over bedrock.	Limestone bedrock is at a depth of less than 10 inches. The RsF unit is steep.
Sand pits: Sa	(1)	(1)	(1)	(1)	(1)	(1)
Shinrock: ShA, SkA, SkB, SkC2, SkD2, SlE, SlF.	Poor: moderately well drained.	Moderate to high.	Fair	Poor	Poor	Moderately good natural drainage; seasonally high water table. The SlE and SlF units are steep.
Shoals: Sm	Poor: somewhat poorly drained; subject to flooding.	High	Good	Poor	Fair to poor	Somewhat poor natural drainage; subject to flooding.
Sisson: SnB, SoB, SoC2, SsB, SsC2, SsD2, SsD3, SsE2, StF.	Fair: well drained.	Moderate	Good to fair, depending on degree of erosion.	Fair to poor	Fair to poor	Good natural drainage; high erodibility; unstable material. The SsE2 and StF units are steep.
Sloan: Sv	Poor: very poorly drained; subject to flooding.	High	Good	Poor	Fair to poor	Very poor natural drainage; subject to flooding; soft when wet.

See footnote at end of table.

interpretations—Continued

Soil features affecting—Continued						
Pipeline construction and maintenance	Farm ponds		Agricultural drainage	Irrigation	Terraces and diversions	Waterways
	Reservoir area	Embankment				
Seasonally high water table; upper part subject to caving.	Layers of fine sand can cause excessive seepage in uppermost 3 feet.	Rapid permeability in uppermost 2 feet; moderately slow permeability below a depth of 1½ to 3 feet.	Somewhat poor natural drainage; rapid permeability in uppermost 1½ to 3 feet; moderately slow permeability in lower part.	Rapid infiltration; medium available moisture capacity; somewhat poor natural drainage; rapid permeability in uppermost 1½ to 3 feet.	Not applicable	Slight erodibility; nearly level; seasonally wet.
Limestone bedrock is at a depth of 10 to 20 inches.	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable.
Limestone bedrock is at a depth of less than 10 inches.	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable.
[1]	[1]	[1]	[1]	[1]	[1]	[1].
Steep in some areas; seasonally high water table.	Slow to moderate rate of seepage.	Fair stability; slow permeability; fair compaction characteristics; good resistance to piping.	Moderately slow permeability; moderately good natural drainage.	Moderate infiltration; high available moisture capacity.	Nearly level to steep; moderate erodibility.	Moderate erodibility; nearly level to steep.
Subject to flooding; seasonally high water table.	Excessive rate of seepage likely when excavated below a depth of 4 feet.	Fair stability; slow permeability; fair compaction characteristics; possibility of piping.	Somewhat poor natural drainage; moderate permeability.	Moderate infiltration; somewhat poor natural drainage; high available moisture capacity.	Not applicable	Slight erodibility; nearly level; subject to flooding.
Steep in some areas; unstable ditch walls in deep cuts.	Moderate to excessive rate of seepage.	Fair to poor stability; moderate permeability; high erodibility; poor resistance to piping; fair to poor compaction characteristics.	Not applicable	Moderate infiltration; high available moisture capacity.	Not applicable because of complexity of slopes.	High erodibility; gently sloping to steep.
Subject to flooding; seasonally high water table.	Subject to flooding; slow rate of seepage.	Fair stability; slow permeability; subject to flooding; fair compaction characteristics; possibility of piping.	Very poor drainage; moderate permeability.	Moderate infiltration; very poor natural drainage; high available moisture capacity.	Not applicable	Subject to flooding; very poor natural drainage; nearly level.

TABLE 5.—*Engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as a source of—			Soil features affecting—
			Topsoil	Road fill		
				Subsoil	Substratum	Highway location
Tawas: Ta	Poor: very poorly drained; organic.	Moderate to high.	Poor when used alone; oxidizes readily; erodible. Fair to good when mixed with a mineral soil.	Unsuitable: organic soil.	Fair to good	Organic soil; high water table; soft and unstable.
Toledo: Tc, To, Tp	Poor: very poorly drained; clayey.	High	Poor	Poor	Poor	Very poor natural drainage; slow runoff; high plasticity; clay.
Trumbull: Tr	Poor: poorly drained; clayey.	High	Fair	Poor	Poor	Poor natural drainage; slow runoff; clayey material.
Tuscola: TsA, TuA, TuB, TwA, TwB.	Fair: moderately well drained; loamy.	Moderate	Good	Fair to poor	Fair to poor	Moderately good natural drainage; moderate erodibility.
Vaughnsville: Va	Poor: soil is seepy in areas along beach ridges.	High	Fair	Fair to poor	Fair to good	Springs and seeps.
Warners: Wa	Poor: very poorly drained.	High	Poor to fair: organic; should be mixed with mineral soils.	Unsuitable: muck.	Unsuitable: marl.	Mostly soft marl; very poor natural drainage.
Warners, clayey subsoil variant: Wc.	Poor: very poorly drained.	High	Poor to fair: organic; should be mixed with mineral soils.	Unsuitable: muck.	Unsuitable: clay	Soft marl underlain by clay; very poor natural drainage.
Washtenaw: Wh	Poor: somewhat poorly drained.	High	Good: suitable soil material to a depth of 4 to 5 feet.	Fair to poor	Poor	Somewhat poor natural drainage; seasonally high water table.

See footnote at end of table.

interpretations—Continued

Soil features affecting—Continued						
Pipeline construction and maintenance	Farm ponds		Agricultural drainage	Irrigation	Terraces and diversions	Waterways
	Reservoir area	Embankment				
High water table	Excessive rate of seepage.	Unsuitable as embankment material.	Poor natural drainage; rapid permeability.	Not applicable	Not applicable	Not applicable.
Seasonally high water table.	Very slow rate of seepage; seasonally high water table.	Fair to poor stability; slow permeability; high shrink-swell potential; subject to cracking.	Slow permeability; very poor natural drainage.	Slow infiltration; high available moisture capacity; very poor natural drainage.	Not applicable	Slight erodibility; seasonally wet.
Seasonally high water table.	Very slow rate of seepage.	Fair to poor stability; slow permeability; fair to poor compaction characteristics; good resistance to piping.	Slow permeability; poor natural drainage.	Slow permeability; poor natural drainage.	Not applicable	Slight erodibility; nearly level; seasonally wet.
Unstable ditch walls; seasonal wetness.	Moderate to excessive rate of seepage.	Fair to poor stability; moderate permeability; poor resistance to piping; fair compaction characteristics.	Moderately good natural drainage; moderate permeability.	Moderate infiltration; medium to high available moisture capacity.	Moderate erodibility; nearly level to gently sloping.	Moderate erodibility; nearly level to gently sloping.
High water table; rapid rate of seepage.	Excessive rate of seepage.	Fair stability; rapid permeability; fair compaction characteristics; poor resistance to piping.	Rapid permeability; large amount of seepage.	Moderate infiltration; medium available moisture capacity.	Not applicable	Somewhat poor natural drainage; seasonally wet.
High water table	High water table; excessive loss in permeable marl.	Not applicable	Not applicable	Not applicable	Not applicable	Very poor natural drainage.
High water table; soft; clayey.	High water table; slow permeability.	Not applicable	Not applicable	Not applicable	Not applicable	Very poor natural drainage.
Seasonally high water table; unstable vertical cuts.	Moderate rate of seepage.	Fair to poor stability; moderate permeability; high erodibility; poor resistance to piping.	Somewhat poor natural drainage; moderate permeability.	Moderate infiltration; moderate permeability; somewhat poor natural drainage.	Not applicable	Slight erodibility; nearly level; seasonally wet.

TABLE 5.—*Engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as a source of—			Soil features affecting—
			Topsoil	Road fill		
				Subsoil	Substratum	Highway location
Wayland: Wn	Poor: subject to flooding.	High	Good	Fair	Poor to fair	Poor natural drainage; subject to flooding.
Wilmer: Wo	Poor: somewhat poorly drained; sandy clay loam.	High	Good	Fair to poor	Good to fair	Somewhat poor natural drainage.

[1] Properties variable; onsite investigation required.

Suitability for winter grading depends upon features that affect the ease with which the soil can be moved by construction equipment. The features considered are texture, moisture content, and stability upon thawing. The rating for poorly drained soils is poor, and that for well-drained sandy and gravelly soils is good.

The features that affect susceptibility to frost action are texture, depth to water table, permeability, and drainage. The degree of frost heaving is determined by the rate of upward capillary flow. The rate of upward capillary flow is determined by the depth to the free water table and the size of connecting vertical pores through which the water must rise. Soils that have moderately slow to moderately rapid permeability have the highest rate of capillary flow. Somewhat poorly drained and poorly drained soils that have moderately slow to moderately rapid permeability are highly susceptible to frost heaving, and so are those that are well drained and have very fine sandy loam and silt loam textures.

The features that affect suitability as a source of topsoil are thickness, texture, fertility, stoniness, and organic-matter content of the surface layer.

Suitability ratings for sources of road fill are based on the estimated AASHO classifications given in table 4. The ratings for well-graded, coarse-grained soils are good, and those for highly plastic, clayey soils and poorly graded silty soils that are difficult to compact and low in stability are poor. Other features considered are depth to bedrock and erodibility.

Highway location refers to both vertical alinement and geographic position. The features considered are drainage, depth to a seasonally high water table, depth to bedrock, and the hazard of flooding. The evaluation is based on the entire profile of an undisturbed soil that has not been artificially drained.

Among the soil features that affect pipeline construction and maintenance are depth to a seasonally high water table, drainage, depth to bedrock, kind of bedrock, and stability of soil material in vertical walls. The shoring of trenches is generally required where the soils are likely to cave in.

Of the soil features that affect farm pond reservoir areas, the rate of seepage is the main consideration, but depth to bedrock and flood hazards are also considered. Among the soil features that affect farm pond embankments are stability, permeability of compacted materials, resistance to piping, and shrink-swell potential. The features affecting farm pond embankments also affect low dikes and levees. The estimated Unified classification given in table 4 was used to evaluate the features of each soil for use in the embankments.

Among the soil features that affect agricultural drainage are natural drainage, permeability, and depth to bedrock. Drainage is needed for maximum crop yields on all soils that are somewhat poorly drained to very poorly drained. Generally both tile and surface drains are required for adequate drainage of soils that have moderately slow to very slow permeability. Surface drains are needed where good outlets for tile drains are not available and where rock is near enough to the surface to interfere with installation of tile.

Among the soil features that affect irrigation are drainage, permeability, infiltration rate, available moisture capacity, and fertility. Soils that are suitable for irrigation should be able to take in water at the rate of half an inch to an inch an hour, but steepness or poor structure causes water to run off rather than soak in. Adequate drainage is essential. Excess water must be removed and waterlogging prevented, to allow aeration of plant roots and good growth of plants.

interpretations—Continued

Soil features affecting—Continued						
Pipeline construction and maintenance	Farm ponds		Agricultural drainage	Irrigation	Terraces and diversions	Waterways
	Reservoir area	Embankment				
Pervious layers in subsoil may cause excessive seepage.	Poor natural drainage; moderate permeability.	Fair to poor stability; moderate permeability; fair to poor compaction characteristics.	Moderate infiltration; high available moisture capacity; very poor natural drainage; outlets may be a problem.	Not applicable	Not applicable	Seasonally high water table; subject to flooding.
Seasonally high water table.	Excessive rate of seepage.	Fair stability; rapid permeability; fair compaction characteristics; poor resistance to piping.	Somewhat poor natural drainage; moderate permeability.	Moderate infiltration; moderate permeability; somewhat poor natural drainage; medium available moisture capacity.	Not applicable	Slight erodibility; nearly level; seasonally wet.

Of the features that affect terraces and diversions, slope and erodibility are the main considerations. Terraces are not necessary on nearly level soils and are not suitable if the slope is more than 12 percent. Terraces shorten slopes, slow runoff, and reduce the erosion hazard. Diversions are used to intercept surface runoff from adjacent areas. They are difficult to construct if the slope is more than 12 percent.

The soil features that affect waterways are slope and erodibility. Grassed waterways are used to prevent the formation of gullies in natural drainageways and to remove excess surface water from sloping areas.

Although not listed in table 5, there are deposits of sand and gravel in the county. The deposits of gravel are not of commercial size, but they are important sources of highway subgrade material. Oakville, Arkport, and Galen soils are sources of molding sand, the only sand commercially produced in the county. Arkport, Belmore, Chili, Galen, Oakville, and Oshtemo soils are sources of sand and gravel.

Soils and Land Use Planning

The use of land in Erie County is diversified. Historically, most of the acreage has been used for farming, but the acreage being used for residential, commercial, industrial, and recreational purposes is increasing. Residential development is expanding most rapidly in Perkins Township, but it is also expanding in the communities of Huron, Milan, and Vermilion. Among other developments are the 6,000-acre Plum Brook facility of the National Aeronautics and Space Administration and a railroad yard put into operation in Groton Township in 1965. The acreage used for railway and highway facilities (fig. 7) is much greater than would be needed to serve only the immediate area, because the county is part of the main corridor of commerce between industrial areas of the east and those of the midwest. The county is one of the few remaining areas in this corridor that has a large acreage of open land.

Table 6 shows estimates of the degree and kind of limitation of each of the soils in Erie County for farming and other specified uses. The degree of limitation is based on soil properties. *Slight* indicates that the limitation is not important and is easily overcome; *moderate* indicates that overcoming the limitation is generally feasible; and *severe*, that the limitation is difficult and costly to overcome and that the use of the soil for the particular purpose is questionable although not impossible.

The column headings in table 6 are discussed in the following paragraphs.

FARMS.—The degrees of limitation for farming are based on the land capability classification system, which is explained in the section "Capability Grouping."

DISPOSAL OF SEWAGE EFFLUENT.—Many homes are being built in areas that have no public sewage disposal systems, and these homes must have individual septic tanks and filter fields. The degrees of limitation for this use depend largely on depth to bedrock, depth to the water table, flood hazard, permeability, and slope.

If the soils are shallow over bedrock, installing a septic tank is difficult or impossible and, because of the small amount of soil material, filtration of sewage is likely to be inadequate. In limestone bedrock, cracks are common. Untreated effluent discharged into these cracks can contaminate ground water. A high water table that persists for an extended period interferes with the functioning of a filter field, because effluent discharged below the water table does not seep away. In slowly permeable

TABLE 6.—*Degree and kind of*

Series and map symbols	Farms	Disposal of sewage effluent	Building sites	Lawns, landscape plantings, and golf fairways
Alexandria:				
AdD	Severe: erosion hazard.	Severe: moderately slow permeability; slope.	Moderate on slopes of 6 to 12 percent. Severe on slopes of 12 to 18 percent.	Moderate: slope
AdF2	Severe: slope; erosion hazard.	Severe: slope; moderately slow permeability.	Severe: slope; seep spots.	Severe: slope
Allis: AlA, AlB, AoA	Severe: poor drainage.	Severe: slow permeability; seasonally high water table; shale at a depth of 20 to 40 inches.	Moderate to severe: seasonally high water table; shale at a depth of 20 to 40 inches.	Severe: acidity; shale at a depth of 20 to 40 inches; seasonally high water table. The AoA unit is stony.
Arkport:				
ArA	Slight: only slight wind erosion hazard.	Slight: possible pollution of springs, wells, and other water sources.	Slight	Moderate: sandy texture.
ArB	Slight: slight wind erosion hazard.	Slight: possible pollution of springs, wells, and other water sources.	Slight	Moderate: sandy texture.
ArC	Moderate: droughtiness; erosion hazard.	Moderate: slope; possible pollution of springs, wells, and other water sources.	Moderate: slope	Moderate: slope; sandy texture.
ArD	Severe: erosion hazard.	Severe: slope	Severe: slope	Severe: slope
Arkport, moderately shallow variant:				
AtA	Slight: droughtiness; erosion hazard.	Severe: limited depth to bedrock; possible pollution of springs, wells, and other water sources.	Severe: limited depth to bedrock.	Moderate: limited depth to bedrock.
AtB	Slight: droughtiness; erosion hazard.	Severe: limited depth to bedrock; possible pollution of springs, wells, and other water sources.	Severe: limited depth to bedrock.	Moderate: limited depth to bedrock.
Beaches:				
Bc	Not rated for farms	Slight: possible pollution of springs, wells, and other water sources.	Slight	Severe: low fertility; low available moisture capacity; sandy texture.
Be	Not rated for farms	Severe: high water table; height of water table governed by level of Lake Erie.	Severe: high water table; height of water table governed by level of Lake Erie.	Severe: low fertility; sandy texture.
Belmore:				
BmA	Slight	Slight: possible pollution of springs, wells, and other water sources.	Slight	Moderate: limited available moisture capacity.
BlB, BmB	Slight	Slight: possible pollution of springs, wells, and other water sources.	Slight	Moderate: limited available moisture capacity.

See footnote at end of table.

limitation for specified land uses

Streets and parking lots	Athletic fields and other intensive play areas	Campsites		Sanitary land fill	Cemeteries
		For tents	For trailers		
Severe: slope	Severe: slope	Moderate: moderately slow permeability; slope.	Severe: slope	Moderate: slope; moderately slow permeability.	Moderate: slope; moderately slow permeability.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: seasonally high water table.	Severe: slow permeability; seasonally high water table. The AoA unit is stony.	Severe: seasonally high water table; slow permeability.	Severe: seasonally high water table; slow permeability.	Severe: shale at a depth of 20 to 40 inches; high clay content; seasonally high water table.	Severe: seasonally high water table; shale at a depth of 20 to 40 inches.
Slight	Slight	Slight	Slight	Severe: rapid permeability; possible pollution of springs, wells, and other water sources.	Moderate: sandy texture.
Moderate: slope	Moderate: slope	Slight	Moderate: slope	Severe: rapid permeability; possible pollution of springs, wells, and other water sources.	Moderate: sandy texture.
Severe: slope	Severe: slope	Moderate: slope	Severe: slope	Severe: rapid permeability; slope; possible pollution of springs, wells, and other water sources.	Moderate: slope; sandy texture.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Slight	Slight	Slight	Slight	Severe: limited depth to bedrock.	Severe: limited depth to bedrock.
Moderate: slope	Moderate: slope	Slight	Moderate: slope	Severe: limited depth to bedrock.	Severe: limited depth to bedrock.
Moderate: slope	Severe: sandy texture.	Severe: sandy texture.	Severe: sandy texture.	Severe: rapid permeability; possible pollution of springs, wells, and other water sources.	Severe: sandy texture.
Severe: high water table.	Severe: sandy texture; high water table.	Severe: sandy texture; high water table.	Severe: sandy texture; high water table.	Severe: high water table	Severe: high water table.
Slight	Slight	Slight	Slight	Severe: rapid permeability; possible pollution of springs, wells, and and other water sources.	Slight.
Moderate: slope	Moderate: slope	Slight	Moderate: slope	Severe: rapid permeability; possible pollution of springs, wells, and other water sources.	Slight.

TABLE 6.—*Degree and kind of*

Series and map symbols	Farms	Disposal of sewage effluent	Building sites	Lawns, landscape plantings, and golf fairways
Belmore—Continued BlC	Moderate: erosion hazard.	Moderate: slope; possible pollution of springs, wells, and other water sources.	Moderate: slope	Moderate: slope
Bennington: BnA, BoA	Slight: wetness hazard.	Severe: seasonally high water table; moderately slow permeability.	Moderate: seasonally high water table.	Moderate: seasonally high water table.
BoB	Slight: erosion hazard.	Severe: moderately slow permeability.	Moderate: seasonally high water table.	Moderate: seasonally high water table.
BpA For Pyrmont part of BpA, see Pyrmont series, PyA unit.	Slight: wetness hazard.	Severe: seasonally high water table; moderately slow permeability; limestone at a depth of 40 to 60 inches.	Moderate: seasonally high water table; bedrock at a depth of 40 to 60 inches.	Moderate: seasonally high water table.
Berks: BrB	Severe: droughtiness; channery; shallow; shattered sandstone at a depth of 20 to 40 inches.	Severe: shattered sandstone at a depth of 20 to 40 inches.	Severe: shattered sandstone at a depth of 20 to 40 inches.	Severe: shattered sandstone at a depth of 20 to 40 inches.
BrD	Severe: droughtiness; slope; shallow; shattered sandstone at a depth of 20 to 40 inches.	Severe: shattered sandstone at a depth of 20 to 40 inches.	Severe: shattered sandstone at a depth of 20 to 40 inches.	Severe: shattered sandstone at a depth of 20 to 40 inches.
BsF	Severe: slope; shattered sandstone at a depth of 20 to 40 inches.	Severe: shattered sandstone at a depth of 20 to 40 inches; slope.	Severe: shattered sandstone at a depth of 20 to 40 inches; slope.	Severe: shattered sandstone at a depth of 20 to 40 inches; slope.
Bogart: BtA	Slight	Slight: possible pollution of springs, wells, and other water sources.	Slight: moderately good drainage.	Slight
BtB	Slight	Slight: possible pollution of springs, wells, and other water sources.	Slight: moderately good drainage.	Slight
Borrow pits: Bw	Severe	Severe: ponding	Severe: ponding	Variable
Cardington: CaA	Slight	Severe: moderately slow permeability.	Slight	Slight
CaB	Slight	Severe: moderately slow permeability.	Slight	Slight

See footnote at end of table.

limitation for specified land uses—Continued

Streets and parking lots	Athletic fields and other intensive play areas	Campsites		Sanitary land fill	Cemeteries
		For tents	For trailers		
Severe: slope	Severe: slope	Moderate: slope	Severe: slope	Severe: rapid permeability; slope; possible pollution of springs, wells, and other water sources.	Moderate: slope.
Moderate: seasonally high water table.	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Severe: seasonally high water table; ponding.	Severe: seasonally high water table.
Moderate: slope	Moderate: slope	Moderate: seasonally high water table.	Moderate: slope	Moderate: seasonally high water table; moderately clayey.	Severe: seasonally high water table.
Moderate: seasonally high water table.	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Severe: seasonally high water table; limestone at a depth of 40 to 60 inches.	Severe: seasonally high water table; limestone at a depth of 40 to 60 inches.
Severe: shattered sandstone at a depth of 20 to 40 inches; slope.	Severe: slope; shattered sandstone at a depth of 20 to 40 inches.	Severe: shattered sandstone at a depth of 20 to 40 inches; slope.	Severe: shattered sandstone at a depth of 20 to 40 inches; slope.	Severe: shattered sandstone at a depth of 20 to 40 inches.	Severe: shattered sandstone at a depth of 20 to 40 inches.
Severe: shattered sandstone at a depth of 20 to 40 inches.	Severe: slope; shattered sandstone at a depth of 20 to 40 inches.	Severe: shattered sandstone at a depth of 20 to 40 inches; slope.	Severe: shattered sandstone at a depth of 20 to 40 inches; slope.	Severe: shattered sandstone at a depth of 20 to 40 inches; slope.	Severe: shattered sandstone at a depth of 20 to 40 inches.
Severe: slope; shattered sandstone at a depth of 20 to 40 inches.	Severe: slope; shattered sandstone at a depth of 20 to 40 inches.	Severe: shattered sandstone at a depth of 20 to 40 inches; slope.	Severe: shattered sandstone at a depth of 20 to 40 inches; slope.	Severe: shattered sandstone at a depth of 20 to 40 inches; slope.	Severe: shattered sandstone at a depth of 20 to 40 inches.
Slight	Slight	Slight	Slight	Severe: rapid permeability in substratum.	Moderate: seasonally high water table.
Moderate: slope	Moderate: slope	Slight	Moderate: slope	Severe: rapid permeability in substratum.	Moderate: seasonally high water table.
Variable	Variable	Severe: ponding	Severe: ponding	Severe: ponding	Severe: ponding.
Slight	Moderate: moderately slow permeability.	Moderate: moderately slow permeability.	Moderate: moderately slow permeability.	Moderate: seasonally high water table.	Moderate: seasonally high water table; moderately slow permeability
Moderate: slope	Moderate: slope; moderately slow permeability.	Moderate: slope	Moderate: slope; moderately slow permeability.	Moderate: seasonally high water table; moderately clayey.	Moderate: seasonally high water table; moderately slow permeability.

TABLE 6.—*Degree and kind of*

Series and map symbols	Farms	Disposal of sewage effluent	Building sites	Lawns, landscape plantings, and golf fairways
Casco, very flaggy subsoil variant: CfA, CfB	Moderate: shallow to limestone; droughtiness.	Severe: broken limestone at a depth of less than 20 inches; possible pollution of springs, wells, and other water sources.	Moderate: broken limestone at a depth of less than 20 inches.	Severe: broken limestone at a depth of less than 20 inches; very droughty.
CfD	Severe: droughtiness; erosion hazard; slope.	Severe: broken limestone at a depth of less than 20 inches; slope; possible pollution of springs, wells, and other water sources.	Moderate to severe: broken limestone at a depth of less than 20 inches; slope.	Severe: broken limestone at a depth of less than 20 inches; slope.
Castalia: ChA, ChB	Severe: droughtiness; shallow to limestone.	Severe: broken limestone at a depth of less than 1 foot; possible pollution of springs, wells, and other water sources.	Severe: broken limestone at a depth of less than 1 foot.	Severe: broken limestone at a depth of less than 1 foot.
Chili: ClA	Slight	Slight: possible pollution of springs, wells, and other water sources.	Slight	Moderate: low available moisture capacity.
ClB	Slight	Slight: possible pollution of springs, wells, and other water sources.	Slight	Moderate: low available moisture capacity.
ClC	Moderate: erosion hazard.	Moderate: slope; possible pollution of springs, wells, and other water sources.	Moderate: slope; some seep spots.	Moderate: low available moisture capacity; slope.
ClD	Severe: droughtiness; erosion hazard.	Severe: slope	Severe: slope	Severe: slope
Colwood: Cm, Co, Cr, Cs	Slight: wetness hazard.	Severe: high water table. Limestone at a depth of 40 to 60 inches in the Cm and Co units, and sandstone or shale at a depth of 40 to 60 inches in Cr and Cs units.	Severe: high water table; soft and unstable when wet.	Severe: high water table.
Cp	Moderate: wetness hazard.	Severe: high water table; limestone at a depth of 40 to 60 inches.	Severe: high water table.	Severe: high water table.
Colyer: CtA	Severe: acidity; droughtiness.	Severe: rippable shale at a depth of less than 20 inches.	Moderate: rippable shale at a depth of less than 20 inches.	Severe: rippable shale at a depth of less than 20 inches; low available moisture capacity; acidity.

See footnote at end of table.

limitation for specified land uses—Continued

Streets and parking lots	Athletic fields and other intensive play areas	Campsites		Sanitary land fill	Cemeteries
		For tents	For trailers		
Moderate: broken limestone at a depth of less than 20 inches.	Severe: broken limestone at a depth of less than 20 inches.	Severe: broken limestone at a depth of less than 20 inches.	Severe: broken limestone at a depth of less than 20 inches.	Severe: broken limestone at a depth of less than 20 inches; possible pollution of springs, wells, and other water sources.	Severe: broken limestone at a depth of less than 20 inches.
Severe: broken limestone at a depth of less than 20 inches; slope.	Severe: slope	Severe: broken limestone at a depth of less than 20 inches; slope.	Severe: broken limestone at a depth of less than 20 inches; slope.	Severe: broken limestone at a depth of less than 20 inches; slope.	Severe: broken limestone at a depth of less than 20 inches; slope.
Moderate: broken limestone at a depth of less than 1 foot.	Severe: broken limestone at a depth of less than 1 foot; channery surface.	Severe: broken limestone at a depth of less than 1 foot.	Severe: broken limestone at a depth of less than 1 foot.	Severe: broken limestone at a depth of less than 1 foot; possible pollution of springs, wells, and other water sources.	Severe: broken limestone at a depth of less than 1 foot.
Slight	Slight	Slight	Slight	Severe: rapid permeability in substratum; possible pollution of springs, wells, and other water sources.	Slight.
Moderate: slope	Moderate: slope	Slight	Moderate: slope	Severe: rapid permeability in substratum; possible pollution of springs, wells, and other water sources.	Slight.
Moderate for streets, severe for parking lots: slope.	Severe: slope	Moderate: slope	Severe: slope	Severe: rapid permeability in substratum; possible pollution of springs, wells, and other water sources.	Moderate: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: rapid permeability in substratum.	Severe: slope.
Severe: high water table; susceptibility to frost heaving.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table. Sandstone or shale at a depth of 40 to 60 inches in the Cr and Cs units.	Severe: high water table. Sandstone or shale at a depth of 40 to 60 inches in the Cr and Cs units.
Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table; limestone at a depth of 40 to 60 inches.	Severe: high water table; limestone at a depth of 40 to 60 inches.
Moderate: rippable shale at a depth of less than 20 inches.	Moderate: rippable shale at a depth of less than 20 inches.	Moderate: rippable shale at a depth of less than 20 inches.	Moderate: rippable shale at a depth of less than 20 inches.	Severe: rippable shale at a depth of less than 20 inches.	Moderate: rippable shale at a depth of less than 20 inches.

TABLE 6.—*Degree and kind of*

Series and map symbols	Farms	Disposal of sewage effluent	Building sites	Lawns, landscape plantings, and golf fairways
Colyer—Continued CtC	Severe: acidity; slope; droughtiness.	Severe: rippable shale at a depth of less than 20 inches.	Moderate: rippable shale at a depth of less than 20 inches; slope if more than 6 percent.	Severe: rippable shale at a depth of less than 20 inches; low available moisture capacity; acidity.
CyE	Severe: slope; droughtiness.	Severe: rippable shale at a depth of less than 20 inches; slope.	Severe: slope	Severe: rippable shale at a depth of less than 20 inches; slope.
Darroch: Da, Dc	Slight: wetness hazard.	Severe: seasonally high water table.	Moderate: seasonally high water table.	Moderate: seasonally high water table.
Dekalb: DkA, DkB	Slight	Severe: sandstone at a depth of 20 to 40 inches.	Severe: sandstone at a depth of 20 to 40 inches.	Severe: low available moisture capacity; sandstone at a depth of 20 to 40 inches.
Del Rey: DrA, DsA	Slight: seasonal wetness hazard.	Severe: moderately slow permeability; seasonally high water table.	Moderate: seasonally high water table.	Moderate: seasonally high water table.
DsB	Slight: seasonal wetness hazard.	Severe: moderately slow permeability; seasonally high water table.	Moderate: seasonally high water table.	Moderate: seasonally high water table.
Digby: DtA, DyA	Moderate: wetness hazard.	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Moderate: seasonally high water table.
Eel: Ee	Slight: infrequent flooding.	Severe: infrequent flooding.	Severe: infrequent flooding.	Slight: infrequent flooding.
Elliott: EhA, EkA	Slight: wetness hazard.	Severe: seasonally high water table; moderately slow permeability.	Moderate: seasonally high water table.	Moderate: seasonally high water table.
Ellsworth: ElA	Slight	Severe: slow permeability.	Moderate: seasonally high water table.	Moderate to slight: seasonally high water table.
ElB	Moderate: erosion hazard.	Severe: slow permeability.	Moderate: seasonally high water table.	Moderate to slight: seasonally high water table.
ElC2	Severe: erosion hazard.	Severe: seepage on slopes; slow permeability.	Moderate: slope	Moderate: slope

See footnote at end of table.

limitation for specified land uses—Continued

Streets and parking lots	Athletic fields and other intensive play areas	Campsites		Sanitary land fill	Cemeteries
		For tents	For trailers		
Moderate where slope is no more than 6 percent; severe where slope is more than 6 percent; rippable shale at a depth of less than 20 inches.	Moderate where slope is no more than 6 percent; shale at a depth of less than 20 inches.	Slight where slope is no more than 6 percent; moderate where slope is more than 6 percent.	Moderate where slope is no more than 6 percent; severe where slope is more than 6 percent.	Severe: rippable shale at a depth of less than 20 inches.	Moderate: rippable shale at a depth of less than 20 inches.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: rippable shale at a depth of less than 20 inches; slope.	Severe: rippable shale at a depth of less than 20 inches; slope.
Moderate: seasonally high water table; high susceptibility to frost heaving.	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Severe: seasonally high water table.
Moderate: sandstone at a depth of 20 to 40 inches; for parking lots, slope of more than 2 percent.	Severe: sandstone at a depth of 20 to 40 inches.	Slight	For the DkA unit, slight. For the DkB unit, moderate: slope.	Severe: sandstone at a depth of 20 to 40 inches.	Severe: sandstone at a depth of 20 to 40 inches.
Moderate: seasonally high water table.	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Moderate: seasonally high water table; moderately clayey.	Severe: seasonally high water table.
Moderate: seasonally high water table.	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Moderate: seasonally high water table; slope.	Moderate: seasonally high water table; moderately clayey.	Severe: seasonally high water table.
Moderate: seasonally high water table.	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.
Slight to moderate: infrequent flooding.	Severe: infrequent flooding.	Severe: infrequent flooding.	Severe: infrequent flooding.	Severe: infrequent flooding.	Severe: infrequent flooding.
Moderate: seasonally high water table.	Moderate: seasonally high water table; moderately slow permeability.	Moderate: seasonally high water table; moderately slow permeability.	Moderate: seasonally high water table; moderately slow permeability.	Severe: ponding; seasonally high water table; moderately clayey.	Severe: seasonally high water table.
Moderate: seasonally high water table.	Severe: slow permeability.	Severe: slow permeability.	Severe: slow permeability.	Moderate: moderately clayey.	Severe: slow permeability.
Moderate: slope	Severe: slow permeability.	Severe: slow permeability.	Severe: slow permeability.	Moderate: moderately clayey.	Severe: slow permeability.
Severe: slope	Severe: slope	Severe: slow permeability; slope.	Severe: slow permeability; slope.	Moderate: slope; moderately clayey.	Severe: slow permeability; slope.

TABLE 6.—*Degree and kind of*

Series and map symbols	Farms	Disposal of sewage effluent	Building sites	Lawns, landscape plantings, and golf fairways
Ellsworth—Continued EID2, EwF---- For Chili part of EwF, see Chili series.	Severe: slope; erosion hazard.	Severe: seepage on slopes; slow permeability.	Severe: slope----	Severe: slope----
Fries: Fr, Fs----	Moderate: wetness hazard.	Severe: high water table; slow permeability; shale at a depth of 20 to 40 inches.	Severe: high water table; shale at a depth of 20 to 40 inches.	Severe: high water table; shale at a depth of 20 to 40 inches.
Fulton: FuA, FuB----	Moderate: wetness hazard.	Severe: seasonally high water table; slow permeability.	Moderate: seasonally high water table; soft and unstable when wet.	Moderate: seasonally high water table.
Galen: GaA----	Slight----	Slight: possible pollution of springs, wells, and other water sources.	Slight----	Moderate: occasional lack of available moisture; sandy texture.
GaB----	Slight----	Slight: possible pollution of springs, wells, and other water sources.	Slight----	Moderate: occasional lack of available moisture; sandy texture.
GfB----	Slight----	Moderate: occasional wetness; limestone at a depth of 40 to 60 inches.	Moderate: limestone at a depth of 40 to 60 inches.	Moderate: occasional lack of available moisture; sandy texture.
GlB----	Slight----	Severe: occasional wetness; slow permeability in layer above shale.	Moderate: shale at a depth of 40 to 60 inches.	Moderate: occasional lack of available moisture; sandy texture.
Gilford: Go----	Moderate: wetness hazard.	Severe: high water table.	Severe: high water table; soft and unstable when wet.	Severe: high water table.
Gravel pits: Gp----	(1)----	(1)----	(1)----	(1)----
Haskins: HsA, HtA----	Slight----	Severe: slow permeability---	Moderate: seasonally high water table.	Moderate: seasonally high water table.
HsB----	Slight----	Severe: slow permeability-	Moderate: seasonally high water table.	Moderate: seasonally high water table.
Jimtown: JtA----	Slight----	Severe: seasonally high water table.	Moderate: seasonally high water table.	Moderate: seasonally high water table.

See footnote at end of table.

limitation for specified land uses—Continued

Streets and parking lots	Athletic fields and other intensive play areas	Campsites		Sanitary land fill	Cemeteries
		For tents	For trailers		
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slow permeability; slope.
Severe: high water table; shale at a depth of 20 to 40 inches.	Severe: high water table; slow permeability; shale at a depth of 20 to 40 inches.	Severe: high water table; ponding; slow permeability.	Severe: high water table; ponding; slow permeability.	Severe: high water table; shale at a depth of 20 to 40 inches.	Severe: high water table; shale at a depth of 20 to 40 inches.
Moderate: seasonally high water table; susceptibility to frost heaving.	Severe: slow permeability; seasonally high water table.	Severe: slow permeability; seasonally high water table.	Severe: slow permeability; seasonally high water table.	Severe: high clay content	Severe: seasonally high water table.
Slight	Slight	Slight	Slight	Severe: rapid permeability; possible pollution of springs, wells, and other water sources.	Moderate: sandy texture.
Moderate: slope	Moderate: slope	Slight	Moderate: slope	Severe: rapid permeability; possible pollution of springs, wells, and other water sources.	Moderate: sandy texture.
Slight where slope is no more than 2 percent. Moderate where slope is more than 2 percent.	Moderate: limestone at a depth of 40 to 60 inches; slope if more than 2 percent.	Slight	Slight where slope is less than 2 percent. Moderate where slope is more than 2 percent;	Severe: limestone at a depth of 40 to 60 inches.	Severe: limestone at a depth of 40 to 60 inches; sandy texture.
Slight. Moderate for parking lots where slope is more than 2 percent.	Moderate: shale at a depth of 40 to 60 inches; slope if more than 2 percent.	Slight	Moderate: slope if more than 2 percent.	Severe: shale at a depth of 40 to 60 inches.	Moderate: occasional wetness; shale at a depth of 40 to 60 inches; sandy texture.
Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.
(1)	(1)	(1)	(1)	(1)	(1).
Moderate: seasonally high water table.	Moderate to severe: seasonally high water table; slow permeability.	Moderate: seasonally high water table; slow permeability below a depth of 18 to 40 inches.	Moderate: seasonally high water table; slow permeability below a depth of 18 to 40 inches.	Severe: seasonally high water table; slow permeability below a depth of 18 to 40 inches.	Severe: seasonally high water table; slow permeability below a depth of 18 to 40 inches.
Moderate: slope.	Moderate to severe: slope; slow permeability.	Moderate: seasonally high water table.	Moderate: slope	Severe: seasonally high water table; slow permeability.	Severe: seasonally high water table; slow permeability.
Moderate: seasonally high water table.	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Severe: seasonally high water table; pervious substratum.	Severe: seasonally high water table.

TABLE 6.—*Degree and kind of*

Series and map symbols	Farms	Disposal of sewage effluent	Building sites	Lawns, landscape plantings, and golf fairways
Joliet: Ju	Severe: wetness hazard.	Severe: high water table; limestone at a depth of less than 20 inches.	Severe: high water table; limestone at a depth of less than 20 inches.	Severe: high water table; limestone at a depth of less than 20 inches.
Kibbie: KbA, KbB, KeA, KhA	Slight: wetness hazard.	Moderate: seasonally high water table.	Moderate: seasonally high water table; soft, unstable material.	Moderate: seasonally high water table.
Kibbie, moderately shallow variant: KfA.	Slight	Severe: seasonally high water table; bedrock at a depth of 20 to 40 inches.	Severe: seasonally high water table; limestone at a depth of 20 to 40 inches.	Moderate: seasonally high water table.
Lenawee: La, Lc	Slight	Severe: high water table; moderately slow permeability.	Severe: high water table; soft, unstable when wet.	Severe: high water table.
Lewisburg: LeA	Slight	Severe: moderately slow permeability.	Slight	Slight
LeB	Slight	Severe: moderately slow permeability.	Slight	Slight
Lewisburg, moderately shallow variant: LgA, LgB	Slight	Severe: solid limestone at a depth of 20 to 40 inches.	Severe: solid limestone at a depth of 20 to 40 inches.	Moderate: solid limestone at a depth of 20 to 40 inches.
LgC	Moderate: erosion hazard.	Severe: solid limestone at a depth of 20 to 40 inches; seepage on slopes.	Severe: limestone bedrock at a depth of 20 to 40 inches; slope.	Moderate: solid limestone at a depth of 20 to 40 inches; slope.
Lobdell: Lm	Slight	Severe: infrequent flooding.	Severe: infrequent flooding.	Slight to moderate: infrequent flooding.
Loudonville: LoA	Slight	Severe: sandstone at a depth of 20 to 40 inches.	Severe: sandstone at a depth of 20 to 40 inches.	Moderate to severe: sandstone at a depth of 20 to 40 inches.
LoB	Slight	Severe: sandstone at a depth of 20 to 40 inches.	Severe: sandstone at a depth of 20 to 40 inches.	Moderate: sandstone at a depth of 20 to 40 inches.
LoC	Moderate: erosion hazard.	Severe: sandstone at a depth of 20 to 40 inches.	Severe: sandstone at a depth of 20 to 40 inches.	Moderate: sandstone at a depth of 20 to 40 inches; slope.
Made land: Ma	Not rated for farms.	Variable	Variable	Variable

See footnote at end of table.

limitation for specified land uses—Continued

Streets and parking lots	Athletic fields and other intensive play areas	Campsites		Sanitary land fill	Cemeteries
		For tents	For trailers		
Severe: high water table; limestone at a depth of less than 20 inches.	Severe: high water table; limestone at a depth of less than 20 inches.	Severe: high water table; limestone at a depth of less than 20 inches.	Severe: high water table; limestone at a depth of less than 20 inches.	Severe: high water table; limestone at a depth of less than 20 inches.	Severe: high water table; limestone at a depth of less than 20 inches.
Moderate: seasonally high water table.	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Severe: seasonally high water table.
Moderate: seasonally high water table.	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Severe: seasonally high water table; limestone at a depth of 20 to 40 inches.	Severe: seasonally high water table; limestone at a depth of 20 to 40 inches.
Severe: high water table; susceptibility to frost heaving.	Severe: high water table; moderately slow permeability.	Severe: high water table; moderately slow permeability.	Severe: high water table; moderately slow permeability.	Severe: high water table	Severe: high water table.
Slight	Moderate: moderately slow permeability.	Moderate: moderately slow permeability.	Moderate: moderately slow permeability.	Slight	Moderate: moderately slow permeability.
Moderate: slope	Moderate: slope; moderately slow permeability.	Moderate: moderately slow permeability.	Moderate: slope	Slight	Moderate: moderately slow permeability.
Moderate: solid limestone at a depth of 20 to 40 inches; slope if more than 2 percent.	Severe: solid limestone at a depth of 20 to 40 inches; moderately slow permeability.	Moderate: moderately slow permeability.	For the LgA unit, moderate: moderately slow permeability. For the LgB unit, moderate: slope.	Severe: solid limestone at a depth of 20 to 40 inches.	Severe: solid limestone at a depth of 20 to 40 inches.
Severe: slope; solid limestone at a depth of 20 to 40 inches.	Severe: slope; solid limestone at a depth of 20 to 40 inches.	Moderate: moderately slow permeability.	Severe: slope	Severe: solid limestone at a depth of 20 to 40 inches.	Severe: solid limestone at a depth of 20 to 40 inches.
Moderate: infrequent flooding.	Slight: not flooded during period of use.	Severe: infrequent flooding.	Severe: infrequent flooding.	Severe: infrequent flooding.	Severe: infrequent flooding.
Severe: sandstone at a depth of 20 to 40 inches.	Severe: sandstone at a depth of 20 to 40 inches.	Slight	Slight	Severe: sandstone at a depth of 20 to 40 inches.	Severe: sandstone at a depth of 20 to 40 inches.
Severe: sandstone at a depth of 20 to 40 inches.	Severe: sandstone at a depth of 20 to 40 inches; slope.	Slight	Moderate: slope	Severe: sandstone at a depth of 20 to 40 inches.	Severe: sandstone at a depth of 20 to 40 inches.
Severe: sandstone at a depth of 20 to 40 inches; slope.	Severe: sandstone at a depth of 20 to 40 inches; slope.	Moderate: slope	Severe: slope	Severe: sandstone at a depth of 20 to 40 inches; slope.	Severe: sandstone at a depth of 20 to 40 inches; slope.
Variable	Variable	Variable	Variable	Variable	Variable.

TABLE 6.—*Degree and kind of*

Series and map symbols	Farms	Disposal of sewage effluent	Building sites	Lawns, landscape plantings, and golf fairways
Mahoning:				
MfA, MgA, MhA	For the MfA and MgA units, moderate: wetness hazard. For the MhA unit, severe: stony.	Severe: seasonally high water table; slow permeability.	Severe: seasonally high water table.	Moderate: seasonally high water table. The MhA unit is stony.
MkA, MlA	Moderate: wetness hazard.	Severe: seasonally high water table; sandstone or shale at a depth of 40 to 60 inches.	Severe: seasonally high water table; sandstone or shale at a depth of 40 to 60 inches.	Moderate: seasonally high water table.
MgB	Moderate: wetness hazard.	Severe: seasonally high water table; slow permeability.	Severe: seasonally high water table.	Moderate: seasonally high water table.
Marsh: Mm	(1)	(1)	(1)	(1)
Mermill: Mn, Mo	Slight	Severe: high water table; slow permeability below a depth of 18 to 40 inches.	Severe: high water table; soft; unstable when wet.	Severe: high water table.
Metea:				
MrA	Slight	Severe: moderately slow permeability below a depth of 18 to 40 inches.	Slight	Moderate: sandy texture.
MrB	Slight	Severe: moderately slow permeability below a depth of 18 to 40 inches.	Slight	Moderate: sandy texture.
MrC	Moderate: droughtiness; erosion hazard; slope.	Severe: moderately slow permeability below a depth of 18 to 40 inches; slope.	Moderate: slope	Moderate: sandy texture.
Millgrove: Ms, Mt	Slight	Severe: high water table	Severe: high water table.	Severe: high water table.
Millsdale: Mu, Mv	Moderate: wetness hazard.	Severe: high water table; solid limestone at a depth of 20 to 40 inches.	Severe: high water table; solid limestone at a depth of 20 to 40 inches.	Severe: high water table; solid limestone at a depth of 20 to 40 inches.

See footnotes at end of table.

limitation for specified land uses—Continued

Streets and parking lots	Athletic fields and other intensive play areas	Campsites		Sanitary land fill	Cemeteries
		For tents	For trailers		
Moderate: seasonally high water table.	Severe: seasonally high water table; slow permeability.	Severe: seasonally high water table; slow permeability.	Severe: seasonally high water table; slow permeability.	Severe: seasonally high water table; high clay content; ponding.	Severe: seasonally high water table; slow permeability.
Moderate: seasonally high water table; sandstone or shale at a depth of 40 to 60 inches.	Severe: seasonally high water table; slow permeability.	Severe: seasonally high water table; slow permeability.	Severe: seasonally high water table; slow permeability.	Severe: seasonally high water table; sandstone or shale at a depth of 40 to 60 inches.	Severe: seasonally high water table; sandstone or shale at a depth of 40 to 60 inches; slow permeability.
Moderate: seasonally high water table; slope.	Severe: slow permeability.	Severe: seasonally high water table; slow permeability.	Severe: seasonally high water table; slow permeability.	Moderate: seasonally high water table; slow permeability.	Severe: seasonally high water table; slow permeability; high clay content below surface layer.
(1)	(1)	(1)	(1)	(1)	(1).
Severe: high water table; susceptibility to frost heaving.	Severe: high water table; slow permeability below a depth of 18 to 40 inches.	Severe: high water table; slow permeability below a depth of 18 to 40 inches.	Severe: high water table; slow permeability below a depth of 18 to 40 inches.	Severe: high water table; high clay content below a depth of 18 to 40 inches.	Severe: high water table; slow permeability below a depth of 18 to 40 inches.
Slight	Moderate: moderately slow permeability below a depth of 18 to 40 inches.	Moderate: moderately slow permeability below a depth of 18 to 40 inches.	Moderate: moderately slow permeability below a depth of 18 to 40 inches.	Severe: possible pollution of springs, wells, and other water sources; pervious material in upper 18 to 40 inches.	Moderate: moderately slow permeability below a depth of 18 to 40 inches; sandy texture.
Moderate: slope	Moderate: slope	Moderate: moderately slow permeability.	Moderate: slope	Severe: possible pollution of springs, wells, and other water sources; pervious material in upper 18 to 40 inches.	Moderate: moderately slow permeability below a depth of 18 to 40 inches; sandy texture.
Severe: slope	Severe: slope	Moderate: slope	Severe: slope	Severe: possible pollution of springs, wells, and other water sources; pervious material in upper 18 to 40 inches; slope.	Moderate: slope; sandy texture; moderately slow permeability below a depth of 18 to 40 inches.
Severe: high water table; susceptibility to frost heaving.	Severe: high water table.	Severe: high water table. The Mt unit has a sticky surface layer.	Severe: high water table. The Mt unit has a sticky surface layer.	Severe: high water table	Severe: high water table.
Severe: high water table; solid limestone at a depth of 20 to 40 inches.	Severe: high water table; solid limestone at a depth of 20 to 40 inches.	Severe: high water table.	Severe: high water table.	Severe: high water table; solid limestone at a depth of 20 to 40 inches.	Severe: high water table; solid limestone at a depth of 20 to 40 inches.

TABLE 6.—*Degree and kind of*

Series and map symbols	Farms	Disposal of sewage effluent	Building sites	Lawns, landscape plantings, and golf fairways
Miner: Mw	Moderate: wetness hazard.	Severe: slow permeability; high water table.	Severe: high water table.	Severe: high water table.
Mitiwanga: MxA	Slight	Severe: sandstone at a depth of 20 to 40 inches; seasonally high water table.	Severe: sandstone at a depth of 20 to 40 inches.	Moderate: sandstone at a depth of 20 to 40 inches; seasonally high water table.
Oakville:				
OaB	Severe: droughtiness.	Slight: possible pollution of springs, wells, and other water sources.	Slight: good drainage.	Severe: sandy texture; droughtiness.
OaC	Severe: droughtiness.	Moderate: seepage on slopes; possible pollution of springs, wells, and other water sources.	Moderate: slope	Severe: sandy texture; droughtiness; moderate slope limitation.
OaE	Severe: droughtiness; slope.	Severe: seepage on slopes; possible pollution of springs, wells, and other water sources.	Severe: slope	Severe: sandy texture; droughtiness; slope.
Orrville: Or	Slight: flooding; wetness hazard.	Severe: flooding	Severe: flooding	Severe: seasonally high water table; flooding.
Oshtemo:				
OsA	Moderate: droughtiness.	Slight: possible pollution of springs, wells, and other water sources.	Slight	Moderate: droughtiness; sandy texture.
OsB	Moderate: droughtiness.	Slight: possible pollution of springs, wells, and other water sources.	Slight	Moderate: droughtiness; sandy texture.
OtA	Moderate: droughtiness.	Slight: possible pollution of springs, wells, and other water sources.	Slight	Moderate: sandy loam texture.
OtB	Moderate: droughtiness.	Slight: possible pollution of springs, wells, and other water sources.	Slight	Moderate: sandy loam texture.
Pewamo:				
Pe	Moderate: wetness hazard.	Severe: high water table; moderately slow permeability.	Severe: high water table.	Severe: high water table; high clay content; poor tilth.
Pc, Ph	Slight: wetness hazard.	Severe: high water table; moderately slow permeability. Limestone at a depth of 40 to 60 inches in the Ph unit.	Severe: high water table. Limestone at a depth of 40 to 60 inches in the Ph unit.	Severe: high water table.

See footnote at end of table.

limitation for specified land uses—Continued

Streets and parking lots	Athletic fields and other intensive play areas	Campsites		Sanitary land fill	Cemeteries
		For tents	For trailers		
Severe: high water table.	Severe: high water table; slow permeability.	Severe: high water table; slow permeability.	Severe: high water table; slow permeability.	Severe: high water table.	Severe: high water table; slow permeability.
Severe: sandstone at a depth of 20 to 40 inches.	Severe: sandstone at a depth of 20 to 40 inches; seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.	Severe: sandstone at a depth of 20 to 40 inches.	Severe: sandstone at a depth of 20 to 40 inches.
Moderate: slope	Moderate: sandy texture; slope.	Moderate: sandy texture.	Moderate: slope	Severe: rapid permeability; possible pollution of springs, wells, and other water sources.	Moderate: sandy texture.
Severe: slope	Severe: sandy texture; slope.	Moderate: slope; sandy texture.	Severe: slope	Severe: rapid permeability; possible pollution of springs, wells, and other water sources.	Moderate: sandy texture.
Severe: slope	Severe: sandy texture; slope.	Severe: slope; sandy texture.	Severe: slope; sandy texture.	Severe: slope; rapid permeability.	Severe: slope.
Severe: flooding	Severe; seasonally high water table; flooding.	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding.
Slight	Slight	Slight	Slight	Moderate: moderately rapid permeability; possible pollution of springs, wells, and other water sources.	Moderate: sandy texture; some gravel.
Moderate: slope	Moderate: slope	Slight	Moderate: slope	Moderate: moderately rapid permeability; possible pollution of springs, wells, and other water sources.	Moderate: sandy texture; some gravel.
Slight	Slight	Slight	Slight	Moderate: moderately rapid permeability; possible pollution of springs, wells, and other water sources.	Slight.
Moderate: slope	Moderate: slope	Slight	Moderate: slope	Moderate: moderately rapid permeability; possible pollution of springs, wells, and other water sources.	Slight.
Severe: high water table; susceptibility to frost heaving.	Severe: high water table; clayey texture; moderately slow permeability.	Severe: high water table; moderately slow permeability; high clay content.	Severe: high water table; moderately slow permeability; high clay content.	Severe: high water table; high clay content.	Severe: high water table; high clay content; moderately slow permeability.
Severe: high water table; susceptibility to frost heaving.	Severe: high water table; moderately slow permeability.	Severe: high water table; moderately slow permeability.	Severe: high water table; moderately slow permeability.	Severe: high water table; high clay content.	Severe: high water table. Limestone at a depth of 40 to 60 inches in the Ph unit.

TABLE 6.—*Degree and kind of*

Series and map symbols	Farms	Disposal of sewage effluent	Building sites	Lawns, landscape plantings, and golf fairways
Prout: PmA, PrA	Moderate: wetness hazard.	Severe: seasonally high water table; shale at a depth of 20 to 40 inches.	Severe: seasonally high water table; shale at a depth of 20 to 40 inches.	Moderate: seasonally high water table; shale at a depth of 20 to 40 inches. The PrA unit has a channery surface.
Prout, brown subsoil variant: PsA	Slight	Severe: seasonally high water table; shale at a depth of 20 to 40 inches.	Moderate: seasonally high water table; shale at a depth of 20 to 40 inches.	Moderate: shale at a depth of 20 to 40 inches; acidity; low fertility.
PsB	Slight	Severe: seasonally high water table; shale at a depth of 20 to 40 inches.	Moderate: seasonally high water table; shale at a depth of 20 to 40 inches.	Moderate: shale at a depth of 20 to 40 inches; acidity; low fertility.
Prout, deep variant: PuA	Slight	Severe: seasonally high water table.	Severe: seasonally high water table.	Moderate: seasonally high water table.
Pyrmont: PyA	Slight	Severe: seasonally high water table; moderately slow permeability.	Moderate: seasonally high water table.	Moderate: seasonally high water table.
Pyrmont, moderately shallow variant: PzA.	Moderate: wetness hazard.	Severe: solid limestone at a depth of 20 to 40 inches; seasonally high water table.	Severe: solid limestone at a depth of 20 to 40 inches; seasonally high water table.	Moderate: seasonally high water table; solid limestone at a depth of 20 to 40 inches.
Quarries: Qu	(1)	(1)	(1)	(1)
Rawson: RcB	Slight	Severe: slow permeability below a depth of 18 to 40 inches.	Slight: substratum tends to be unstable when wet.	Slight
RdA	Slight	Severe: slow permeability below a depth of 18 to 40 inches.	Slight: substratum tends to be unstable when wet.	Slight

See footnote at end of table.

limitation for specified land uses—Continued

Streets and parking lots	Athletic fields and other intensive play areas	Campsites		Sanitary land fill	Cemeteries
		For tents	For trailers		
Moderate: seasonally high water table; shale at a depth of 20 to 40 inches.	Severe: seasonally high water table; shale at a depth of 20 to 40 inches. The PrA unit has a channery surface.	Severe: seasonally high water table. The PrA unit has a channery surface.	Severe: seasonally high water table. The PrA unit has a channery surface.	Severe: seasonally high water table; shale at a depth of 20 to 40 inches.	Severe: seasonally high water table; shale at a depth of 20 to 40 inches.
Moderate: seasonally high water table; shale at a depth of 20 to 40 inches.	Moderate: seasonally high water table; shale at a depth of 20 to 40 inches.	Moderate: seasonally high water table; shale at a depth of 20 to 40 inches.	Moderate: seasonally high water table; shale at a depth of 20 to 40 inches.	Moderate: shale at a depth of 20 to 40 inches; seasonally high water table.	Moderate: shale at a depth of 20 to 40 inches; seasonally high water table.
Moderate: slope	Moderate: slope	Moderate: seasonally high water table.	Moderate: slope	Moderate: shale at a depth of 20 to 40 inches; seasonally high water table.	Moderate: shale at a depth of 20 to 40 inches; seasonally high water table.
Moderate: seasonally high water table.	Severe: slow permeability.	Severe: slow permeability.	Severe: slow permeability.	Moderate: seasonally high water table; shale at a depth of 40 to 60 inches.	Severe: slow permeability.
Moderate: seasonally high water table.	Moderate: seasonally high water table; moderately slow permeability.	Moderate: seasonally high water table; moderately slow permeability.	Moderate: seasonally high water table; moderately slow permeability.	Moderate: seasonally high water table.	Severe: seasonally high water table; moderately slow permeability.
Severe: seasonally high water table; solid limestone at a depth of 20 to 40 inches.	Severe: solid limestone at a depth of 20 to 40 inches; seasonally high water table.	Moderate: seasonally high water table; moderately slow permeability.	Moderate: seasonally high water table; moderately slow permeability.	Severe: seasonally high water table; limestone at a depth of 20 to 40 inches.	Severe: seasonally high water table; limestone at a depth of 20 to 40 inches.
(1)	(1)	(1)	(1)	(1)	(1).
Moderate: slope	Moderate: slope	Slight	Moderate: slope	Moderate: seasonally high water table.	Moderate to severe: seasonally high water table; moderately slow to slow permeability below a depth of 18 to 40 inches.
Slight	Moderate to severe: moderately slow to slow permeability below a depth of 18 to 40 inches.	Slight	Slight	Moderate: seasonally high water table.	Moderate to severe: seasonally high water table; moderately slow to slow permeability below a depth of 18 to 40 inches.

TABLE 6.—*Degree and kind of*

Series and map symbols	Farms	Disposal of sewage effluent	Building sites	Lawns, landscape plantings, and golf fairways
Rimer: Rf, Rg	Slight	Severe: seasonally high water table; moderately slow permeability below a depth of 18 to 40 inches.	Moderate: seasonally high water table.	Moderate: seasonally high water table. The Rf unit has a sandy surface layer.
Ritchey: RhB	Moderate: droughtiness.	Severe: solid limestone at a depth of 10 to 20 inches; possible pollution of springs, wells, and other water sources.	Severe: solid limestone at a depth of 10 to 20 inches.	Severe: solid limestone at a depth of 10 to 20 inches.
Romeo: RsB, RsD, RsF	Severe: droughtiness, shallow. The RsF unit is steep.	Severe: solid limestone at a depth of less than 10 inches. The RsF unit is steep.	Severe: solid limestone at a depth of less than 10 inches. The RsF unit is steep.	Severe: solid limestone at a depth of less than 10 inches. The RsF unit is steep.
Sand pits: Sa	Not rated for farms	Slight: highly permeable material; possible pollution of springs, wells, and other water sources.	Variable	Severe: sandy texture
Shinrock:				
ShA, SkA	Slight	Severe: moderately slow permeability; seasonally high water table.	Slight	Slight
SkB	Slight	Severe: moderately slow permeability; seasonally high water table.	Slight	Slight
SkC2	Moderate: erosion hazard.	Severe: moderately slow permeability; seepage on slopes.	Moderate: slope	Moderate: erosion hazard on slopes.
SkD2, SlE, SlF	Severe: slope; erosion hazard.	Severe: seepage on slopes.	Severe: slope	Severe: slope
Shoals: Sm	Slight: wetness; flooding.	Severe: seasonally high water table; flooding.	Severe: seasonally high water table; flooding.	Moderate: seasonally high water table; flooding.
Sisson:				
SoB, SsB	Slight	Slight: possible pollution of springs, wells, and other water sources.	Slight	Slight
SoC2, SsC2	Moderate: slope; erosion hazard.	Moderate: seepage on slopes; possible pollution of springs, wells, and other water sources.	Moderate: slope	Moderate: slope
SnB	Slight	Slight: possible pollution of springs, wells, and other water sources.	Slight	Moderate: loamy fine sand surface texture.
SsD2, SsD3	Moderate: slope; erosion hazard.	Severe: seepage on slopes.	Severe: slope	Severe: slope

See footnote at end of table

limitation for specified land uses—Continued

Streets and parking lots	Athletic fields and other intensive play areas	Campsites		Sanitary land fill	Cemeteries
		For tents	For trailers		
Moderate: seasonally high water table.	Moderate: seasonally high water table; moderately slow permeability below a depth of 18 to 40 inches.	Moderate: seasonally high water table; moderately slow permeability below a depth of 18 to 40 inches.	Moderate: seasonally high water table; moderately slow permeability below a depth of 18 to 40 inches.	Severe: seasonally high water table.	Severe: seasonally high water table; moderately slow permeability below a depth of 18 to 40 inches.
Severe: solid limestone at a depth of 10 to 20 inches.	Severe: solid limestone at a depth of 10 to 20 inches.	Severe: solid limestone at a depth of 10 to 20 inches.	Severe: solid limestone at a depth of 10 to 20 inches.	Severe: solid limestone at a depth of 10 to 20 inches.	Severe: solid limestone at a depth of 10 to 20 inches.
Severe: solid limestone at a depth of less than 10 inches. The RsF unit is steep.	Severe: solid limestone at a depth of less than 10 inches. The RsF unit is steep.	Severe: solid limestone at a depth of less than 10 inches. The RsF unit is steep.	Severe: solid limestone at a depth of less than 10 inches. The RsF unit is steep.	Severe: solid limestone at a depth of less than 10 inches. The RsF unit is steep.	Severe: solid limestone at a depth of less than 10 inches. The RsF unit is steep.
Variable	Variable	Variable	Variable	Severe: highly permeable material; possible pollution of springs, wells, and other water sources.	Severe: sandy texture.
Slight	Moderate: moderately slow permeability.	Moderate: moderately slow permeability.	Moderate: moderately slow permeability.	Slight	Moderate: seasonally high water table; moderately slow permeability.
Moderate: slope	Moderate: slope; moderately slow permeability.	Moderate: moderately slow permeability.	Moderate: slope; moderately slow permeability.	Slight	Moderate: seasonally high water table; moderately slow permeability.
Severe: slope	Severe: slope	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope; moderately slow permeability.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope; moderately slow permeability.
Severe: flooding; seasonally high water table.	Moderate: seasonally high water table; flooding.	Severe: flooding; seasonally high water table.	Severe: flooding; seasonally high water table.	Severe: seasonally high water table; flooding.	Severe: seasonally high water table; flooding.
Moderate: slope.	Moderate: slope.	Slight	Moderate: slope	Slight: possible pollution of springs, wells, and other water sources.	Slight.
Severe: slope	Severe: slope	Moderate	Severe: slope	Moderate: slope	Moderate: slope.
Moderate: slope.	Moderate: slope.	Slight	Moderate: slope	Slight: possible pollution of springs, wells, and other water sources.	Moderate: loamy fine sand surface texture.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.

TABLE 6.—*Degree and kind of*

Series and map symbols	Farms	Disposal of sewage effluent	Building sites	Lawns, landscape plantings, and golf fairways
Sisson—Continued				
SsE2, StF	Severe: slope; erosion hazard.	Severe: seepage on slopes.	Severe: slope	Severe: slope
Sloan: Sv	Moderate: wetness hazard; hard to drain.	Severe: flooding; high water table.	Severe: flooding; high water table.	Severe: flooding; high water table.
Tawas: Ta	Severe: wetness hazard.	Severe: high water table	Severe: high water table.	Severe: high water table; muck surface layer.
Toledo: Tc, To, Tp	Moderate: wetness hazard.	Severe: high water table; slow permeability.	Severe: high water table; soft and unstable.	Severe: high water table.
Trumbull: Tr	Moderate: wetness hazard.	Severe: high water table; slow permeability.	Severe: high water table.	Severe: high water table.
Tuscola:				
TsA, TuA, TwA	Slight	Slight: possible pollution of springs, wells, and other water sources.	Slight	For the TuA and TwA units, slight. For the TsA unit, moderate: sandy texture.
TuB, TwB	Slight	Slight: possible pollution of springs, wells, and other water sources.	Slight	Slight
Vaughnsville: Va	Slight: wetness hazard.	Severe: seasonally high water table; seepage.	Moderate: seasonally high water table; seepage.	Moderate: seasonally high water table.
Warners: Wa, Wc	Severe: wetness hazard.	Severe: high water table	Severe: high water table; soft, unstable material.	Severe: high water table; muck or marl; chunks of travertine in some areas.
Washtenaw: Wh	Slight: wetness hazard; overwashing.	Severe: high water table; overwashing.	Severe: high water table; overwashing; soft and unstable when wet.	Severe: high water table; overwashing.
Wayland: Wn	Moderate: wetness hazard.	Severe: high water table; flooding.	Severe: high water table; flooding.	Severe: high water table; flooding.
Wilmer: Wo	Slight: wetness hazard.	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Moderate: seasonally high water table.

[1] Properties variable; onsite investigation required.

limitation for specified land uses—Continued

Streets and parking lots	Athletic fields and other intensive play areas	Campsites		Sanitary land fill	Cemeteries
		For tents	For trailers		
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: flooding; high water table.	Severe: flooding; high water table.	Severe: flooding; high water table.	Severe: flooding; high water table.	Severe: flooding; high water table.	Severe: flooding; high water table.
Severe: high water table; susceptibility to frost heaving.	Severe: high water table; muck surface layer.	Severe: high water table; muck surface layer.	Severe: high water table; muck surface layer.	Severe: high water table; muck surface layer.	Severe: high water table; muck surface layer.
Severe: high water table.	Severe: high water table; slow permeability; silty clay texture.	Severe: high water table; slow permeability.	Severe: high water table; slow permeability.	Severe: high water table; high clay content.	Severe: high water table; slow permeability; silty clay texture.
Severe: high water table.	Severe: high water table; slow permeability.	Severe: high water table; slow permeability.	Severe: high water table; slow permeability.	Severe: high water table; high clay content; ponding.	Severe: high water table; slow permeability.
Slight	Slight	Slight	Slight	Slight	Moderate: seasonally high water table.
Moderate: slope	Moderate: slope	Slight	Moderate: slope	Slight	Moderate: seasonally high water table.
Moderate: seasonally high water table.	Moderate: seasonally high water table; slope if more than 2 percent.	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Severe: seasonally high water table; seepage.	Severe: seasonally high water table; seepage.
Severe: high water table; susceptibility to frost heaving; soft, unstable material.	Severe: high water table; muck or marl surface layer.	Severe: high water table; muck or marl surface layer.	Severe: high water table; muck or marl surface layer.	Severe: high water table; muck or marl surface layer.	Severe: high water table; muck or marl surface layer.
Severe: high water table; overwashing.	Severe: high water table; overwashing.	Severe: high water table; overwashing.	Severe: high water table; overwashing.	Severe: high water table; overwashing.	Severe: high water table; overwashing.
Severe: high water table; flooding.	Severe: high water table; flooding.	Severe: high water table; flooding.	Severe: high water table; flooding.	Severe: high water table; flooding.	Severe: high water table; flooding.
Moderate: seasonally high water table.	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.

Figure 7.—**Ohio Turnpike, in area of Lewisburg and Pyrmont soils.**

soils, the seepage of effluent is very slow. If the soils have a sandy or gravelly substratum, effluent may seep away without adequate filtration and pollute nearby streams and other water sources. If a filter field has a steep slope, effluent may seep to the surface on the lower part of the slope.

BUILDING SITES.—The degrees of limitation for building sites apply to residential, commercial, institutional, and light industrial buildings that have basements and are no more than three stories high. They depend largely on depth to bedrock, slope, natural drainage, the flood hazard, and surface stoniness. Methods of sewage disposal are not considered.

If the soils are shallow over bedrock, digging basements and installing utility lines are difficult and expensive. Basements in poorly drained and somewhat poorly drained soils are likely to be wet unless foundation drainage is provided. By means of extensive systems of tile drains and open ditches, large areas of the wet soils in Erie County have been made suitable for farming. Excavations for buildings are apt to disrupt these artificial drainage systems. A combination of poor natural drainage and silty texture makes soils soft and compressible and, consequently, unfavorable for foundations. Heaving and cracking of foundations can be expected if the soils have high shrink-swell potential. Flooding, even if infrequent, causes costly damage.

LAWNS, LANDSCAPE PLANTINGS, AND GOLF FAIRWAYS.—The degrees of limitation for these uses depend upon natural drainage, slope, depth to bedrock, surface texture, stoniness, flood hazard, and available moisture capacity. Generally, the original surface layer in an area is better for growing lawn grasses and ornamentals than either fill brought from other areas or soil material taken from excavations. The surface layer can be scalped before construction is begun, stored away from the construction site, and then replaced after construction and grading are finished. The natural surface layer removed in grading for streets also can be used for lawns.

Some of the soils of Erie County are shallow over very acid shale. If any of this shale is mixed with the surface layer, lawn grasses are hard to establish. The amount of supplemental watering that will be needed to maintain a lawn depends largely on the depth and nature of the soil. This is important in parts of the county where water is scarce. Grading of steep slopes can cause erosion.

STREETS AND PARKING LOTS.—The degrees of limitation for streets and parking lots are based upon depth to the water table, slope, depth to bedrock, flooding hazard, and stoniness. They apply only to residential streets, which carry a minimum of heavy-duty traffic. Soils that have severe limitations can be located by means of the soil map and avoided so far as possible. If they cannot be avoided, the problems associated with their use can be identified.

Estimates of soil properties important in highway construction and maintenance are also given in the section "Engineering Uses of the Soils."

ATHLETIC FIELDS AND OTHER INTENSIVE PLAY AREAS.—The degrees of limitation depend largely on natural drainage, slope, depth to bedrock, stoniness, permeability, surface texture, and flood hazard. It is assumed that no fill is to be used. Well-drained, medium-textured soils have only slight limitations. Soils that are wet, steep, very sandy, very clayey, or very shallow have severe limitations. Flooding is a severe limitation, if it occurs. The degree of limitation for athletic fields can be slight or moderate, depending on the frequency and duration of local flooding.

CAMPSITES.—Campsites have to be suitable, without surfacing, for parking cars and trailers and for outdoor living during the camping season. The degrees of limitation depend largely on drainage and flood hazard. Permeability, slope, and texture also have to be considered. Well drained and moderately well drained soils have the least limitations. Poorly drained and very poorly drained soils, soils in depressions, and soils subject to flooding have the most limitations. Permeable soils are less limited than impermeable ones, because they dry more quickly. A slope of less than 12 percent is best for tent sites. Slope is a more critical factor for trailer sites than for tent sites. Medium-textured soils have less serious limitations than either coarse-textured or fine-textured ones.

SANITARY LAND FILL.—Among the properties that affect the degrees of limitation for sanitary land fill are drainage, flood hazard, slope, depth to bedrock, texture, permeability, and stoniness. Natural drainage is a critical factor. All soils that are subject to flooding have severe limitations. Slope is important, because heavy equipment has to be used and because of the erosion hazard on bare slopes. Coarse-textured soils have less serious limitations than medium-textured and fine-textured soils because they are easier to move. All permeable soils are limited by the risk of contamination of ground water.

CEMETERIES.—Among the soil properties that affect the degree of limitation for cemeteries, natural drainage and depth to bedrock are of prime importance. Others are flooding, texture, and slope. The limitation is slight if drainage is good, moderate if drainage is moderately good, and severe if drainage is poor or somewhat poor. All soils that are subject to flooding have severe limitations. If graves have to be dug below the water table, they will fill with water. The depth to and kind of bedrock is important if depth to bedrock is less than 6 feet. Medium-textured soils have fewer limitations than coarse-textured or fine-textured soils. Slope is important because of its effect on trafficability.

Descriptions of the Soils

In this section the soils of Erie County are described in detail. The procedure is to describe first the soil series and then the mapping units in that series. Thus, to get full information on any one mapping unit, it is necessary to read both the description of that unit and the description of the soil series to which the unit belongs.

Each series description contains a short description of a soil profile considered typical of the series and a much more detailed description of the same profile that scientists, engineers, and others can use in making highly technical interpretations. If the profile of a given mapping unit differs from this typical profile, the differences are stated in the description of the mapping unit, unless they are apparent from the name of the mapping unit. The colors described are for moist soils, unless otherwise noted. Those that have a Munsell color value of 4 or more are considered to be light colored; those that have a color value of less than 4 are considered to be dark colored. Many of the terms used in describing soil series and mapping units are defined in the Glossary, and others are defined in the section "How This Survey Was Made."

The approximate acreage and proportionate extent of the soils are shown in table 7. At the back of this soil survey is the "Guide to Mapping Units," which lists the mapping units in the county and shows the capability unit each mapping unit is in and the pages on which the mapping units and capability units are described.

Alexandria Series

The Alexandria series consists of light-colored, well-drained soils that formed in moderately high lime glacial till. These soils are on the side slopes of stream valleys in the western and northern parts of the county.

A typical profile has an 8-inch plow layer of grayish-brown, friable silt loam. Below the plow layer is a 3-inch layer of yellowish-brown friable silt loam. The subsoil is about 19 inches thick. The uppermost third is yellowish-brown, firm clay; the middle part is mottled, yellowish-brown, firm silty clay loam; and the lowest part is mottled, brown, firm silty clay loam. The underlying material is mottled, brown, firm, limy silty clay loam (glacial till).

Permeability is moderately slow, and the available moisture capacity is medium. Runoff is rapid. Erosion is a hazard, and tilth is poor if the original surface layer has been removed. In spite of the erosion hazard, all but the steepest areas are used for crops.

Typical profile of Alexandria silt loam, in a cultivated field, 400 feet east of State Route 269 and 300 feet north of Strecker Road; lot 20, sec. 3, Groton Township.

Ap—0 to 8 inches, grayish-brown (10YR 5/2) silt loam; weak, coarse, subangular blocky structure (cloddy); friable; neutral; abrupt, smooth boundary.

A2—8 to 11 inches, yellowish-brown (10YR 5/4) silt loam; weak, medium, platy structure; friable; medium acid; abrupt, irregular boundary.

B21t—11 to 18 inches, yellowish-brown (10YR 5/4) light clay; moderate, coarse, prismatic structure breaking to moderate, medium, angular blocky; firm; continuous, moderately thick, brown (10 YR 4/3) clay films on ped surfaces; medium acid; gradual boundary.

B22t—18 to 24 inches, yellowish-brown (10YR 5/4) heavy silty clay loam; common, medium, distinct mottles of yellowish brown (10YR 5/8); moderate, coarse, prismatic structure breaking to moderate, medium, angular blocky; firm; discontinuous, moderately thick, brown (10YR 4/3) clay films on ped surfaces; slightly acid; gradual boundary.

B3—24 to 30 inches, brown (10YR 5/3) silty clay loam; many, coarse, distinct mottles of dark grayish brown (10YR 4/2); moderate, medium, prismatic structure breaking to moderate, medium, subangular blocky; firm; neutral; clear, smooth boundary.

TABLE 7.—*Approximate acreage and proportionate extent of the soils*

Soil	Acres	Percent
Alexandria silt loam, 6 to 18 percent slopes	156	0.1
Alexandria silt loam, 18 to 40 percent slopes, moderately eroded	228	.1
Allis silty clay loam, 0 to 2 percent slopes	5,228	3.1
Allis silty clay loam, 2 to 6 percent slopes	456	.3
Allis stony silt loam, 0 to 2 percent slopes	195	.1
Arkport loamy fine sand, 0 to 2 percent slopes	351	.2
Arkport loamy fine sand, 2 to 6 percent slopes	2,201	1.3
Arkport loamy fine sand, 6 to 12 percent slopes	238	.1
Arkport loamy fine sand, 12 to 18 percent slopes	118	.1
Arkport loamy fine sand, moderately shallow variant, 0 to 2 percent slopes	210	.1
Arkport loamy fine sand, moderately shallow variant, 2 to 6 percent slopes	196	.1
Beaches	407	.2
Beaches, wet	190	.1
Belmore sandy loam, 2 to 6 percent slopes	237	.1
Belmore sandy loam, 6 to 12 percent slopes	130	.1
Belmore loam, 0 to 2 percent slopes	218	.1
Belmore loam, 2 to 6 percent slopes	184	.1
Bennington loam, 0 to 2 percent slopes	363	.2
Bennington silt loam, 0 to 2 percent slopes	2,469	1.5
Bennington silt loam, 2 to 6 percent slopes	178	.1
Bennington-Pyrmont silt loams, limestone substratum, 0 to 2 percent slopes	1,263	.8
Berks channery silt loam, 0 to 6 percent slopes	526	.3
Berks channery silt loam, 6 to 18 percent slopes	146	.1
Berks channery soils, 18 to 60 percent slopes	257	.2
Bogart loam, 0 to 2 percent slopes	1,469	.9
Bogart loam, 2 to 6 percent slopes	1,038	.6
Borrow pits	1,424	.8
Cardington silt loam, 0 to 2 percent slopes	271	.2
Cardington silt loam, 2 to 6 percent slopes	522	.3
Casco loam, very flaggy subsoil variant, 0 to 2 percent slopes	166	.1
Casco loam, very flaggy subsoil variant, 2 to 6 percent slopes	383	.2
Casco loam, very flaggy subsoil variant, 6 to 18 percent slopes	127	.1
Castalia very channery silt loam, 0 to 2 percent slopes	1,662	1.0
Castalia very channery silt loam, 2 to 6 percent slopes	246	.1
Chili loam, 0 to 2 percent slopes	204	.1
Chili loam, 2 to 6 percent slopes	888	.5
Chili loam, 6 to 12 percent slopes	220	.1
Chili loam, 12 to 18 percent slopes	76	(1)
Colwood fine sandy loam	944	.6
Colwood silt loam	3,584	2.1
Colwood silt loam, limestone substratum	210	.1
Colwood silt loam, acid variant	1,395	.8
Colwood silty clay loam, acid variant	1,388	.8
Colyer shaly loam, 0 to 2 percent slopes	421	.3
Colyer shaly loam, 2 to 12 percent slopes	125	.1
Colyer soils, 12 to 50 percent slopes	248	.1
Darroch silt loam	1,421	.8
Darroch fine sandy loam, coarse subsoil variant	2,399	1.4
Dekalb fine sandy loam, 0 to 2 percent slopes	111	.1
Dekalb fine sandy loam, 2 to 6 percent slopes	289	.2
Del Rey loam, 0 to 2 percent slopes	1,458	.9
Del Rey silt loam, 0 to 2 percent slopes	5,847	3.5
Del Rey silt loam, 2 to 6 percent slopes	263	.2
Digby sandy loam, 0 to 2 percent slopes	569	.3
Digby loam, 0 to 2 percent slopes	565	.3
Eel silt loam	351	.2
Elliott silt loam, 0 to 2 percent slopes	506	.3
Elliott silty clay loam, 0 to 2 percent slopes	367	.2
Ellsworth silt loam, 0 to 2 percent slopes	121	.1
Ellsworth silt loam, 2 to 6 percent slopes	1,643	1.0
Ellsworth silt loam, 6 to 12 percent slopes, moderately eroded	325	.2
Ellsworth silt loam, 12 to 18 percent slopes, moderately eroded	224	.1
Ellsworth and Chili soils, 18 to 50 percent slopes	578	.3
Fries silt loam	460	.3
Fries silty clay loam	1,495	.9
Fulton silty clay loam, 0 to 2 percent slopes	2,503	1.5
Fulton silty clay loam, 2 to 6 percent slopes	134	.1
Galen loamy fine sand, 0 to 2 percent slopes	3,510	2.1
Galen loamy fine sand, 2 to 6 percent percent slopes	1,157	.7
Galen loamy fine sand, limestone substratum, 0 to 6 percent slopes	211	.1
Galen loamy fine sand, shale substratum, 0 to 6 percent slopes	323	.2
Gilford fine sandy loam	825	.5
Gravel pits	49	(1)
Haskins loam, 0 to 2 percent slopes	2,390	1.4
Haskins loam, 2 to 6 percent slopes	236	.1
Haskins loam, dark surface variant, 0 to 2 percent slopes	562	.3
Jimtown loam, 0 to 2 percent slopes	1,417	.8
Joliet silt loam	614	.4
Kibbie fine sandy loam, 0 to 2 percent slopes	5,321	3.2
Kibbie fine sandy loam, 2 to 6 percent slopes	131	.1
Kibbie silt loam, 0 to 2 percent slopes	836	.5
Kibbie fine sandy loam, moderately shallow variant, 0 to 2 percent slopes	457	.3
Kibbie silt loam, acid variant, 0 to 2 percent slopes	767	.5
Lenawee silt loam	4,039	2.4
Lenawee silty clay loam	3,888	2.3
Lewisburg silt loam, 0 to 2 percent slopes	82	(1)
Lewisburg silt loam, 2 to 6 percent slopes	134	.1
Lewisburg silt loam, moderately shallow variant, 0 to 2 percent slopes	2,416	1.4

See footnote at end of table.

TABLE 7.—*Approximate acreage and proportionate extent of the soils*—Continued

Soil	Acres	Percent
Lewisburg silt loam, moderately shallow variant, 2 to 6 percent slopes	637	.4
Lewisburg silt loam, moderately shallow variant, 6 to 12 percent slopes	94	.1
Lobdell silt loam	255	.2
Loudonville loam, 0 to 2 percent slopes	237	.1
Loudonville loam, 2 to 6 percent slopes	576	.3
Loudonville loam, 6 to 12 percent slopes	168	.1
Made land	1,615	1.0
Mahoning loam, 0 to 2 percent slopes	1,385	.8
Mahoning silt loam, 0 to 2 percent slopes	7,571	4.5
Mahoning silt loam, 2 to 6 percent slopes	957	.6
Mahoning stony silt loam, 0 to 2 percent slopes	232	.1
Mahoning loam, sandstone substratum, 0 to 2 percent slopes	406	.2
Mahoning silt loam, shale substratum, 0 to 2 percent slopes	621	.4
Marsh	3,284	1.9
Mermill silt loam	967	.6
Mermill silty clay loam	258	.2
Metea loamy fine sand, 0 to 2 percent slopes	1,366	.8
Metea loamy fine sand, 2 to 6 percent slopes	686	.4
Metea loamy fine sand, 6 to 12 percent slopes	130	.1
Millgrove loam	1,017	.6
Millgrove silty clay loam	166	.1
Millsdale silt loam	791	.5
Millsdale silty clay loam	935	.6
Miner silty clay loam	2,666	1.6
Mitiwanga loam, 0 to 2 percent slopes	678	.4
Oakville loamy fine sand, 2 to 6 percent slopes	252	.2
Oakville loamy fine sand, 6 to 12 percent slopes	109	.1
Oakville loamy fine sand, 12 to 25 percent slopes	127	.1
Orrville silt loam	1,196	.7
Oshtemo loamy sand, 0 to 2 percent slopes	353	.2
Oshtemo loamy sand, 2 to 6 percent slopes	596	.4
Oshtemo sandy loam, 0 to 2 percent slopes	250	.2
Oshtemo sandy loam, 2 to 6 percent slopes	473	.3
Pewamo silty clay loam	8,590	5.1
Pewamo silty clay	725	.4
Pewamo silty clay loam, limestone substratum	594	.4
Prout loam, 0 to 2 percent slopes	1,853	1.1
Prout channery loam, 0 to 2 percent slopes	143	.1
Prout loam, brown subsoil variant, 0 to 2 percent slopes	265	.2
Prout loam, brown subsoil variant, 2 to 6 percent slopes	187	.1
Prout silt loam, deep variant, 0 to 2 percent slopes	2,182	1.3
Pyrmont silt loam, 0 to 2 percent slopes	589	.4
Pyrmont silt loam, moderately shallow variant, 0 to 2 percent slopes	1,928	1.1
Quarries	1,153	.7
Rawson fine sandy loam, 2 to 6 percent slopes	560	.3
Rawson loam, 0 to 2 percent slopes	410	.2
Rimer loamy fine sand	537	.3
Rimer fine sandy loam	1,117	.7
Ritchey loam, 0 to 6 percent slopes	973	.6
Romeo silt loam, 0 to 6 percent slopes	1,447	.9
Romeo silt loam, 6 to 18 percent slopes	194	.1
Romeo silt loam, 18 to 50 percent slopes	59	(1)
Sand pits	54	(1)
Shinrock loam, 0 to 2 percent slopes	486	.3
Shinrock silt loam, 0 to 2 percent slopes	543	.3
Shinrock silt loam, 2 to 6 percent slopes	1,400	.8
Shinrock silt loam, 6 to 12 percent slopes, moderately eroded	556	.3
Shinrock silt loam, 12 to 18 percent slopes, moderately eroded	374	.2
Shinrock soils, 18 to 25 percent slopes	165	.1
Shinrock soils, 25 to 40 percent slopes	580	.3
Shoals silt loam	1,090	.6
Sisson loamy fine sand, 2 to 6 percent slopes	516	.3
Sisson fine sandy loam, 2 to 6 percent slopes	314	.2
Sisson fine sandy loam, 6 to 12 percent slopes, moderately eroded	340	.2
Sisson silt loam, 2 to 6 percent slopes	125	.1
Sisson silt loam, 6 to 12 percent slopes, moderately eroded	573	.3
Sisson silt loam, 12 to 18 percent slopes, moderately eroded	496	.3
Sisson silt loam, 12 to 18 percent slopes, severely eroded	1,032	.6
Sisson silt loam, 18 to 25 percent slopes, moderately eroded	316	.2
Sisson soils, 25 to 50 percent slopes	774	.5
Sloan silt loam	1,982	1.2
Tawas muck	35	(1)
Toledo silty clay loam	1,195	.7
Toledo silty clay	3,571	2.1
Toledo silty clay, calcareous variant	912	.5
Trumbull silt loam	886	.5
Tuscola loamy fine sand, 0 to 2 percent slopes	1,058	.6
Tuscola fine sandy loam, 0 to 2 percent slopes	2,674	1.6
Tuscola fine sandy loam, 2 to 6 percent slopes	1,310	.8
Tuscola silt loam, 0 to 2 percent slopes	328	.2
Tuscola silt loam, 2 to 6 percent slopes	363	.2
Vaughnsville loam	80	(1)
Warners soils	2,029	1.2
Warners soils, clayey subsoil variant	503	.3
Washtenaw soils	907	.5
Wayland silt loam	567	.3
Wilmer loam	513	.3
Water (areas 2 to 40 acres in size and streams less than ⅛-mile wide)	1,603	.9
Total	168,960	100.0

[1] Less than 0.05 percent.

C—30 to 60 inches, brown silty clay loam; many, medium, faint mottles of dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4); massive; firm; many, small, gray (10YR 5/1) carbonate concretions; calcareous.

The surface layer ranges from dark grayish brown (10YR 4/2) in slightly eroded or uneroded areas to yellowish brown (10YR 5/4) in severely eroded areas. There is either a very thin A2 horizon or none in severely eroded areas and in some moderately eroded areas. The Bt horizon ranges from heavy clay loam to light clay. This horizon has a clay content of 35 to 42 percent. It is free of gray mottles in the uppermost 10 inches, but in some areas it has bright-colored mottles throughout. The depth to carbonates ranges from 20 to 30 inches. Reaction in the solum ranges from medium acid to neutral. The content of stones and pebbles in the solum is about 5 percent, and that in the underlying glacial till is as much as 10 percent. The underlying till is clay loam or silty clay loam.

Alexandria soils are free of mottles to a greater depth than the moderately well drained Cardington soils, which occupy less sloping areas nearby. They are more clayey than Sisson soils and less clayey than Shinrock soils, and they have a brighter colored, less dense subsoil than Ellsworth soils. Alexandria soils differ from Belmore soils in lacking gravel.

Alexandria silt loam, 6 to 18 percent slopes (AdD).—This soil occurs as small areas on the sides of valleys and large sinkholes. It has the profile described as typical of the series.

Included in mapping were small areas in which the surface layer is darker colored and some in which it is yellowish brown. Also included were small areas that have slopes of less than 6 percent.

Most areas have been cleared. Small grain, corn, hay, and pasture are the principal crops. Productivity is moderate, though the erosion hazard is severe. Intensive measures are needed to control erosion of the steeper parts. (Capability unit IIIe–2)

Alexandria silt loam, 18 to 40 percent slopes, moderately eroded (AdF2).—This soil is on the sides of major stream valleys. Slopes range mainly between 25 and 35 percent, but the extreme range is 18 to 40 percent. The profile is similar to the one described as typical of the series, but in some areas the depth to limy material is as little as 20 inches. Drainage is generally good, but some areas as much as a quarter acre in size are kept wet by springs and seep spots. The degree of erosion varies within small areas. In general, the surface layer is lighter colored in the more eroded areas.

This soil erodes rapidly if not protected by vegetation. It is not suitable for cultivation. Most areas are woodland or permanent pasture. (Capability unit VIIe–1)

Allis Series

The Allis series consists of nearly level to gently sloping, light-colored, poorly drained to somewhat poorly drained soils that formed in thin glacial deposits and are underlain at a depth of 20 to 40 inches by shale. These soils occur as relatively large areas in a belt that extends from northeast to southwest across the county. Fries and Mahoning soils are in the same general areas.

A typical profile has a surface layer of firm silty clay loam that is dark grayish brown in the uppermost 4 inches and yellowish brown and mottled in the lower 8 inches. The subsoil consists of a 12-inch layer of grayish-brown, mottled, firm silty clay. The lower part of the subsoil has fewer vertical cracks and more horizontal cracks than the upper part. At a depth of 24 inches is a layer of light olive-gray silty clay loam and soft shale. The soft shale is hard to distinguish from the clayey soil material. Bedrock of weathered shale is within 40 inches of the surface. The shale gradually becomes harder with depth.

The available moisture capacity is low to medium, depending on the depth to shale. The organic-matter content is low. Productivity is low because of wetness, acidity, poor tilth, and low organic-matter content.

Because of the low productivity, some areas that were once farmed have been abandoned. The acreage still farmed is used for hay, small grain, and corn. Artificial drainage is needed for economic production of the common crops.

Typical profile of Allis silty clay loam, 0 to 2 percent slopes, in a wooded area, 0.1 mile east of the corner of Ashmont and Poorman Roads; lot 8, sec. 3, Vermilion Township.

A1—0 to 4 inches, dark grayish-brown (10YR 4/2) silty clay loam; moderate, medium, crumb structure; firm; strongly acid; abrupt, wavy boundary.

A2—4 to 12 inches, yellowish-brown (10YR 5/4) silty clay loam; common, medium, distinct mottles of yellowish brown (10YR 5/8); weak, fine, subangular blocky structure; firm; very strongly acid; clear, wavy boundary.

B2g—12 to 24 inches, grayish-brown (2.5Y 5/2) silty clay; many, coarse, prominent mottles of yellowish brown (10YR 5/6) and few, coarse, prominent mottles of reddish brown (5YR 5/4); moderate, medium, prismatic structure breaking to weak, thin, platy; firm; thin, patchy, dark grayish-brown (2.5Y 4/2) clay films on vertical ped faces; very strongly acid; abrupt, irregular boundary.

IIB-R—24 to 40 inches, light olive-gray (5Y 6/2) silty clay loam and soft shale; many, coarse, prominent mottles of yellowish-brown (10YR 5/6); strong, thin, platy structure inherited from the bedding of the shale; firm; very strongly acid; gradual boundary.

R—40 to 60 inches, light-gray (N 7/0) weathered shale; many, coarse, prominent mottles of yellowish red (5Y 5/6); strong, thin, platy structure; very firm; extremely acid.

In cultivated areas the A1 horizon and the upper part of the A2 horizon have been mixed and now form an Ap horizon. The effect of underlying shale on profile development is extremely variable within short distances. In some areas the platy, shale-derived soil material extends to a depth of only 20 inches, but in adjacent areas, glacial till of mixed lithology extends to a depth of 3 or 4 feet. The depth to acid shale bedrock is dominantly 20 to 40 inches. Solid shale is not present within 3½ feet of the surface in all places, but weathered shaly material is present within 4 feet of the surface in almost all places. Isolated fragments of hard shale and sandstone are common in the upper part of the profile.

Allis soils are finer textured than Prout soils, and have poorer tilth because their organic-matter content is generally lower. They are more acid and are shallower to shale than Mahoning soils. Allis soils differ from Fulton soils in being more acid and in being underlain by shale. They have a lighter colored surface layer than the very poorly drained Fries soils, which occupy nearby depressions.

Allis silty clay loam, 0 to 2 percent slopes (AlA).—This soil has the profile described as typical of the series. It occurs as large areas, some nearly a square mile in size and many more than a hundred acres in size. In some low areas, the second layer is dominantly gray. A few very small knolls and ridges are slightly better drained. In numerous small areas the depth to shale is

more than 40 inches, although in most of these areas, there is soft or weathered shale above a depth of 40 inches. Included are a few areas of the Prout soils, which are friable loam or silt loam down to within a few inches of the shale. In some areas, the soil material above the shale is glacial till, which contains numerous pebbles and a few stones, and in other areas, the soil material is water laid and is stone free. There are a few short slopes of more than 2 percent.

Most areas were once cleared, but several have been abandoned and are growing up to brush. The larger areas in the eastern part of the county are still being farmed and are used mainly for hay and pasture crops, but there are also small acreages used for grapes, small grain, and corn. In the scattered areas in the central and western parts of the county, small grain and corn are important crops. Numerous homes have been built on this soil, especially in Vermilion Township (Capability unit IVw–1)

Allis silty clay loam, 2 to 6 percent slopes (AlB).—This soil is on the sides of minor natural drainageways and on the sides and tops of low knolls. Most areas are long and narrow and less than 20 acres in size. The profile is similar to the one described as typical of the series, but in some areas the upper part of the subsoil is more brown and less gray.

Included in mapping were a few small areas in which the surface layer is silt loam and numerous small areas where the slope is either less than 2 percent or more than 6 percent. Also included were small areas in which the depth to hard shale is more than 40 inches, although in most such areas there is soft or weathered shale above a depth of 40 inches. On the surface in a few areas are glacial stones 1 foot to 3 feet in diameter.

Most areas are in woodland or pasture, but some are within cultivated fields. Runoff is moderate to rapid. Erosion of cultivated areas is a slight hazard. Wetness and poor tilth are the main limitations. (Capability unit IVw–1)

Allis stony silt loam, 0 to 2 percent slopes (AoA).—This soil is in the northeastern part of the county. It is flooded occasionally. The largest areas are along Chappel Creek and Sugar Creek in Vermilion Township.

In some areas of this soil, especially in those along Chappel Creek and Sugar Creek, numerous cobblestones and sandstone flagstones are mixed through the entire profile above the shale. Some of the flagstones are as much as 4 feet across. The creeks in these areas run on the shale, and the soil material and stones were deposited during floods. Generally, the soil mass is about 40 percent cobblestones more than 3 inches in diameter and about 20 percent stones more than a foot in diameter. These proportions vary within short distances. Abandoned stream channels dissect these areas.

In other areas, about 30 percent of the soil mass consists of stones, boulders, and flagstones of sandstone and granite, 6 inches to 2 feet in diameter. In a few small areas there are large boulders on the surface but few stones in the soil.

Included in mapping were small areas that have slopes of more than 2 percent and some low spots occupied by the very poorly drained Fries soils.

Most of the acreage has not been cleared. Much of what has been cleared is used for permanent pasture. In all areas the stones severely limit use. Runoff is slow. (Capability unit IVw–1)

Arkport Series

The Arkport series consists of nearly level to moderately steep, light-colored, well-drained soils. These soils are generally on small ridges and are commonly adjacent to or surrounded by Galen, Colwood, and other less well drained soils.

A typical profile in a cultivated field has a surface layer that consists of 9 inches of dark grayish-brown, very friable loamy fine sand over 12 inches of yellowish-brown, loose very fine sand. Below this is a 6-inch layer of yellowish-brown, loose very fine sand that contains bands of strong-brown, friable loamy very fine sand, and below this, a 21-inch layer of light yellowish-brown, loose very fine sand that contains bands and nodules of strong-brown, friable very fine sandy loam. The underlying material is stratified light yellowish-brown very fine sand and yellowish-brown very fine sand. This layer contains bands and nodules of strong-brown very fine sandy loam. There is no mottling, but the contrasting color of some of the bands and nodules resembles mottling.

Runoff is slow, permeability is rapid, and the available moisture capacity is low. The gently sloping, moderately sloping, and moderately steep phases are more droughty than the nearly level phase.

Most of the acreage is cropland. The control of wind erosion is a problem in most areas; it is most serious where early varieties of vegetables are grown. The nearly level and gently sloping soils are moderately productive and are suitable for irrigation.

Typical profile of Arkport loamy fine sand (Er–20), 2,900 feet east of State Route 4, 2,200 feet south of Fox Road; lot 9, sec. 4, Perkins Township (Core samples for Bureau of Public Roads taken 9/21/64, at depths of 3 to 6 inches, 13 to 16 inches, 23 to 26 inches, and 40 to 43 inches).

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) loamy fine sand; single grain; neutral; abrupt, smooth boundary.

A3—9 to 21 inches, yellowish-brown (10YR 5/8) very fine sand; single grain; loose; slightly acid; clear, irregular boundary.

A&B1—21 to 27 inches, yellowish-brown (10YR 5/8) very fine sand; single grain; loose; 10 percent bands of strong-brown (7.5YR 5/6), friable loamy very fine sand; slightly acid; clear, irregular boundary.

A&B2—27 to 48 inches, light yellowish-brown (10YR 6/5) very fine sand; 40 percent thin, irregular bands (Bt horizon) and nodules of strong-brown (7.5YR 5/6) very fine sandy loam; massive; matrix loose, bands friable; slightly acid; clear, smooth boundary.

C—48 to 60 inches, stratified light yellowish-brown (10YR 6/4) and yellowish-brown (10YR 5/4) very fine sand; single grain; loose; few thin bands and nodules of strong-brown (7.5YR 5/6) very fine sandy loam; neutral.

In eroded areas the surface layer is light grayish brown or light yellowish brown. More than 90 percent of the sand particles in the profile are either fine or very fine in size. The chief variables are the thickness, number, and vertical placement of the Bt horizons. The thickness ranges from 6 to 10 inches, and the number from 2 to more than 20. The soil material in the Bt horizons ranges from fine sandy loam to loam, and the material between them from fine sand to loamy very fine sand. The depth to the first band of the Bt horizon ranges from 10 to 30 inches. In addition to the bands, there

are irregularly shaped masses of Bt horizon material in many places. The reaction in the upper part of the profile ranges from medium acid to mildly alkaline. Carbonates occur below a depth of 48 inches in some places.

Arkport soils differ from Oakville soils in having bands and nodules of fine sandy loam. They are well drained; in the A&B horizons, they have slightly brighter colors (higher chromas) than the moderately well drained Galen soils; and they are free of mottles. Arkport soils contain more fine sand and very fine sand but less coarse sand and less gravel than Oshtemo soils. They are generally coarser textured than Sisson soils.

Arkport loamy fine sand, 0 to 2 percent slopes (ArA).—This soil occurs as small areas on deltas and outwash plains and on the tops of sand ridges. As a result of wind erosion, a few spots have a lighter colored surface layer than is typical of Arkport soils.

Included in mapping were small areas of the moderately well drained Galen soils, which occur in shallow depressions; a few small areas of Oshtemo soils; a few of Oakville soils; and a few of Sisson soils.

Most of the acreage is cropland and is farmed with surrounding soils. Cabbage, tomatoes, other vegetables, and field crops are grown. Vegetable crops are irrigated with sprinkler systems. (Capability unit IIs–1)

Arkport loamy fine sand, 2 to 6 percent slopes (ArB).—This soil has the profile described as typical of the series. It occurs as small areas on the sides of low sand ridges and on the sides of natural drainageways on deltas and outwash plains. In a few spots, the surface layer is lighter colored than is typical, as a result of wind erosion.

Included in mapping were small areas of the moderately well drained Galen soils, which are on the lower slopes of some of the ridges; a few small areas of Oakville soils; and a few small areas of Sisson soils.

Most of the acreage is cropland. Cabbage, tomatoes, sweet corn, and other vegetables are grown in addition to corn and wheat. Vegetable crops are irrigated with sprinkler systems. (Capability unit IIs–1)

Arkport loamy fine sand, 6 to 12 percent slopes (ArC).—This soil occurs mostly as long narrow areas on the sides of low sand ridges and of natural drainageways on deltas and outwash plains. In a few spots the surface layer is light grayish brown, as a result of erosion by wind and water.

Included in mapping were small areas of Oakville soils; small areas of Sisson soils, which occur on some slopes in the central part of the county: narrow strips on the tops of some of the ridges where the slope is less than 6 percent; and narrow strips where the slope is more than 12 percent.

Some of the acreage is cropland, and some is pasture. Control of blowing sand is a problem in a few areas. (Capability unit IIIe–1)

Arkport loamy fine sand, 12 to 18 percent slopes (ArD).—This soil occurs as long narrow areas on the side slopes of a few stream valleys on outwash plains and sandy deltas. In a few small areas, the surface layer is light grayish brown, as a result of erosion by wind and water.

Included in mapping were small areas of Oakville soils; small areas of Sisson soils; narrow strips on the top of some of the ridges where the slope is less than 12 percent; and a few small areas where the slope is more than 18 percent.

Most areas are pasture, but a few small areas are within cultivated fields. Control of blowing sand is a problem in some cultivated areas and in pastures that have been overgrazed. The blowing sand can damage vegetable crops in nearby areas. (Capability unit IVe–2)

Arkport Series, Moderately Shallow Variant

The Arkport series, moderately shallow variant, consists of nearly level to gently sloping, light-colored, well-drained soils that formed in thin deposits of sandy outwash and are underlain by limestone at a depth of 20 to 40 inches. The original vegetation was hardwood forest. These soils are on hills in the northwestern part of the county. They are surrounded most commonly by the deeper Galen soils and the moderately shallow variant Lewisburg soils.

A typical profile in a cultivated field has a 6-inch plow layer of dark grayish-brown, very friable loamy fine sand. The subsoil consists of 19 inches of reddish-yellow, loose loamy fine sand over 3 inches of strong-brown, firm, limy sandy clay loam. Below this is bedrock.

These soils are droughty. In some areas wind erosion is a slight hazard. Productivity is generally low.

The use of these soils depends largely on the use of the surrounding soils. Most areas are used for pasture or crops.

Typical profile of Arkport loamy fine sand, moderately shallow variant, 2 to 6 percent slopes, 1,000 feet north of Bogart Road and 1,000 feet east of Barden Street in the village of Castalia; lot 31, sec. 3, Margaretta Township.

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) loamy fine sand, weak, fine, crumb structure; very friable; neutral; abrupt, smooth boundary.

B1—6 to 25 inches, reddish-yellow (7.5YR 6/8) loamy fine sand; single grain; loose; neutral; abrupt, wavy boundary.

IIB2t—25 to 28 inches, strong-brown (7.5YR 5/6) sandy clay loam; massive; firm; clay bridgings between sand grains; calcareous; abrupt, smooth boundary.

IIIR—28 inches +, gray (10YR 6/1) limestone bedrock; calcareous.

In some uncultivated areas there is a thin A2 horizon. The upper part of the profile, to a depth of 18 to 38 inches, is loamy fine sand or fine sand in texture and in some places has dark-brown mottles. In places there is a discontinuous Bt horizon of fine sandy loam as much as 6 inches thick. The IIB horizon ranges from loam to clay loam in texture and from 2 to 6 inches in thickness. The soil material in this horizon resembles glacial till, and there is evidence of clay accumulation. The depth to solid bedrock ranges from 20 to 40 inches. Above the solid bedrock in some places is as much as 10 inches of limestone rubble.

Arkport soils, moderately shallow variant, are shallower to limestone than Galen soils, limestone substratum. They differ from typical Arkport soils in being underlain by limestone at a depth of 20 to 40 inches. Arkport soils, moderately shallow variant, are coarser textured than Lewisburg soils, moderately shallow variant, and Casco soils, very flaggy subsoil variant.

Arkport loamy fine sand, moderately shallow variant, 0 to 2 percent slopes (AtA).—This soil occurs as small areas on limestone hills in the northwestern part of the county. In some areas it has faint mottles below a depth of 15 inches. The underlying rock is solid in most areas but fractured in some. In a few areas soil material extends down into cracks and pockets in the bedrock to a depth of more than 40 inches.

Included in mapping were areas of the moderately well drained Galen soils, limestone substratum, which occupy small closed depressions; a few small areas of soils that have slopes of more than 2 percent; and a few areas in which the surface layer is sandy loam.

The use of this soil is governed by the use of adjacent soils, because the areas are too small to be farmed separately. Wind erosion is a hazard when the surface is bare, and the blowing sand can damage crops in adjacent areas. (Capability unit IIs–1)

Arkport loamy fine sand, moderately shallow variant, 2 to 6 percent slopes (AtB).—This soil occurs as small areas on limestone hills in the northwestern part of the county. It has the profile described as typical of the Arkport series, moderately shallow variant. The surface layer is lighter colored in a few eroded areas than in surrounding areas. The underlying rock is solid in most areas but fractured in some. In a few areas soil material extends into cracks and pockets in the rock, to a depth of more than 40 inches.

Included in mapping were numerous small areas that have slopes of either less than 2 percent or more than 6 percent, and small areas in which the thickness of the sandy layers is less than 10 inches. Also included were a few areas in which the surface layer is sandy loam.

The use of this soil is governed by the use of surrounding soils. Wind erosion is a slight hazard when the surface is bare. (Capability unit IIs–1)

Beaches

Beaches (Bc) is a land type that occurs along Lake Erie; the largest acreage is on the higher parts of Cedar Point. It consists of layers of sand of various sizes and of fine gravel. Each layer has a slightly different color. The uppermost 2 to 6 inches of soil material is typically darker colored than the rest. The sand extends to depths of more than 60 inches. The slope range is 0 to 12 percent, but slopes of 2 to 6 percent are more common.

Most areas of this land type are used for residential and recreational purposes. Special techniques have to be applied in constructing foundations. The water table level is governed largely by the water level in the lake and is occasionally high enough to cause difficulty with septic tanks. The sand is soft and loose, and unless confined and packed, it provides poor traction for vehicles.

The scattered vegetation consists of deciduous trees in some areas and of low-growing annuals in others. Cottonwood, basswood, willow, and oak grow in open groves. Horsetail (genus *Equisetum*) covers some of the open areas. Beach grass (species of *Ammophila*) has been used to stabilize bare areas where wind erosion is a hazard. Only plants tolerant of low available moisture, low organic-matter content, low fertility, and hot weather can be used. (Not placed in a capability unit)

Beaches, Wet

Beaches, wet (Be) is a land type that occurs in low areas on Cedar Point and in other low areas along the shore of Lake Erie. In these areas the water table is within 15 inches of the surface for part of the year. Some of these areas are inundated at times, depending on the water level in Lake Erie and the direction of the wind. The slope is mostly less than 2 percent, but there are a few short slopes of more than 2 percent.

The uppermost 1 inch to 8 inches of soil material has been darkened by organic staining and is black or very dark gray. The underlying material consists of thin layers of gray to brown sand mottled with yellowish brown. The reaction is neutral to calcareous.

Most areas have no vegetation, but some have cattails and marsh grass. Aquatic birds, insects, and amphibians are common in the areas not polluted or filled with refuse. Keeping these areas clean is essential for the maintenance of wildlife habitat. (Not placed in a capability unit)

Belmore Series

The Belmore series consists of nearly level to moderately sloping, light-colored, well-drained soils. These soils occur as narrow strips on beach ridges and outwash plains in the western and central parts of the county. In lower positions nearby are Digby, Millgrove, Haskins, and Mermill soils.

A typical profile in a cultivated field has an 11-inch plow layer of dark grayish-brown, very friable loam. Below the plow layer is a 5-inch layer of yellowish-brown, very friable gravelly loam. The subsoil consists of 8 inches of yellowish-brown, friable fine gravelly loam over 22 inches of yellowish-brown, loose gravelly sandy loam. The underlying layer is yellowish-brown, loose, stratified medium sand and fine sand that contains gravel.

Runoff is slow, permeability is moderate to rapid, and the available moisture capacity is low to medium. Productivity is generally moderate. Crops respond well to fertilizer and manure.

Most areas are used for crops, principally corn, wheat, hay, and vegetables. Smaller areas are used for pasture, orchards, or residential development.

Typical profile of Belmore loam, 0 to 2 percent slopes, in a cultivated field, on the north side of State Route 113, half a mile east of the corner of Route 113 and Bemis Road; Strong Tract, sec. 1, Groton Township.

Ap—0 to 11 inches, dark grayish-brown (10YR 4/2) loam; weak, medium, crumb structure; very friable; slightly acid; abrupt, smooth boundary.

A2—11 to 16 inches, yellowish-brown (10YR 5/6) gravelly loam; moderate, thin, platy structure; very friable; slightly acid; clear, smooth boundary.

B2t—16 to 24 inches, yellowish-brown (10YR 5/4) fine gravelly loam; weak, medium, subangular blocky structure; friable; discontinuous brown (10YR 5/3) clay films on ped surfaces; some clay bridgings between coarse fragments; slightly acid; gradual boundary.

B3—24 to 46 inches, yellowish-brown (10YR 5/6) gravelly sandy loam, single grain; loose; few very thin clay films on coarse fragments; slightly acid; clear, wavy boundary.

IIC—46 to 60 inches, yellowish-brown (10YR 5/4), stratified medium sand and fine sand; single grain; loose; 10 percent gravel; neutral.

The A2 horizon is lacking in some deep-plowed fields. The B horizon ranges from gravelly sandy loam to sandy clay loam in texture; it has a clay content of between 18 and 35 percent. In some areas the B horizon has faint, high-chroma mottles, but there are no mottles indicating wetness within 2 feet of the surface. Below a depth of 20 inches is a mixture of loam, sand, and gravel. There are also thin layers of clean sand and gravel, but most layers also contain some loam. The content of gravel ranges from almost

374-857—71——7

none to half the soil mass. The A and B horizons range from slightly acid to neutral, and the C horizon, where not calcareous, from neutral to moderately alkaline.

Belmore soils have a less sandy subsoil than Oshtemo soils. They are less acid than Chili and Bogart soils. They are more gravelly than Sisson soils, and they have brighter colors and fewer gray mottles than Digby soils.

Belmore sandy loam, 2 to 6 percent slopes (BlB).—This soil occurs as small areas on the tops and sides of beach ridges in the northwestern part of the county. The surface layer consists of either sandy loam or loamy sand. It is underlain by 6 to 18 inches of firm, reddish-brown clay loam. Beneath this is loose limestone gravel mixed in some areas with sand or loam. Below a depth of 4 feet in some areas is solid limestone or limestone rubble.

Included in mapping were a few small areas that have slopes of either less than 2 percent or more than 6 percent.

Most areas of this soil are within fields of more extensive soils and are used for crops. Erosion is a moderate hazard. The available moisture capacity is generally low. (Capability unit IIe–2)

Belmore sandy loam, 6 to 12 percent slopes (BlC).—This soil occurs as small areas on beach ridges in the northwestern part of the county. The surface layer, to a depth of 18 inches, is mostly either sandy loam or loamy sand, and below this is a 4- to 10-inch layer of reddish-brown clay loam. The underlying material is loose clean limestone gravel. The surface layer is brown or yellowish brown in a few small areas that are moderately eroded.

Included in mapping were a few small areas that have slopes of less than 6 percent and numerous areas that have slopes of more than 12 percent.

Most areas of this soil are used for permanent pasture. The erosion hazard is severe unless a cover of vegetation is maintained. Droughtiness is a limitation. (Capability unit IIIe–1)

Belmore loam, 0 to 2 percent slopes (BmA).—This soil occurs throughout the western and central parts of the county, as small areas on outwash plains and adjacent to deep valleys. It has the profile described as typical of the series. In a few spots the surface layer is sandy or gravelly. A few small areas near Castalia are underlain by clean limestone gravel.

Included in mapping were a few small areas of the somewhat poorly drained Digby soils, which occur in depressions, and small areas of the sandier Oshtemo soils. Also included were a few small areas that have slopes of more than 2 percent.

Since only a few areas of this soil are extensive enough to be farmed separately, the use and management of most areas are governed by the use and management of adjacent soils. Corn, oats, wheat, soybeans, and hay are the main crops grown on this soil, but tomatoes, cabbage, sweet corn, and other special crops are well suited. Productivity is moderate, and the response to management is good. Droughtiness is a moderate limitation. (Capability unit IIs–2)

Belmore loam, 2 to 6 percent slopes (BmB).—This soil occurs as small areas along drainageways and on low beach ridges. In spots the surface layer is gravelly. In areas adjacent to Pewamo and Blount soils, glacial till of clay loam texture is at a depth of more than 48 inches. A few small areas south of Castalia are underlain by clean limestone gravel.

Included in mapping were some areas of the somewhat poorly drained Wilmer soils and the very poorly drained Millgrove soils, both of which occur as long narrow strips, 30 to 40 feet wide, along small drainageways. Also included were a few small areas of the sandier Oshtemo soils and a few areas that have slopes of either less than 2 percent or more than 6 percent.

Since no area of this soil is extensive enough to be farmed separately, use and management are governed by the use and management of the adjacent soils. Corn, oats, wheat, soybeans, and hay are the main crops grown. Productivity is moderate, and the response to management is good. Erosion is a moderate hazard. (Capability unit IIe–2)

Bennington Series

The Bennington series consists of nearly level to gently sloping, light-colored, medium-textured, somewhat poorly drained soils that formed in glacial till that contained a moderate amount of carbonates. These soils occupy nearly level areas and low knolls, mostly on the till plains in the southwestern part of the county. In nearby depressions are Pewamo soils, and on the nearby slopes are Cardington and Alexandria soils.

A typical profile in a cultivated field has an 8-inch plow layer of dark grayish-brown, friable silt loam over a 2-inch transitional layer of pale-brown, mottled, firm silty clay loam. The subsoil consists of 10 inches of yellowish-brown, mottled, very firm silty clay over 7 inches of brown, mottled, firm silty clay loam. The underlying material consists of grayish-brown, mottled, firm, limy silty clay loam over light yellowish-brown to yellowish-brown, mottled, firm, limy clay loam.

The water table is seasonally high. Runoff is slow, permeability is moderately slow, and the available moisture capacity is medium.

Most areas of these soils have been cleared and drained and are used for crops. Productivity is moderate once drainage has been established.

Typical profile of Bennington silt loam, 2 to 6 percent slopes, (Er–31), 300 feet south of Strecker Road, 2,000 feet east of State Route 264, Groton Township (Core samples taken 10/21/64, at depths of 3 to 6 inches, 14 to 17 inches, 22 to 35 inches, and 44 to 47 inches).

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

A&B—8 to 10 inches, pale-brown (10YR 6/3) silty clay loam; many, coarse, prominent mottles of brown (7.5YR 4/4); dark grayish-brown (10YR 4/2) root channels; moderate, medium, platy structure breaking to moderate, fine, subangular blocky; firm; slightly acid; clear, irregular boundary; horizon is discontinuous.

B21t—10 to 20 inches, yellowish-brown (10YR 5/4) light silty clay; many, medium, distinct mottles of yellowish brown (10YR 5/8) and many, coarse, distinct mottles of grayish brown (10YR 5/2); moderate, medium, prismatic structure breaking to strong, medium and fine, angular blocky; very firm; continuous brown (10YR 5/2) coatings on ped surfaces; discontinuous moderately thick clay films on all ped surfaces and patchy thick films on vertical surfaces; slightly acid; clear, wavy boundary.

B22t—20 to 27 inches, brown (10YR 5/3) silty clay loam; many, medium, distinct mottles of yellowish brown (10YR 5/6); weak, medium, prismatic structure breaking to weak, coarse, subangular blocky; firm; very thin patchy clay films on vertical ped faces; neutral; abrupt, very irregular boundary. (This horizon is thicker where shale fragments are abundant in till.)

C1—27 to 38 inches, grayish-brown (10YR 5/2) silty clay loam; many, coarse, faint mottles of yellowish-brown (10YR 5/4) and common, coarse, prominent mottles of light-gray (10YR 7/1) lime; weak, medium, platy structure breaking to blocky; firm; fragments of black shale; calcareous; concentration of carbonates is variable; gradual boundary.

C2—38 to 48 inches, light yellowish-brown (10YR 6/4) light clay loam; many, coarse, faint mottles of grayish brown (10YR 5/2) and yellowish brown (10YR 5/6); moderate, medium, platy structure; firm; calcareous; gradual boundary.

C3—48 to 60 inches, yellowish-brown (10YR 5/6 and 5/8) light clay loam; common, coarse, distinct mottles of grayish brown (10YR 5/2); weak, very thick, platy structure; exterior of plates is light gray (10YR 6/1 and 7/1); dark-gray (10YR 4/1) root channels; firm; strongly calcareous.

In areas that have not been cultivated, there commonly is an A2 horizon of light brownish-gray light silty clay loam about 6 inches thick. The A2 horizon is very thin or absent in some cultivated areas. The B2 horizon ranges from heavy clay loam to light silty clay in texture. In the B horizon, there are extreme variations in the thickness of clay films on ped surfaces and in the proportion of the ped surfaces covered. The underlying till has a clay loam or silty clay loam texture. It has distinctly platy structure in some places, but it is massive in other places. There are pebbles throughout the profile.

Bennington soils have a lighter colored surface layer and a brighter colored subsoil than the very poorly drained Pewamo soils, which occur in depressions. They have a grayer subsoil than the moderately well drained Cardington soils. Bennington soils are more pebbly than Del Rey soils. They have a lighter colored surface layer than Elliott soils. They are thicker over limy material than are Pyrmont soils.

Bennington loam, 0 to 2 percent slopes (BnA).—This soil is in nearly level areas and on low knolls, mostly in the southwestern part of the county. The loam surface layer extends to a depth of 8 to 14 inches.

Included in mapping were small areas in which the surface layer is silt loam or fine sandy loam, small areas of Haskins soils in which loam or gravelly loam extends to a depth of more than 14 inches, and areas of the dark-colored, very poorly drained Pewamo soils, which occupy closed depressions and minor natural drainageways. Also included were a few small areas in which the surface layer and subsoil are strongly acid. These areas are around sinkholes in the extreme southwestern part of the county. Also in the southwest corner are numerous areas where the 32- to 60-inch layer is loam rather than silty clay loam.

Most areas of this soil have been cleared and are used for corn, small grain, soybeans, and hay. Wetness is a moderate limitation. The included areas underlain by loam are a little easier to drain than those underlain by silty clay loam. (Capability unit IIw-2)

Bennington silt loam, 0 to 2 percent slopes (BoA).—This soil has the profile described as typical of the series. It occurs mostly as 5-acre to 200-acre areas. It is on till plains, mostly in the western part of the county. Surrounding many areas of this soil are larger areas of Pewamo soils. Around the limestone sinkholes in the southwest corner of the county are areas in which the surface layer and subsoil are more acid than is typical.

Included in mapping were small areas of the dark-colored, somewhat poorly drained Elliott soils; areas of dark-colored, very poorly drained Pewamo soils, which occupy depressions and narrow natural drainageways; and areas along the sides of some of these drainageways where the slope is slightly more than 2 percent. Also included were small areas in which the surface layer is silty clay loam or loam.

Most areas of this soil have been cleared and are used for crops. The main crops are corn, wheat, soybeans, and hay. Wetness is a moderate limitation. (Capability unit IIw–2)

Bennington silt loam, 2 to 6 percent slopes (BoB).—This soil is on ridges, on knolls, and on the side slopes of small drainageways in the western part of the county. It has the profile described as typical of the series. Around sinkholes in the southwest corner of the county are a few areas in which the surface layer and subsoil are very acid. These areas are most numerous in the area west of State Route 269 and south of Strecker Road.

Included in mapping were a few small areas that have slopes of less than 2 percent; a few very small areas in which the surface layer is loam; and areas of the dark-colored, very poorly drained Pewamo soils, which occupy drainageways and very small depressions. Also included were a few areas of the moderately well drained Cardington soils, which occur on small knolls.

Most areas of this soil have been cleared and are used for crops. The main crops are corn, wheat, soybeans, and hay. Wetness is a moderate hazard. Erosion is a hazard, particularly on long slopes. (Capability unit IIw–6)

Bennington-Pyrmont silt loams, limestone substratum, 0 to 2 percent slopes (BpA).—This complex is in areas near limestone outcrops in the western part of the county.

In the Bennington soil in this complex, the reaction is neutral to mildly alkaline, the depth to carbonates is as little as 20 inches, the calcareous till above the bedrock is only 8 to 24 inches thick, and the depth to limestone bedrock is 40 to 60 inches. In the Pyrmont soil, the depth to limy soil material is less than 20 inches and the depth to limestone bedrock is 40 to 60 inches.

Included in mapping were small areas in which the depth to limestone is either less than 40 inches or more than 60 inches. Also included were a few small areas in which the slope is slightly more than 2 percent; numerous small areas in which the surface layer is loam, and areas of the dark-colored, very poorly drained Pewamo soil, limestone substratum, which occupies small drainageways.

A large acreage of this complex is in the city of Sandusky and is used for residential and industrial purposes. Most other areas have been cleared and are used for crops, principally corn, small grain, and soybeans. Wetness is a moderate limitation. Installation of tile is hampered in some areas by the limestone bedrock (Capability unit IIw–2)

Berks Series

The Berks series consists of light-colored, well-drained soils that formed in deposits weathered from sandstone. These soils are underlain by broken sandstone and shale at a depth of less than 20 inches. The original vegetation was an oak-hickory forest. These soils occur in the southeastern part of the county.

A typical profile in a cultivated field has a 6-inch plow layer of dark grayish-brown channery silt loam. The subsoil consists of friable channery silt loam that is dark yellowish brown in the uppermost 4 inches and yellowish brown and mottled in the lower 8 inches. It contains numerous sandstone fragments. The underlying material is broken sandstone. At a depth of 30 inches is solid sandstone bedrock.

These soils are droughty. Runoff is medium to very rapid, depending on the slope. Permeability is rapid, and the available moisture capacity is low to very low. Productivity is generally low.

Most areas of these soils are in woodland or pasture, but a few small areas of the more gently sloping soils are used for cultivated crops or orchard crops.

Typical profile of Berks channery silt loam, 0 to 6 percent slopes, in a cultivated field, 200 feet east of Cable Road, 1,500 feet south of Harmon Road; lot 7, Florence Township.

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) channery silt loam; weak, fine, granular structure; friable; medium acid; abrupt, smooth boundary.

B1—6 to 10 inches, dark yellowish-brown (10YR 4/4) channery silt loam; weak, fine, subangular blocky structure; friable; medium acid; gradual, smooth boundary.

B2—10 to 18 inches, yellowish-brown (10YR 5/4) channery silt loam; common, medium, distinct mottles of yellowish brown (10YR 5/8); weak, fine, subangular blocky structure; friable; 40 percent angular sandstone fragments 2 to 4 inches across; strongly acid; abrupt, irregular boundary.

C—18 to 30 inches, 95 percent fine-grained acid sandstone broken into pieces 1 inch to 2 inches thick and 10 to 18 inches long, and 5 percent yellowish-brown (10YR 5/4) loam, which fills the interstices.

R2—30 inches +. fine-grained, soil sandstone bedrock.

If not plowed, this soil has an A horizon 2 to 4 inches thick. From 20 to 50 percent of the A or Ap horizon consists of sandstone fragments 2 to 5 inches long. More than 50 percent of the material between the A or Ap horizon and the rock consists of fragments more than 2 inches in diameter. The rest is soil material of silt loam, loam, and sandy loam texture. Beginning at a depth of less than 20 inches, more than 75 percent of the soil mass consists of fragments more than 10 inches in diameter. The depth to the R horizon ranges from 24 to 42 inches. The reaction throughout the solum is medium acid to strongly acid.

In the Berks soils in Erie County, the coarse material is dominantly fine-grained sandstone and only a little of it is shale; in typical soils of the Berks series, the coarse material is dominantly shale and includes only a little sandstone.

Berks soils are shallower to sandstone and shale than Loudonville soils. They differ from Colyer soils in being underlain by standstone and shale instead of entirely by shale. They differ from Ritchey and Romeo soils in being underlain by sandstone and shale instead of limestone.

Berks channery silt loam, 0 to 6 percent slopes (BrB).—This soil occurs as small areas on the tops and sides of sandstone hills in the southeastern part of the county. It has the profile described as typical of the series. On the surface in some areas are large stones and boulders, and there are a few small rock outcrops.

Included in mapping were many small areas in which the depth to broken rock is more than 20 inches or the depth to solid rock is more than 40 inches. Also included were areas in which the surface layer is loam or fine sandy loam and a few small areas that have slopes of more than 6 percent.

A few areas of this soil are used for crops and orchards, but most are woodland, pasture, or idle land. A few areas have been used for residential development, and sandstone has been quarried from some areas. (Capability unit IVs–2)

Berks channery silt loam, 6 to 18 percent slopes (BrD).—This soil occurs as small areas on the sides of sandstone hills in the southeastern part of the county. Most areas are long and narrow. On the surface in some areas are rocks and boulders. In cleared areas some of the soil has been lost through erosion. The depth to rock varies within short distances. The depth to broken rock is most commonly 10 to 20 inches, but in numerous small areas it is either less than 10 inches or more than 20 inches. In a few places the depth to solid rock is more than 42 inches. Some of the slopes are made up of nearly vertical steps 3 to 8 feet high, between which are flat or gently sloping ledges that are 10 to 20 feet wide. The faces of the steps have at most only a few inches of soil cover, and many are bare. The soil cover is thickest at the back of the ledges, but parts of the ledges are bare rock.

Included in mapping were a few vertical rock faces, a few small areas that have slopes of either less than 6 percent or more than 18 percent, and some areas in which the surface layer is loam or fine sandy loam.

Most areas of this soil are permanent pasture, woodland, or idle land. Shallowness and steepness are severe limitations. Erosion is a hazard in cleared areas. In such a shallow soil, productivity can be greatly reduced by only slight erosion. Droughtiness is a very severe hazard. (Capability unit IVs–2)

Berks channery soils, 18 to 60 percent slopes (BsF).—These soils occur as long narrow areas on the side slopes of the valley of the Vermilion River, in areas where the river runs through the sandstone hills.

Included in mapping were numerous small areas where the depth to broken rock is more than 20 inches; numerous small areas where the depth to solid rock is more than 40 inches; many vertical rock cliffs as much as 300 feet long and 20 feet high; and ledges that are 20 to 50 feet wide and several hundred feet long and have a slope of less than 18 percent. On these ledges and at the base of the slopes, blocks of sandstone 2 to 6 feet in diameter have accumulated. These blocks have broken off the upper part of the slopes. They are most common where small streams enter the main valley. In addition, numerous smaller sandstone fragments are on the surface in most areas.

These soils are mostly woodland. They cannot be farmed, because of the steep slopes and the rocks. Droughtiness is a severe hazard. (Capability unit VIIs–1)

Bogart Series

The Bogart series consists of nearly level to gently sloping, light-colored, moderately well drained soils that formed in outwash. These soils are generally on the highest parts of terraces and beach ridges. On the lower parts are Jimtown and Millgrove soils.

A typical profile in a cultivated field has an 8-inch plow layer of dark grayish-brown, friable loam. Below this is a 6-inch layer of light yellowish-brown, friable loam. The 12-inch subsoil is strong-brown, mottled, firm coarse gravelly clay loam. The underlying material is dark yellowish-brown, very friable to loose gravelly sandy loam.

Runoff is slow, and permeability is moderately rapid to rapid. The available moisture capacity is low to medium, depending on the gravel content. Productivity is moderate.

Most areas of these soils are used for orchards or for crops. Most crops need large amounts of lime and fertilizer.

Typical profile of Bogart loam, 0 to 2 percent slopes, in a cultivated field southwest of Joppa Road, between Church Road and Chappel Creek; lot 11, sec. 3, Florence Township.

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) loam; weak, fine and very fine, crumb structure; friable; 30 percent round pebbles more than 1 inch in diameter; slightly acid; abrupt, smooth boundary.

A2—8 to 14 inches, light yellowish-brown (10YR 6/4) loam; moderate, medium, platy structure; friable; 40 percent round or flat pebbles more than 1 inch in diameter; medium acid; clear, wavy boundary.

B2t—14 to 26 inches, strong-brown (7.5YR 5/4) coarse gravelly clay loam; few, fine, distinct mottles of dark reddish brown (5YR 3/4); weak, medium, subangular blocky structure; firm; thin, discontinuous clay films on ped faces; 10 percent pebbles more than 2 inches in diameter; slightly acid; clear, irregular boundary.

C—26 to 60 inches, dark yellowish-brown (10YR 4/4) gravelly sandy loam; structureless; very friable to loose; 20 percent cobblestones 3 to 4 inches in diameter, and 30 percent gravel 1 inch to 3 inches in diameter; slightly acid.

In uncultivated areas, there is an A1 horizon 3 to 4 inches thick. In cultivated areas, the Ap horizon is loam or fine sandy loam. The B horizon is gravelly sandy loam, gravelly loam, gravelly sandy clay loam, or gravelly clay loam. In this horizon, the content of gravel or coarser material is as much as 30 percent, the content of clay ranges from 18 to 35 percent, and consistence ranges from friable to firm. Where there are no definite peds, clay bridgings are evident between the coarse fragments. The C horizon has a matrix of loamy sand, sandy loam, or loam but includes a few thin layers of finer textured material. In this horizon the content of gravel or cobblestones ranges from 10 to 80 percent. The gravel is all well rounded. That in the eastern part of the county is dominantly of sandstone origin, but much of that in Oxford Township consists of shale fragments. The reaction ranges from slightly acid to very strongly acid and is most acid in the A2 horizon and the upper part of the B horizon. The content of fragments more than 3 inches in diameter is as much as 20 percent. The Bogart soils in Erie County commonly lack the 2-chroma mottles that are characteristic of Bogart soils in other places.

Bogart soils have brighter colors in the subsoil than the somewhat poorly drained Jimtown soils. They differ from the well-drained Chili soils in being mottled. They are more acid than Belmore soils. Bogart soils formed in deeper gravelly deposits than did Rawson soils. They are more gravelly and more acid than Tuscola soils.

Bogart loam, 0 to 2 percent slopes (BtA).—This soil is on beach ridges, terraces, and outwash plains in the eastern part of the county and in the southeastern part of Oxford Township. It has the profile described as typical of the series.

Included in mapping were some areas in which numerous small stones give the surface a gravelly appearance; some areas in which the uppermost foot of soil is fine sandy loam; small areas of the somewhat poorly drained Jimtown and Digby soils, both of which occupy small depressions; and a few small areas that have slopes of more than 2 percent.

Most of this soil is used for crops. Corn, wheat, soybeans, and hay are grown. A sizeable acreage in the eastern part of the county is used for apple and peach orchards. Pumpkins and sweet corn are important crops in the southeastern part of Oxford Township. Droughtiness is a moderate hazard. The included areas of fine sandy loam are slightly susceptible to wind erosion. (Capability unit IIs–2)

Bogart loam, 2 to 6 percent slopes (BtB).—This soil is on beach ridges and terraces in the eastern and south-central parts of the county.

Included in mapping were some areas in which numerous small stones give the surface a gravelly appearance; some areas in which the surface layer is fine sandy loam; a few small areas of the well-drained Chili soils; and small areas that have slopes of either less than 2 percent or more than 6 percent.

Most areas of this soil are used for crops. Corn, oats, wheat, soybeans, and hay are grown, and there are numerous apple and peach orchards. Erosion is a moderate hazard. The included areas of fine sandy loam are slightly susceptible to wind erosion. Local wetness created by seep spots on the sides of some ridges is a limitation. (Capability unit IIe–2)

Borrow Pits

Borrow pits (Bw) is a land type that occurs in areas where gypsum and associated calcareous materials have been strip mined for use in manufacturing cement, plaster, and wallboard materials. Most of the acreage consists of large marl pits in the Resthaven Wildlife Area near Castalia, but there are borrow pits, generally filled with water, along the expressways.

The marl pits are characterized by parallel ridges 5 to 7 feet high and 5 to 10 feet apart. In these areas the soil material is dominated by chunks of marl, ¼ inch to 1 inch in diameter, that are mixed with fine-textured soil material. The soil material in the root zone is calcareous, has poor physical properties, and has very low available moisture capacity. Among the plants that can tolerate this kind of soil material are various kinds of trees, bushes, and annual plants. Most of these areas are used as wildlife habitat.

In the areas along the expressways, the soil material is moderately fine textured, is calcareous, and has poor physical properties. Most of these areas have a cover of both natural and planted vegetation. Many of them are used as wildlife habitat. (Not placed in a capability unit)

Cardington Series

The Cardington series consists of nearly level to gently sloping, light-colored, medium-textured, moderately well drained soils that formed in glacial till. These soils are on hilltops and slopes. The well-drained Alexandria soils are in nearby steeper areas, and the somewhat poorly drained Bennington soils are in nearby depressions.

A typical profile in a cultivated field has an 8-inch plow layer of dark grayish-brown, friable silt loam. Below this is a 2-inch layer of brown, friable silt loam. The subsoil consists of a 6-inch layer of yellowish-brown, firm clay over 32 inches of firm silty clay loam that is yellowish brown and mottled in the upper 10 inches and brown and mottled in the lower 6 inches. The underlying material is dark yellowish-brown, mottled, firm, limy clay loam glacial till.

Permeability is moderately slow, and the available moisture capacity is medium. Natural drainage is adequate in all but very wet periods. Erosion is a hazard in gently sloping areas. Productivity is moderate to high.

Most areas of these soils are used for crops. Corn, soybeans, small grain, and hay are the principal crops.

Typical profile of Cardington silt loam, 2 to 6 percent slopes, in a cultivated field, 900 feet north of Potter Road, 700 feet west of the railroad; lot 2, sec. 4, Groton Township.

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium, granular structure; friable; slightly acid; abrupt, smooth boundary.

A2—8 to 10 inches, brown (10YR 5/3) silt loam; weak, medium, platy structure; friable; medium acid; clear, irregular boundary.

B21t—10 to 16 inches, yellowish-brown (10YR 5/4) light clay; moderate, medium, prismatic structure breaking to strong, medium, angular blocky; firm; thin, continuous, brown (10YR 5/3) clay films on ped surfaces; medium acid; clear, irregular boundary.

B22t—16 to 26 inches, yellowish-brown (10YR 5/4) heavy silty clay loam; common, medium, faint mottles of grayish brown (10YR 5/2) and yellowish brown (10YR 5/6); moderate, medium, prismatic structure breaking to strong, medium, angular blocky; firm; continuous thin and discontinuous moderately thick, brown (10YR 4/3) clay films on ped surfaces; slightly acid; gradual boundary.

B3—26 to 32 inches, brown (10YR 5/3) silty clay loam; many, coarse, faint mottles of grayish brown (10YR 5/2) and common, medium, distinct mottles of yellowish-brown (10YR 5/6); weak, coarse, prismatic structure breaking to weak, thick, platy structure, which in turn breaks to moderate, fine, subangular blocky; firm; few very thin clay films on prism faces; neutral; clear, irregular boundary.

C—32 to 60 inches, dark yellowish-brown (10YR 4/4) clay loam; many, coarse, distinct mottles of grayish brown (10YR 5/2) and yellowish brown (10YR 5/4 and 5/6); massive; firm; contains many small carbonate concretions and moderate amounts of dark-colored shale fragments; calcareous.

The A1 or Ap horizon ranges from loam to silt loam in texture and from 10YR 4/2 to 10YR 5/2 in color. There is no A2 horizon in some areas, mainly eroded areas. In some places there is a slight interfingering of material from the A2 horizon into the Bt horizon. The content of clay in the Bt horizon ranges from 35 to 45 percent. There are gray, 2-chroma mottles within the uppermost 10 inches of the B horizon, but mottles of a higher chroma are also common. The C horizon ranges from heavy loam to silty clay loam in texture. The depth to carbonates ranges from 24 to 42 inches. The reaction ranges from slightly acid to strongly acid. Numerous shale fragments are in the lower part of the B horizon and in the C horizon in some areas. Small, sharp pebbles occur throughout the profile.

Cardington soils are shallower to mottles than the well-drained Alexandria soils. They are brighter colored in the lower part of the subsoil than the somewhat poorly drained Bennington soils. They have better structure than Ellsworth soils. Cardington soils are pebbly, but the Shinrock soils are not. They are deeper to lime than Lewisburg soils.

Cardington silt loam, 0 to 2 percent slopes (CaA).—This soil is mainly in the southwestern part of the county.

Included in mapping were numerous small areas in which the surface layer is loam and areas of the somewhat poorly drained Bennington soils, which occupy small depressions and minor natural drainageways. Also included were a few small areas that have slopes of slightly more than 2 percent.

Most areas of this soil have been cleared and are used for corn, small grain, and hay. (Capability unit I–1)

Cardington silt loam, 2 to 6 percent slopes (CaB).—This soil has the profile described as typical of the series. It is on knolls and the sides of natural drainageways and small valleys in the western and central parts of the county.

Included in mapping were small areas of moderately eroded soils that have short slopes of 4 to 6 percent and receive runoff from adjacent areas. These moderately eroded soils have a lighter colored surface layer. Also included were a few areas, in the southwestern part of the county, that have a surface layer of loam and some that are underlain by glacial till of loam rather than clay loam texture; small areas that have slopes of either less than 2 percent or more than 6 percent; and a few very small areas of the nearly level, somewhat poorly drained Bennington soils. The included areas underlain by loam glacial till are slightly better drained than those underlain by silty clay loam till.

Most of this soil has been cleared and is used for crops. Corn, small grain, soybeans, and hay are grown. Erosion is a hazard, particularly where the slopes are long and where runoff from adjacent areas concentrates. (Capability unit IIe–1)

Casco Series, Very Flaggy Subsoil Variant

The Casco series, very flaggy subsoil variant, consists of light-colored, well-drained soils that are underlain by limestone rubble at a depth of less than 20 inches. The original vegetation was hardwood forest. Scattered areas of these soils occur in the western part of the county and on Kelleys Island.

A typical profile in a cultivated area has a 9-inch plow layer of dark-brown, friable loam. The subsoil consists of a 5-inch layer of brown, firm gravelly clay loam over 5 inches of dark-brown, friable very flaggy loam. The underlying material, at a depth of 19 inches, consists of flat fragments of limestone lying much as they would have if they had been piled in a stone wall. The spaces between the limestone fragments are filled with loamy material. The amount of soil material decreases with depth.

Runoff is medium, permeability is rapid, and the available moisture capacity is low. The reaction is mildly alkaline. The organic-matter content is low. Productivity is low to moderate.

Most of the acreage is used for crops. A small acreage is used for pasture, and a little is idle land. Soybeans and small grain are suitable crops.

Typical profile of Casco loam, very flaggy subsoil variant, 2 to 6 percent slopes, south side of Mason Road, 0.2 mile west of State Route 99.

Ap—0 to 9 inches, dark-brown (10YR 4/3) loam; weak, fine, crumb structure; friable; mildly alkaline; abrupt, smooth boundary.

B2t—9 to 14 inches, brown (7.5YR 4/4) gravelly clay loam; moderate, medium, subangular blocky structure; firm; clay bridgings between sand and gravel fragments; mildly alkaline; abrupt, irregular boundary.

IIB22t—14 to 19 inches, dark-brown (7.5YR 3/2) very flaggy loam; massive; friable; 80 percent limestone fragments 2 to 4 inches in diameter and 20 percent loam; clay coatings on and between coarse fragments; calcareous; gradual boundary.

IIC—19 to 48 inches, limestone rubble; 90 percent loose limestone fragments 4 to 10 inches in diameter and 10 percent loamy material.

IIIR—48 inches +, solid limestone bedrock.

Between the A1 and Bt horizons in uncultivated areas is a thin, grayish-brown (10YR 5/2) A2 horizon. The B2t horizon ranges from loam to light clay in texture and is gravel free in some profiles. It ranges from 6 to 15 inches in thickness, and it extends into the IIC horizon. At least 90 percent of the IIC horizon consists of limestone fragments more than 6 inches in diameter and ½ inch to 2 inches in thickness. The interstices are filled with loam or sandy loam. The degree to which the interstices are filled decreases with depth. The rubble extends to a depth of 4 to 6 feet.

Casco soils, very flaggy subsoil variant, are deeper to rubble than Castalia soils. They differ from Ritchey soils in being underlain by limestone rubble instead of solid limestone. They differ from Berks soils in being underlain by limestone rubble instead of solid limestone. They differ from Berks soils in being underlain by broken limestone rather than by broken sandstone and shale.

Casco loam, very flaggy subsoil variant, 0 to 2 percent slopes (CfA).—This soil occurs as small areas on limestone hills in the northwestern part of the county. Almost half of it is more than 20 inches deep over the limestone rubble.

Included in mapping were areas of soils that have a surface layer of fine sandy loam and in places a subsoil of fine sandy loam, and areas of soils that have a surface layer of silt loam and a subsoil of silty clay loam. Also included were small areas of Castalia soils, in which the surface layer is directly underlain by rubble, and a few small areas that have slopes of slightly more than 2 percent.

Most of the acreage is used for crops, principally hay and small grain. Droughtiness is a severe limitation. (Capability unit IIIs–2)

Casco loam, very flaggy subsoil variant, 2 to 6 percent slopes (CfB).—This soil occurs as small areas on hillsides and low ridges. On a few of the ridges, there is no limestone within 5 feet of the surface. The profile of this soil is the one described as typical of the series. In some areas the surface layer is dominantly silt loam or fine sandy loam, and in about half the areas, the depth to rubble is more than 20 inches. In some areas where the surface layer is silt loam, the subsoil is silty clay loam, and in some areas where the surface layer is fine sandy loam, the subsoil is sandy loam or loamy sand. In many areas where the soil is shallower than is typical, numerous limestone fragments are on the surface.

Included in mapping were small areas of Castalia soils, in which the surface layer is directly underlain by rubble, and a few areas of eroded soils that have a reddish-brown or yellowish-brown surface layer. Also included were a few small areas that have slopes of either less than 2 percent or more than 6 percent.

Most areas of this soil are within cultivated fields. Hay and small grain are the principal crops. Droughtiness is a severe limitation. Erosion is a hazard, and the loss of even a small amount of soil material reduces the available moisture capacity and impairs the productivity of such a shallow soil as this one. (Capability unit IIIs–2)

Casco loam, very flaggy subsoil variant, 6 to 18 percent slopes (CfD).—This soil occurs as small areas on the sides of limestone hills in the northwestern part of the county. The surface layer is fine sandy loam or silt loam in some areas, and the subsoil is fine sandy loam to silty clay loam. The depth to limestone rubble ranges from 10 to 40 inches and varies widely within small areas. In some areas where the soil is shallower than is typical, there are numerous limestone fragments on the surface.

Included in mapping were a few spots of eroded soils that have a reddish-brown or yellowish-brown surface layer, and a few small areas that have slopes of either less than 6 percent or more than 18 percent.

Areas of this soil are within cultivated fields or pasture. Droughtiness is a very severe limitation. Erosion is a hazard, and the loss of even a small amount of soil material reduces the available moisture capacity and impairs the productivity of such a shallow soil as this one. (Capability unit IVs–2)

Castalia Series

The Castalia series consists of dark-colored, well-drained soils that are very shallow over limestone rubble. These soils contain a very large proportion of flat pieces of limestone. The original vegetation consisted of hardwood forest and a ground cover of prairie grass. These soils are on limestone hills in Margaretta Township and on Kelleys Island.

A typical profile in a cultivated field has an 8-inch plow layer of very dark grayish-brown, friable, limy very channery silt loam. The underlying material consists of flat fragments of limestone, 3 to 10 inches in diameter, that lie much as they would if they had been placed in a stone wall. The content of limestone fragments is more than half, and the soils are limy throughout the entire profile.

Runoff is slow, permeability is rapid, and the available moisture capacity is very low. Productivity is generally low.

Some of the acreage is cropland, but most of it is permanent pasture. The areas on Kelleys Island are idle. Small grain and hay are the main crops.

Typical profile of Castalia very channery silt loam, 0 to 2 percent slopes, in a cultivated field, 300 feet south and 500 feet east of the corner of Portland Road and State Route 99; lot 4, sec. 2, Groton Township.

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) very channery silt loam; strong, fine, granular structure; friable; 60 percent limestone fragments 1 inch to 5 inches in diameter and ½ to 1 inch thick; calcareous; abrupt, smooth boundary.

C1—8 to 24 inches, 90 percent gray (10YR 5/1) limestone fragments 3 to 10 inches in diameter and ½ inch to 2 inches thick, and 10 percent dark grayish-brown (10YR 4/2) loam, which fills the spaces between the fragments; fragments are displaced slightly from original bedding; many fine roots; strongly calcareous; gradual boundary.

C2—24 to 60 inches, 90 percent flat fragments of limestone 6 to 18 inches in length and ½ inch to 2 inches thick, lying roughly in original bedding planes; about half the spaces between fragments are partly filled with loamy soil material; common medium and fine roots between fragments and in films of soil material on stones; calcareous.

The surface layer has a reddish color in some areas because of iron stains on the limestone. The content of channery fragments in the upermost 10 inches is at least one-half. In the C horizon, the soil material between the fragments is loam or silt loam. The degree to which the cracks are filled with soil material decreases with depth. The limestone rubble extends to depths ranging from 42 inches to 15 feet. Below this, in most places, there is solid limestone, but in a few places there is shale, a lacustrine deposit, or glacial till. The soil is calcareous throughout.

Castalia soils differ from Romeo soils in being underlain by limestone rubble instead of solid limestone. They differ from Casco soils, very flaggy subsoil variant, in lacking a subsoil between the plow layer and the limestone rubble.

Castalia very channery silt loam, 0 to 2 percent slopes (ChA).—This soil is in the western part of the county and on Kelleys Island. It is very shallow over broken limestone. It is well drained because water drains into the cracks in the underlying rock. This soil has the profile described as typical of the series. On the surface in most areas are numerous limestone fragments.

Included in mapping were small areas of Casco soils, very flaggy subsoil variant, small areas of Romeo soils, and many areas of soils that have a dark reddish-brown surface layer. Also included were small areas in which the surface layer is fine sandy loam or silty clay loam and a few small areas of soils that have slopes of more than 2 percent and generally a dark reddish-brown surface layer.

Some of the larger areas of this soil are used for crops, principally hay and small grain. Other areas are used for permanent pasture. Much of the acreage on Kelleys Island is idle. (Capability unit IIIs–2)

Castalia very channery silt loam, 2 to 6 percent slopes (ChB).—This soil is on broad hillsides and narrow stony ridges in Margaretta Township and on Kelleys Island. On the surface in many areas are limestone fragments as much as a foot in diameter.

Included in mapping were areas of Casco soils, very flaggy subsoil variant; areas of Romeo soils; small areas, in depressions and on ridgetops, that have slopes of less than 2 percent; and small areas, on very narrow slopes across hillsides and on parts of the side slopes of ridges, that have slopes of more than 6 percent. Also included were small areas where the surface layer is dark reddish brown. These areas are most numerous on the tops of narrow ridges and on their side slopes.

The larger areas of this soil are used for small grain, hay, and pasture. The areas on ridges are used with the surrounding soils. Most of the areas on Kelleys Island are idle. Erosion is a hazard, and the loss of even a small amount of soil material reduces the productivity of such a shallow, stony soil as this one. (Capability unit IIIs–2)

Chili Series

The Chili series consists of nearly level to moderately steep, light-colored, well-drained soils that formed in outwash. They are on the side slopes of the valley of the Vermilion River and on beach ridges and outwash plains in the eastern and central parts of the county. Ellsworth soils are in adjoining higher areas on the sides of the valley of the Vermilion River, and Bogart, Digby, Jimtown, Millgrove, and other soils are on the lower slopes of the beach ridges.

A typical profile in a disturbed area has a 2-inch surface layer of dark grayish-brown, friable loam. Below this is a 5-inch layer of light yellowish-brown, friable gravelly sandy loam. The subsoil consists of a 9-inch layer of yellowish-brown, friable gravelly loam over 10 inches of yellowish-brown, friable gravelly sandy clay loam. Below this is a 24-inch layer of yellowish-brown, friable, stratified gravelly loam and gravelly sandy loam. The underlying material is yellowish-brown, friable, stratified gravelly sandy loam and loamy sand.

Runoff is slow to medium, depending on the slope. Permeability is moderately rapid to rapid. The available moisture capacity is low to medium, depending on the content of coarse fragments. The content of organic matter and the supply of plant nutrients are generally low. Droughtiness is a hazard, especially in the steeper soils. Productivity is moderate to low, depending on the slope.

Most of the acreage is used for orchard crops or hay and pasture. Fruit trees are well suited, and a large proportion of the gently sloping acreage is used as orchard. Lime is necessary for most field crops.

Typical profile of Chili loam, 2 to 6 percent slopes, in a gravel pit on the south side of Trinter Road; lot 10, sec. 1, Vermilion Township.

A1—0 to 2 inches, dark grayish-brown (10YR 4/2) loam; moderate, medium, crumb structure; friable; very strongly acid; abrupt, irregular boundary.

A2—2 to 7 inches, light yellowish-brown (10YR 6/4) gravelly sandy loam; weak, thin, platy structure; friable; very strongly acid; gradual boundary.

B21t—7 to 16 inches, yellowish-brown (10YR 5/4) gravelly loam; massive; friable; clay bridgings evident; very strongly acid; gradual boundary.

B22t—16 to 26 inches, yellowish-brown (10YR 5/4) gravelly sandy clay loam; massive; friable; clay bridgings evident; strongly acid; gradual boundary.

IIB3—26 to 50 inches, yellowish-brown (10YR 5/6), stratified gravelly loam and gravelly sandy loam; massive; friable; strongly acid.

IIC—50 to 60 inches, yellowish-brown (10YR 5/4) stratified gravelly sandy loam, loam, and sand and gravel; massive; friable; strongly acid.

The A2 horizon is much thinner in cultivated areas than in other areas. The Bt horizon ranges from friable to firm in consistence and from 19 to 36 inches in thickness and is gravelly loam, gravelly clay loam, or gravelly sandy clay loam in texture (clay content 18 to 35 percent). The IIB3 and IIC horizons range from friable to loose in consistence and consist of gravelly sandy loam or gravelly loam and thin strata of loose sand and gravel. In these horizons the content of fragments of gravel size or larger is as much as 80 percent, and the content of fragments more than 3 inches in diameter is as much as 20 percent. The gravel is well rounded and is mainly sandstone. The A and B horizons range from medium acid to very strongly acid, and the C horizon from slightly acid to very strongly acid.

Chili soils are more strongly acid than Belmore soils. They are finer textured than Oshtemo soils. They differ from Bogart soils in lacking mottles. They are more gravelly, less silty, and more acid than Sisson soils.

Chili loam, 0 to 2 percent slopes (ClA).—This soil is on the tops of beach ridges and on terraces in the eastern part of the county and in the southeastern part of Oxford Township. Numerous small stones give the surface a gravelly appearance in some areas. There is a large amount of shaly gravel in the areas that occur in Oxford Township. This soil is generally less droughty and more productive than the steeper Chili soils.

Included in mapping were small areas of the moderately well drained Bogart soils and small areas of the sandier Oshtemo soils.

Most areas are used for crops or orchards. Corn, oats, wheat, soybeans, and hay are the principal crops. A large acreage in the eastern part of the county is used for peach orchards. Pumpkins, sweet corn, and other vegetables are grown, in addition to field crops, in the southeastern part of Oxford Township. (Capability unit IIs–2)

Chili loam, 2 to 6 percent slopes (ClB).—This soil is on beach ridges in the eastern part of the county and in the southeastern part of Oxford Township. It has the profile described as typical of the series. Numerous small stones give the surface a gravelly appearance in some areas. There is a large amount of shaly gravel in the areas that occur in Oxford Township. Small seep spots cause local wetness on some slopes.

Included in mapping were small areas of the moderately well drained Bogart soils, which occur on some of the lower slopes. Also included were small areas of Oshtemo soils and small areas of Belmore soils.

A large acreage in the eastern part of the county is used for apple and peach orchards, but most other areas are used for crops. Corn, oats, wheat, and hay are the principal crops, but vegetables are grown in some areas, mainly in Oxford Township. Erosion is a moderate hazard if cultivated crops are grown. The seep spots generally are not large enough to interfere with cultivation, but they constitute a limitation on the use of the soil for individual building sites. (Capability unit IIe–2)

Chili loam, 6 to 12 percent slopes (ClC).—This soil occurs as small areas on the sides of beach ridges and terraces in the eastern part of the county and in the southeastern part of Oxford Township. About a third of the acreage has been moderately eroded and consequently has a light brownish-gray or yellowish-brown surface layer. Numerous small stones give the surface a gravelly appearance in some areas.

Included in mapping were spots in which the surface layer is silt loam, gravelly loam, or sandy loam. Also included were small areas that have slopes of either less than 6 percent or more than 12 percent.

The use and management of this soil is governed by the use and management of surrounding soils. Erosion is a hazard unless a cover of vegetation is maintained. Wetness caused by seep spots is a limitation on the use of the soil for individual building sites. (Capability unit IIIe–1)

Chili loam, 12 to 18 percent slopes (ClD).—This soil is on the sides of beach ridges and terraces in the eastern part of the county. About a third of the acreage has been moderately eroded and consequently has a light brownish-gray or yellowish-brown surface layer.

Included in mapping were small areas in which the surface layer is gravelly loam or fine sandy loam. Also included were small areas that have slopes of either less than 12 percent or more than 18 percent.

Most areas of this soil are in woodland. The areas that have been cleared either are used for permanent pasture or are idle. The erosion hazard is very severe. Wetness created by seep spots is a limitation on the use of the soil for individual building sites. (Capability unit IVe–2)

Colwood Series

The Colwood series consists of dark-colored, very poorly drained soils that formed in lake-laid silt and fine sand. The original vegetation consisted of swamp hardwoods and marsh grass. These soils are in level areas, small natural drainageways, and shallow depressions in the central and western parts of the county. Generally, they occupy the lowest part of the landscape. Kibbie or Galen soils occupy the nearby higher areas.

A typical profile in a cultivated field has an 8-inch plow layer of black, friable silt loam. Below this is a 4-inch layer of black, friable silt loam. The subsoil consists of 8 inches of dark-gray, mottled, friable silt loam over 10 inches of yellowish-brown, mottled, firm silt loam. The underlying material consists of grayish-brown and yellowish-brown, friable, stratified silt loam, very fine sandy loam, loamy fine sand, and silty clay loam.

Runoff is slow to ponded, permeability is moderate, and the available moisture capacity is high. The organic-matter content is high, and tilth is good. Productivity is very good where adequate drainage has been provided.

Most areas of these soils are used for crops. Vegetables and field crops are grown.

Typical profile of Colwood silt loam, 0.2 mile north of Bryan Road, 100 feet west of the Oxford-Milan township line; Dumont Tract, Oxford Township.

Ap—0 to 8 inches, black (10YR 2/1) silt loam; moderate, medium, granular structure; friable; neutral; abrupt, smooth boundary.

A1—8 to 12 inches, black (10YR 2/1) silt loam; weak, medium, subangular blocky structure; friable; neutral; clear, wavy boundary.

B1g—12 to 20 inches, dark-gray (10YR 4/1) silt loam; common, medium, prominent mottles of yellowish brown (10YR 5/6); weak, medium, subangular blocky structure; friable; neutral; clear, smooth boundary.

B2g—20 to 30 inches, gray (10YR 6/1) heavy silt loam; many, coarse, prominent mottles of yellowish brown (10YR 5/6) and grayish brown (10YR 5/2); weak, medium, subangular blocky structure; firm; gray (10YR 5/1) and dark-gray (10YR 4/1) coatings on peds; neutral; clear, smooth boundary.

C—30 to 60 inches, grayish-brown (10YR 5/2) and yellowish-brown (10YR 5/6), stratified silt loam (50 percent), very fine sandy loam (30 percent), loamy fine sand (10 percent), and silty clay loam (10 percent); laminar structure; friable; calcareous.

The A horizon is 10 to 20 inches thick, and black (10YR 2/1) to very dark grayish brown (10YR 3/2) in color. There is no definite evidence of clay accumulation in the B horizon, but finer textured strata are in some areas. The B horizons dominantly have colors with chromas of 2 or less, although brighter hues dominate in some subhorizons. The thickness and texture of the individual layers are extremely variable within short distances. At the fine end of the range, the profile is dominantly silt loam with lenses of fine sand and silty clay loam. At the coarse end of the range, the profile is dominantly fine sandy loam with as much as 20 inches of loamy fine sand or fine sand. The solum is slightly acid to mildly alkaline in reaction. The depth to carbonates ranges from 24 to 48 inches.

374-857—71——8

Colwood soils are coarser textured than Lenawee soils and finer textured than Gilford soils. They have a darker colored surface layer and a grayer subsoil than the somewhat poorly drained Kibbie soils. Colwood soils have a grayer subsoil than Darroch soils. They are more silty and less gravelly than Digby soils.

Colwood fine sandy loam (Cm).—This soil occurs in nearly level areas, in depressions, and in the bottoms of small natural drainageways on lake plains and deltas.

Included in mapping were numerous small areas in which soil material washed from the nearby slopes has covered the dark-colored surface layer of this soil. Such areas are most numerous at the base of steep slopes and along natural drainageways. In many of these areas the texture of the surface layer is not fine sandy loam. Also included were a few small knolls, which are occupied by the better drained Kibbie or Galen soils.

Most areas of this soil that are surrounded by nearly level or gently sloping soils have been artificially drained and are part of cropped fields. Narrow strips along drainageways, surrounded by steep slopes, are used for pasture, because such areas are difficult to drain and cultivate. (Capability unit IIw–5)

Colwood silt loam (Co).—This soil occurs in nearly level areas, in depressions, and on the bottoms of narrow natural drainageways on lake plains and deltas. Some of the nearly level areas are large. This soil has the profile described as typical of the series.

Included in the large level areas were areas of Lenawee soils and small knolls occupied by the light-colored Kibbie soils. Also included were numerous areas in which the surface layer is loam, a few areas in which the surface layer is silty clay loam, and a few small areas that are underlain by glacial till of clay loam texture at a depth of 4 to 5 feet. Other inclusions were a few small areas of soils that have a limy surface layer and a few areas, mostly behind beach ridges in the eastern part of the county, of soils that have a mucky and limy surface layer.

Included in the areas in natural drainageways were small areas where soil material washed from adjacent slopes has covered the dark-colored surface of the Colwood soil. These areas are lighter colored than other areas, and in many the surface layer is loam or sandy loam.

The large areas of this soil have been artificially drained and are used for corn, grain, and hay. The use of the smaller areas is governed by the use of surrounding soils. Most are part of cultivated fields. Generally, the narrow strips along the bottoms of steep-sided valleys are used for pasture, because they are difficult to drain and to work. (Capability unit IIw–5)

Colwood silt loam, limestone substratum (Cp).—This soil occupies nearly level areas, depressions, and natural drainageways. The depth to the limestone substratum is generally between 40 and 60 inches, but in numerous spots it is less than 40 inches or more than 60 inches. In many areas, mainly in Margaretta Township, the soil is finer textured than is typical and has a layer of silty clay loam and thin layers of silty clay just above the limestone. The layer just above the limestone is very limy, and in some places the entire profile is limy. Lighter colored soil material has been deposited on the dark-colored surface in small areas, mostly along streams.

Included in mapping were small areas in which the surface layer is loam or silty clay loam.

Some areas of this soil are used for crops and other areas for pasture, depending on the use of surrounding soils. Laying tile or digging ditches for drainage can be difficult because of the limestone substratum. Inclusions of silty clay loam are harder to drain than the typical silt loam. (Capability unit IIw–5)

Colwood Series, Acid Variant

The Colwood series, acid variant, consists of dark-colored, very poorly drained soils that formed in 40 to 60 inches of lake-bed deposits or glacial till and are underlain by shale or sandstone. The largest acreage is underlain by shale. The original vegetation consisted of hardwoods and, in the wetter areas, swamp grass. These soils are in depressions and natural drainageways and on level plains. They occupy the lowest parts of the landscape. Kibbie soils, acid variant, are generally on nearby knolls.

A typical profile has an 8-inch plow layer of very dark brown silt loam. Below this is a 3-inch layer of very dark brown silt loam. The subsoil consists of 5 inches of grayish-brown, mottled, firm silty clay loam over 20 inches of grayish-brown, mottled, very firm silty clay. Below this is a 14-inch layer of strong-brown, mottled, firm silty clay loam. At a depth of 50 inches is bedrock of very dark grayish-brown weathered shale. There is no lime in the profile.

The organic-matter content is high. Tilth is good. Productivity is moderate if adequate drainage has been provided.

Most areas of these soils are used for crops, principally corn, small grain, soybeans, and hay. In some areas the underlying sandstone and shale interfere with the installation of tile.

A typical profile of Colwood silt loam, acid variant, in Oxford Township, west of Ransom Road and north and west of gravel road to airport beacon (Er–37).

Ap—0 to 8 inches, very dark brown (10YR 2/2) silt loam; grayish brown (10YR 5/2) when dry; moderate, fine, granular structure; friable; neutral; clear, smooth boundary.

A1—8 to 11 inches, very dark brown (10YR 2/2) silt loam; grayish-brown (10YR 5/2) when dry; weak, medium, subangular blocky structure breaking to moderate, medium, granular; friable; neutral; diffuse, irregular boundary.

B1g—11 to 16 inches, grayish-brown (10YR 5/2) light silty clay loam; many, coarse, prominent mottles of strong brown (7.5YR 5/6); moderate, medium, prismatic structure breaking to weak, thick, platy; firm; continuous very dark grayish-brown (10YR 3/2) clay coatings on prism faces; extremely acid; clear, irregular boundary.

B21g—16 to 26 inches, grayish-brown (10YR 5/2) light silty clay; many (40 percent), coarse, prominent mottles of strong brown (7.5YR 5/6); moderate, medium, prismatic structure breaking to weak, very fine, platy; very firm; continuous grayish-brown (10YR 5/2) coatings, 1 millimeter to 2 millimeters thick, on prism faces but broken by streaks of very dark grayish brown (10YR 3/2) along major root channels; extremely acid; gradual boundary.

B22g—26 to 36 inches, grayish-brown (10YR 5/2) silty clay; many (50 percent) mottles of strong brown (7.5YR 5/6) in ped interiors; moderate, coarse, prismatic structure breaking to weak, thin, platy; very firm; dark grayish brown (10YR 1/2) in root channels on ped faces; extremely acid; gradual boundary.

B3—36 to 50 inches, strong-brown (7.5YR 5/6) silty clay loam; many, coarse, prominent mottles of grayish brown (10YR 5/2); moderate, coarse, prismatic structure breaking to weak, medium, platy; firm; light brownish-gray (2.5YR 6/2) coatings on 70 percent of prism faces; scattered, irregularly shaped, dark-gray (10YR 4/1) masses; dark grayish brown (10YR 3/2) in root channels on prism faces; extremely acid; gradual boundary.

IIR1—50 to 52 inches, very dark grayish-brown (10YR 3/2) weathered shale.

IIR2—52 inches +, dark-colored shale.

The A1 horizon ranges from black (10YR 2/1) to very dark gray (10YR 3/1) in color and from 10 to 20 inches in thickness. The Bg horizon ranges from heavy silt loam to silty clay in texture and from 10 to 30 inches in thickness. The clay content of this horizon ranges from 18 to 35 percent, but there is no evidence of clay accumulation. In some places this horizon has thin strata of fine sand and silt. Some profiles include a stratified C horizon in which silt loam and silty clay loam are dominant but thin strata of fine sand, silt, and silty clay also occur. In places the uppermost few inches of shale is not weathered. Coarse fragments in the soil are more numerous and the reaction is less acid where the bedrock is sandstone than where it is shale. The reaction ranges from neutral to extremely acid. Shale chips and pebbles occur in some areas.

Colwood soils, acid variant, are more strongly acid than typical Colwood soils, and they have shale or sandstone at a depth of 40 to 60 inches. They are more strongly acid, more silty and clayey, and less gravelly than Millgrove soils. Colwood soils, acid variant, have a thicker A1 horizon and a grayer subsoil than Kibbie soils, acid variant. They are deeper to shale than Fries soils. They have a thicker dark-colored surface layer and are more silty than Miner soils.

Colwood silt loam, acid variant (Cr).—This soil has the profile described as typical of Colwood series, acid variant. It occurs in level areas and in depressions on lake plains. It is underlain by shale. The areas are as much as 500 acres in size. In a few areas, the surface layer is lighter colored than is typical. The subsoil ranges from fine sandy loam to silty clay in texture, but it is dominantly silty clay loam. In some areas the boundary between the soil and the underlying shale is abrupt, but in other areas it is gradual. In most areas the depth to shale is 40 to 60 inches, but there are numerous small areas where the depth to shale is less.

Included in mapping were a few areas where there is no solid shale within 5 feet of the surface, but in most of these areas there is weathered shale within 5 feet. Also included were small knolls and ridges that are occupied by the somewhat poorly drained Kibbie soils, acid variant.

Most of the larger areas of this soil are used for crops, but some narrow strips along the drainageways are used for pasture. (Capability unit IIIw–7)

Colwood silty clay loam, acid variant (Cs).—This soil occurs in nearly level areas, in depressions, and in shallow natural drainageways. It occurs as large areas in the central part of the county and as smaller areas in other parts of the county. It is underlain by sandstone and shale. The areas underlain by shale are much more extensive than those underlain by sandstone.

In the areas underlain by shale, the subsoil is silty clay loam or silty clay. In many of these areas, particularly in the eastern part of the county, the surface layer is gray or dark gray. Included in these areas in mapping were a few knolls and ridges of Kibbie soils, acid variant. In a few areas the depth to solid shale is more than 5 feet, but in most of these, soft or weathered shale is within 5 feet of the surface.

The areas underlain by sandstone are in the eastern part of the county. In these areas, the subsoil is dominantly clay loam but contains thin layers of loam or gravelly loam. The soil is more pebbly than that in the areas underlain by shale. The depth to sandstone is between 40 and 60 inches in most places, but in a few small areas it is less than 40 inches and in some it is more than 60 inches. In some places the sandstone is solid, but in other places, it is shattered. Included in these areas in mapping were a few knolls and ridges of Mitiwanga soils.

Most of the larger areas of this soil are used for crops. The smaller areas in the eastern part of the county are used for crops, woodland, and permanent pasture. Areas underlain by sandstone are less easy to drain than those underlain by shale. (Capability unit IIIw–7)

Colyer Series

The Colyer series consists of light-colored, well-drained soils that are shallow over shale and contain numerous shale fragments. The original vegetation was a hardwood forest. These soils are on knolls, ridgetops, and steep banks.

A typical profile in a residential area has a 3-inch surface layer of dark-brown, friable shaly loam. The 8-inch subsoil is brown, friable very shaly silt loam. Below a depth of 11 inches is weathered shale.

Runoff is rapid to medium, depending on the slope. Permeability is moderate, and the available moisture capacity is very low. Because of acidity and droughtiness, productivity is generally low.

The less sloping areas of these soils are used for crops and pasture, and the steeper areas for woodland or pasture.

Typical profile of Colyer shaly loam, 0 to 2 percent slopes, in a residential area on Hull Road; lot 27, sec. 4, Huron Township.

A1—0 to 3 inches, dark-brown (7.5YR 3/2) shaly loam; weak, fine, crumb structure; friable; slightly acid; abrupt, smooth boundary.

B—3 to 11 inches, brown (7.5YR 4/2) very shaly silt loam; weak, fine, subangular blocky structure; friable; very strongly acid; clear, irregular boundary.

R1—11 to 17 inches, brown (7.5YR 5/4) weathered shale; laminar structure following the bedding planes of the shale; easily crushed; thick strong-brown (7.5YR 5/8) coatings of weathering products along the bedding planes; very strongly acid; gradual boundary.

R2—17 inches +, very dark grayish-brown (10YR 3/2) shale; bedded; hard (not easily crushed); strong-brown (7.5YR 5/8) stains on bedding planes; extremely acid.

The color of the surface layer ranges from 10YR to 5YR in hue, but hues of 10YR and 7.5YR predominate. The solum ranges from loam to silty clay loam in texture and, unless limed, from strongly acid to extremely acid in reaction. The content of shale fragments larger than sand size in the A and B horizons is as much as 50 percent. The R1 horizon does not retain the shale structure in all places. On eroded slopes and in some other places where the soil is very shallow over solid shale, there is no layer of weathered shale. The shale is black, brown, or gray, and around the edges of the fragments are yellowish rims of weathering products. The depth to hard shale is less than 20 inches. The shale has weathered more rapidly in the south-central part of the county than in other places, apparently because the upper layers were loosened by the action of glacial ice. The Colyer soils in this county are less clayey than Colyer soils in other areas.

Colyer soils are shallower to shale than Allis and Prout soils. They differ from Castalia soils in being acid instead of calcareous throughout the profile; both of these soils lack a B horizon. Colyer soils differ from Berks soils in being underlain by shale rather than by sandstone and shale.

Colyer shaly loam, 0 to 2 percent slopes (CtA).—This soil has the profile described as typical of the series. It is on broad shale ridges in Huron, Perkins, and Oxford Townships and is most extensive near Kimball. The surface layer is dark brown, grayish brown, reddish brown, or yellowish red, but the redder colors occur only in small areas. The content of shale fragments above the hard shale is 30 to 70 percent. These fragments are loosely imbedded in soil material of loam or silt loam texture.

Included in mapping were small areas of Prout soils, in which the depth to shale is more than 20 inches; and a few areas that have slopes of slightly more than 2 percent.

In spite of low productivity, most of the larger areas are used for crops, chiefly corn, soybeans, small grain, and hay. Productivity is generally low because of droughtiness and acidity. (Capability unit IVs–2)

Colyer shaly loam, 2 to 12 percent slopes (CtC).—This soil is on shale ridges and the side slopes of minor drainageways. Most of the acreage is in the western part of Huron Township, the southern part of Perkins Township, and the northern part of Oxford Township, but there are a few small areas along the Vermilion River. The surface layer of this soil is grayish brown, reddish brown, or yellowish red. In the small areas along the Vermilion River, the thin layer above the shale is silty clay loam instead of very shaly silt loam. The content of shale fragments above the shale is 30 to 50 percent. These fragments are loosely imbedded in soil material of loam or silt loam texture. In a few eroded areas, the soil material consists of little more than loose shale fragments.

Included in mapping were small areas of Prout soils, in which the depth to shale is more than 20 inches; numerous small areas, mostly along the top of narrow ridges, that have slopes of less than 2 percent; and a very few areas that have slopes of more than 12 percent.

Narrow areas of this soil are within cropped fields that consist mostly of deeper soils. Because of the droughtiness and acidity, productivity is generally low. (Capability unit IVs–2)

Colyer soils, 12 to 50 percent slopes (CyE).—These soils are on the sides of the major stream valleys. They have a texture of shaly loam, shaly silt loam, and, in some areas, loam. The slopes are broken where side streams enter the main valleys. Some side streams have cut steep valleys, now partly filled with mixtures of soil material and shale fragments. The dominant slope range is 25 to 35 percent. Large boulders are on the surface in a few areas.

Included in mapping were numerous areas of other soils, mostly of the same kinds as the more nearly level soils at the top of the slope. Such inclusions are most numerous on the upper parts of the slopes. Also included were a few vertical banks of shale, as much as 30 feet high and as much as a tenth of a mile long. Other inclusions were a few narrow ledges that have slopes of as little as 6 percent. Some of these are seepy.

These soils are not generally farmed, because of the slope. Most of the acreage is used for woodland or wildlife habitat. (Capability unit VIIs–1)

Darroch Series

The Darroch series consists of nearly level, dark-colored, somewhat poorly drained soils that formed in lake-laid silt and clay. The original vegetation consisted of a thin hardwood forest and a dense cover of prairie grass. These soils are on the lake plain and are most extensive near Avery.

A typical profile in a cultivated area has a 10-inch plow layer of very dark brown, friable silt loam. Below this is a 4-inch layer of very dark grayish-brown, friable silt loam. The subsoil consists of yellowish-brown, mottled silty clay loam that is firm in the uppermost 12 inches and very firm in the lower 8 inches. The underlying material is gray, mottled, firm, limy silty clay loam that contains thin strata of silt loam.

The available moisture capacity is high. The organic-matter content is high, and tilth is generally good. Productivity is good if artificial drainage has been provided.

Most of the acreage has been cleared and drained and is used for corn, small grain, soybeans, and vegetables.

Typical profile of Darroch silt loam, in a cultivated field, north side of Mason road, three-fourths of a mile west of Spears Corners; sec. 3, Milan Township.

Ap—0 to 10 inches, very dark brown (10YR 2/2) silt loam; moderate, very fine, granular structure; friable; neutral; abrupt, smooth boundary.

A12—10 to 14 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, medium, granular structure; friable; neutral; diffuse, wavy boundary.

Bt—14 to 26 inches, yellowish-brown (10YR 5/4) heavy silty clay loam; common, fine, distinct mottles of yellowish brown (10YR 5/8) and few, coarse, faint mottles of grayish brown (10YR 5/2); strong, medium, prismatic structure breaking to moderate, fine, angular blocky; firm; thick very dark gray (10YR 3/1) coatings on prisms, and thin brown (10YR 4/3) coatings on blocks; organic matter in coatings prevents positive identification of clay films; neutral; clear, wavy boundary.

B3—26 to 34 inches, yellowish-brown (10YR 5/4) light silty clay loam; common, medium, faint mottles of yellowish brown (10YR 5/6); strong, coarse, prismatic structure breaking to strong, medium, angular blocky; very firm; thick dark-gray (10YR 4/1) coatings on prisms; calcareous; gradual boundary.

C—34 to 60 inches, gray (10YR 5/1) silty clay loam; many, coarse, distinct mottles of yellowish brown (10YR 5/4); laminar structure; firm; few, distinct, vertical ped faces that have dark-gray (10YR 4/1) coatings; numerous thin strata of silt loam; calcareous.

The A or Ap horizon ranges from 8 to 16 inches in thickness and is black (10YR 2/1), very dark brown (10YR 2/2), or very dark grayish brown (10YR 3/2). Between the A and B horizons in some areas there is a thin A2 horizon. Mottling begins just below the A1 horizon. The B horizon is silty clay loam or light silty clay, and the grade of structure ranges from weak to strong. The ped surfaces are coated with organic matter, clay, or both. In many places the C horizon contains thin strata of silt and very fine sand. The depth to carbonates ranges from 20 to 36 inches.

Typical Darroch soils are finer textured than Darroch soils, coarse subsoil variant. They are siltier than Elliott soils in the C horizon, and they lack pebbles, which are common in Elliott soils. Darroch soils contain more silt and less sand and gravel than Wilmer soils. They have a darker colored surface layer than Del Rey soils. They are less acid and have a thicker dark-colored surface layer than Kibbie soils, acid variant. Darroch soils are better drained and have a brighter colored subsoil than Lenawee soils.

Darroch silt loam (Da).—This soil is nearly level. It is on the lake plain and is especially extensive near

Avery. Almost half of it contains no layer finer than heavy silt loam.

Included in mapping were small areas in which the dark-colored surface layer extends only to the depth of plowing and numerous areas in which layers of fine sandy loam or fine sand occur below a depth of 3 feet. Also included were small areas of the very poorly drained Lenawee soils, which are in depressions and minor natural drainageways; a few small areas in which the surface layer is fine sandy loam or silty clay loam; and a few small areas that have slopes of slightly more than 2 percent.

Almost the entire acreage is used for field crops and special crops. (Capability unit IIw–4)

Darroch Series, Coarse Subsoil Variant

The Darroch series, coarse subsoil variant, consists of nearly level, dark-colored, somewhat poorly drained soils that formed in water-laid silt and fine sand. The original vegetation consisted of a sparse hardwood forest and a dense ground cover of prairie grass. These soils are on the lake plain, mostly in the central part of the county. Colwood soils occupy nearby depressions, and Belmore soils are on adjacent beach ridges.

A typical profile in a cultivated area has a 9-inch plow layer of very dark brown, friable fine sandy loam. Below this is a 3-inch layer of very dark grayish-brown, friable sandy loam. The subsoil consists of 10 inches of yellowish-brown, mottled, friable fine sandy loam over 6 inches of light olive-brown, very friable loamy sand. The underlying material consists of yellowish-brown, mottled, very friable, limy, stratified fine sandy loam, loamy fine sand, and silt loam.

Runoff is slow, permeability is moderately slow, and the available moisture capacity is medium. The content of organic matter is high, and tilth is good. The supply of plant nutrients and lime is high. Productivity is good if adequate drainage has been provided.

Most areas of these soils have been cleared and drained. Corn, small grain, soybeans, and vegetables are grown successfully.

Typical profile of Darroch fine sandy loam, coarse subsoil variant, in a cultivated field, 300 feet south of Scheid Road and 400 feet east of Plum Brook Ordnance Works fence; sec. 3, Milan Township.

A1p—0 to 9 inches, very dark brown (10YR 2/2) fine sandy loam; weak, coarse, crumb structure; friable; slightly acid; abrupt, smooth boundary.

A12—9 to 12 inches, very dark grayish-brown (10YR 3/2) fine sandy loam; weak, medium, granular structure; friable; slightly acid; clear, wavy boundary.

B1—12 to 16 inches, yellowish-brown (10YR 5/4) fine sandy loam; common, fine, faint mottles of yellowish brown (10YR 5/8); moderate, medium, subangular blocky structure; friable; neutral; gradual boundary.

B2—16 to 22 inches, yellowish-brown (10YR 5/4) fine sandy loam; common, fine, faint mottles of yellowish brown (10YR 5/6) and few, coarse, faint mottles of grayish brown (10YR 5/2); weak, medium and coarse, subangular blocky structure; friable; common, medium, prominent concretions of very dark grayish-brown (10YR 3/2) manganese; neutral; gradual boundary.

B3—22 to 28 inches, light olive-brown (2.5YR 5/4) loamy sand; few, coarse, distinct mottles of yellowish brown (10YR 5/6); massive; very friable; common, medium, prominent concretions of very dark grayish-brown (10YR 3/2) manganese; neutral; clear, smooth boundary.

IIC—28 to 60 inches, yellowish-brown (10YR 5/4) stratified fine sandy loam (60 percent), loamy fine sand (30 percent), and silt loam (10 percent); common, coarse, distinct mottles of grayish brown (10YR 5/2) and yellowish brown (10YR 5/8); massive; very friable; moderately calcareous.

The surface layer is black (10YR 2/1), very dark brown (10 YR 2/2), or very dark grayish brown (10YR 3/2). These colors extend to a depth of 8 to 16 inches. The B and C horizons have strata that range from fine sand to heavy silt loam, but the whole range does not usually occur in the same profile. The depth to carbonates ranges from 20 to 48 inches. The solum is slightly acid to neutral.

Darroch soils, coarse subsoil variant, are coarser textured than typical Darroch soils. They have a darker colored surface layer and are sandier and less acid than Kibbie soils, acid variant. Darroch soils, coarse subsoil variant, have a brighter colored subsoil than the poorly drained Colwood soils. They contain more silt and less gravel than Wilmer soils.

Darroch fine sandy loam, coarse subsoil variant (Dc).—This soil is nearly level. It is on the lake plain and deltas in the central part of the county. The largest areas are near Union Corners and Shinrock. Sizable areas, east of the Huron River, have a surface layer and subsoil of loamy fine sand, and the dark-colored surface layer is thinner than is typical. These areas were once occupied by such better drained soils as Arkport and Galen soils, but there has been considerable mixing of soil materials and the water table is closer to the surface as a result of the removal of molding sand and the subsequent restoration of the topsoil.

Included in mapping were small areas of light-colored, somewhat poorly drained soils and small areas of the dark-colored, very poorly drained Colwood and Gilford soils, which are in depressions and minor natural drainageways. Other inclusions, mainly in areas east of the Huron River, were a few knolls and ridges on which Galen soils occur; and a few small areas that have slopes of more than 2 percent.

Most areas have been drained artificially and are used for field crops and vegetables. In general, areas of this soil west of the Huron River are more productive than areas east of the river. (Capability unit IIw–4)

Dekalb Series

The Dekalb series consists of nearly level to gently sloping, light-colored, moderately coarse textured, generally well-drained soils that formed in sandy beach deposits and are underlain by sandstone bedrock at a depth of 20 to 40 inches. The original vegetation was a hardwood forest. These soils are on sandstone hills in the southeastern part of the county.

A typical profile in a cultivated field has an 8-inch plow layer of dark grayish-brown, very friable fine sandy loam. The 20-inch subsoil consists of yellowish-brown, friable fine sandy loam. It has numerous fragments of sandstone in the lowermost 4 inches. At a depth of 28 inches is sandstone bedrock. The reaction is acid throughout the profile.

Runoff is slow, permeability is rapid, and the available moisture capacity is low. Productivity is generally low for field crops and moderate for orchard crops.

Most areas are now in orchard or pasture or are idle. These soils are well suited to woodland.

Typical profile of Dekalb fine sandy loam, 2 to 6 percent slopes, 200 feet west of Bellamy Road, one-fourth mile north of State Route 113; sec. 1, Berlin Township.

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) fine sandy loam: weak, coarse, subangular blocky structure; friable; medium acid; clear, wavy boundary.
B21—8 to 24 inches, yellowish-brown (10YR 5/4) fine sandy loam; weak, coarse, subangular blocky structure; friable; medium acid; clear, wavy boundary.
B22—24 to 28 inches, yellowish-brown (10YR 5/4) fine sandy loam; massive; friable; 60 percent sandstone fragments 3 to 8 inches in diameter and 1 inch to 2 inches thick; medium acid; clear, smooth boundary.
IIR—28 inches +, solid, fine-grained sandstone bedrock.

The A horizon and the upper part of the B horizon are sandy loam or fine sandy loam. In parts of the B horizon, there are some clay bridgings but not enough to make this a Bt horizon. In some places the B22 horizon is missing. The depth to solid sandstone ranges from 20 to 40 inches. The upper part of the profile of the Dekalb soils in Erie County formed in outwash, but the typical Dekalb soils formed in residuum weathered from sandstone. The upper part of the B horizon contains less coarse fragments than that of the B horizon in typical Dekalb soils elsewhere.

Dekalb soils are coarser textured than Loudonville soils and consequently are more droughty.

Dekalb fine sandy loam, 0 to 2 percent slopes (DkA).—This soil occurs as small areas on sandstone hills in the southeastern part of the county. In some areas it is only moderately well drained and has mottles at a depth of 15 to 24 inches.

Included in mapping were areas of the somewhat poorly drained Mitiwanga soils, which occupy small depressions and minor natural drainageways; small areas of Berks soils, in which the depth to rock is less than 20 inches; and areas that have rock at a depth of more than 40 inches. Also included were small areas of loamy fine sand or loam and areas that have slopes of more than 2 percent.

This soil is used as cropland, orchard, pasture, and woodland. (Capability unit IIs–3)

Dekalb fine sandy loam, 2 to 6 percent slopes (DkB).—This soil has the profile described as typical of the series. It occurs as small areas on sandstone hills in the southeastern part of the county. In some areas it contains gravelly or cobbly layers, and in a few eroded areas, the surface layer is lighter colored. In some areas there are seep spots.

Included in mapping were small areas of Berks soils, in which the depth to rock is less than 20 inches, and areas that have rock at a depth of more than 40 inches. Also included were small areas in which the surface layer is loamy fine sand or loam and small areas that have slopes of either less than 2 percent or more than 6 percent.

This soil is used as cropland, orchard, woodland, and pasture. (Capability unit IIe–3)

Del Rey Series

The Del Rey series consists of nearly level to gently sloping, light-colored, moderately clayey, somewhat poorly drained soils that formed in silty to clayey lakebed deposits. These soils are most extensive on the lake plain, which extends across the northern part of the county, but there are smaller areas elsewhere.

A typical profile in a cultivated field has a 10-inch plow layer of dark grayish-brown, friable silt loam. The subsoil consists of 6 inches of dark-brown, mottled, very firm silty clay over 12 inches of brown, mottled, firm, limy silty clay loam. The underlying material consists of 32 inches of grayish-brown, mottled, firm silty clay loam.

The water table is high part of the year. Runoff is slow, permeability is moderately slow, and the available moisture capacity is high. The organic-matter content is moderately high, and tilth is generally good. If adequately drained, these soils are productive.

Most areas of these soils are used for crops. Vegetables as well as all the common field crops are grown.

Typical profile of Del Rey silt loam, 0 to 2 percent slopes, south side of Homegardner Road, between State Routes 99 and 101; lot 11, sec. 2, Margaretta Township.

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine, granular structure; friable; slightly acid; abrupt, smooth boundary.
B21tg—10 to 16 inches, dark-brown (10YR 4/3) light silty clay; many, coarse, distinct mottles of yellowish brown (10YR 5/4); weak, coarse, angular blocky structure breaking to strong, fine, angular blocky; very firm; thick, continuous, dark grayish-brown (10YR 4/2) clay coatings on ped surfaces; slightly acid; clear, smooth boundary.
B22tg—16 to 28 inches, brown (10YR 5/3) heavy silty clay loam; many, coarse, faint mottles of yellowish brown (10YR 5/4 and 5/6); moderate, fine, angular blocky structure; firm; patchy, moderately thick, dark grayish brown (10YR 4/2) clay coatings on ped surfaces; neutral; clear, smooth boundary.
C1g—28 to 40 inches, grayish-brown (2.5Y 5/2) silty clay loam: many, coarse, distinct mottles of yellowish brown (10YR 5/4 and 5/6) and grayish brown (10 YR 5/2): massive, but laminated because of stratification; firm; calcareous; clear, smooth boundary.
C2g—40 to 60 inches, grayish-brown (10YR 5/2) light silty clay loam; many, coarse, faint mottles of gray (10YR 5/1 and 5Y 5/1); massive, but laminated because of stratification; firm; calcareous.

The plow layer ranges from loam to silt loam in texture, and the A1 horizon is not more than 10 inches thick. Below the Ap or A1 horizon in many areas is a 2- to 4-inch, grayish-brown (2.5Y 5/2) A2 horizon. The B horizon ranges from heavy silty clay loam to light silty clay in texture. In some places the lower part of the B horizon contains thin strata of loam and silt loam. The C horizon ranges from silty clay loam stratified with silty clay, in areas where Del Rey soils grade to Fulton soils, to heavy silt loam stratified with silty clay loam, silt, and very fine sand, in areas where Del Rey soils grade to Kibbie soils. The solum ranges from medium acid to neutral. The depth to calcareous material ranges from 28 to 40 inches.

Del Rey soils are shallower to mottling than Shinrock soils. They have a lighter colored surface layer and a brighter colored subsoil than Lenawee soils. They have a lighter colored surface layer than Darroch soils. Del Rey soils differ from Bennington soils in lacking pebbles and stones.

Del Rey loam, 0 to 2 percent slopes (DrA).—This soil is on the lake plain and is especially extensive in Berlin, Perkins, and Huron Townships. The surface layer and subsoil, to a depth of 8 to 14 inches, are loam or fine sandy loam. About half the acreage is fine sandy loam.

Included in mapping were numerous small areas where the silty clay loam substratum is underlain at a depth of 3 to 5 feet by silt and fine sand. Also included were areas of the very poorly drained, dark-colored Lenawee soils, which occupy small closed depressions and minor natural drainageways, and areas, on the side slopes of these drainageways, that have slopes of slightly more than 2 percent.

Most areas are used for crops. (Capability unit IIw–2)

Del Rey silt loam, 0 to 2 percent slopes (DsA).—This soil has the profile described as typical of the series. It is on the lake plain. The areas are as much as several hundred acres in size.

Included in mapping were small areas in which the surface layer is black or very dark brown loam or silty clay loam. The silty clay loam is especially common in some parts of Margaretta Township. Also included were areas that have thin layers of fine sand and silt below a depth of 30 inches; areas of the dark-colored, very poorly drained Lenawee soils, which occupy some closed depressions and minor natural drainageways; and areas, on the sides of some of these drainageways, that have slopes of slightly more than 2 percent. Other inclusions were small areas of Rimer soils and a few areas in Vermilion Township in which the soil is not limy within 40 inches of the surface and the upper part of the subsoil is medium acid.

Almost the entire acreage is used for crops. (Capability unit IIw–2)

Del Rey silt loam, 2 to 6 percent slopes (DsB).—This soil is on low knolls and on the side slopes of minor natural drainageways on the lake plain. The areas are generally less than 10 acres in size.

Included in mapping were a few small areas of soils that are fine sandy loam or loam to a depth of 6 to 15 inches and a few small areas in which silt loam or fine sand occurs at a depth of 3 to 5 feet. Also included were a few eroded areas in which the surface layer is lighter colored.

Most areas of this soil are in cultivated fields with other soils. Unprotected areas will erode, and most areas are too small to warrant special erosion control practices. (Capability unit IIw–6)

Digby Series

The Digby series consists of nearly level, light-colored, somewhat poorly drained soils that formed in sandy to gravelly outwash. These soils are on the lower slopes of beach ridges and on outwash plains.

A typical profile in a cultivated area has a 9-inch plow layer of dark grayish-brown, friable loam. The subsoil consists of 16 inches of brown, mottled, firm sandy clay loam over 15 inches of yellowish-brown, mottled, friable gravelly sandy loam. The underlying material is grayish-brown, mottled, very friable, stratified sandy loam and gravelly sandy loam.

The water table is seasonally high. Runoff is slow, permeability is moderate, and the available moisture capacity is low to medium. Productivity is moderate.

Most areas of these soils are used for crops.

Typical profile of Digby loam, 0 to 2 percent slopes, in a cultivated field, 400 feet north of the railroad crossing, on the west side of Frailey Road.

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) loam; weak, medium, crumb structure; friable; slightly acid; abrupt, smooth boundary.

Bt—9 to 25 inches, brown (10YR 5/3) sandy clay loam; common, medium, distinct mottles of gray (10YR 5/1); weak, medium, subangular blocky structure; firm; grayish-brown (10YR 5/2) clay coatings cover 70 percent of ped surfaces; neutral; gradual boundary.

B3—25 to 40 inches, yellowish-brown (10YR 5/4) gravelly sandy loam; common, medium, distinct mottles of gray (10YR 5/1); massive; friable; mildly alkaline; gradual boundary.

C2—40 to 60 inches, grayish-brown (10YR 5/2) stratified sandy loam and gravelly sandy loam; many, coarse, distinct mottles of yellowish brown (10YR 5/6); single grain; very friable; mildly alkaline.

The plow layer is loam or sandy loam, and in many areas there is a grayish-brown (10YR 5/2) A2 horizon. The B horizon ranges from heavy sandy loam to clay loam in texture. The C horizon is stratified, dominantly with loamy sand, sandy loam, and their gravelly equivalents. The content of gravel ranges from almost none to 40 percent. Except for the A1 or Ap horizon, all the horizons are mottled. The depth to carbonates ranges from 24 to more than 60 inches. The A and B horizons range from medium acid to mildly alkaline. The C horizon ranges from neutral to moderately alkaline and is calcareous in places.

Digby soils are less acid than Jimtown soils. They differ from Haskins soils in having a substratum of stratified sandy loam and gravelly sandy loam instead of silty clay loam. Digby soils have a coarser textured, more gravelly subsoil than Kibbie soils. They have a lighter colored surface layer than Wilmer soils.

Digby sandy loam, 0 to 2 percent slopes (DtA).—This soil is on outwash plains in all parts of the county and is most extensive on the side slopes of beach ridges and in the spaces between ridges. The surface layer is sandy loam to a depth of 8 to 18 inches. Below a depth of 3 feet in some areas are thin layers of sand, gravel, or cobblestones. In a few spots gravel is on the surface. The available moisture capacity is lower than that of Digby loam.

Included in mapping were numerous small areas of the dark-colored Wilmer soils; small areas of the very poorly drained, dark-colored Millgrove soils, which occur in depressions; and a few small areas that have slopes of slightly more than 2 percent.

Most areas have been drained and are used for field crops and vegetables. (Capability unit IIw–3)

Digby loam, 0 to 2 percent slopes (DyA).—This soil has the profile described as typical of the series. It is on outwash plains in all parts of the county and is most extensive on the side slopes of beach ridges and in the spaces between ridges. In a few spots gravel is on the surface. Below a depth of 4 feet in a few areas, generally where Digby soils are next to Pewamo or Bennington soils, is fine-textured glacial till.

Included in mapping were a few small areas of the dark-colored Wilmer soils and small areas of the very poorly drained, dark-colored Millgrove soils, which occur in depressions.

Most areas of this soil have been drained and are used for field crops and vegetables. (Capability unit IIw–3)

Eel Series

The Eel series consists of light-colored, medium-textured, moderately well drained soils that formed in stream deposits. The original vegetation consisted of lowland hardwoods. These soils are in the higher parts of stream valleys, mainly along the Huron River. They are flooded occasionally. Sloan and Shoals soils are in the lower parts of the same valleys.

A typical profile in a cultivated area has a 9-inch plow layer of dark grayish-brown, friable silt loam. The sub-

soil consists of 9 inches of brown, friable silty clay loam. The underlying material consists of 42 inches of brown, mottled, friable, silt loam that has thin lenses of fine sandy loam.

Runoff is slow, permeability is moderate, and the available moisture capacity is high. The supply of plant nutrients is good, and tilth is good.

Most areas of these soils are pasture or woodland, but some of the larger areas along the Huron River are cropland.

Typical profile of Eel silt loam, in a cultivated field, 200 feet west of the bridge and 50 feet north of Mason Road, at Fries Landing; Milan Township.

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, crumb structure; friable; neutral; abrupt, smooth boundary.

B—9 to 18 inches, brown (10YR 5/3) silty clay loam; very weak, fine, subangular blocky structure; friable; mildly alkaline; clear, smooth boundary.

C2—18 to 34 inches, brown (10YR 4/3) silt loam; common, coarse, faint mottles of grayish brown (10YR 5/2); laminar structure because of stratification; friable; several thin lenses of grayish-brown (10YR 5/2) fine sandy loam; moderately alkaline; clear, smooth boundary.

C3—34 to 60 inches, brown (10YR 4/3) silt loam; many, coarse, faint mottles of grayish brown (10YR 5/2); laminar structure because of stratification; friable; few thin lenses of grayish brown (10YR 5/2) fine sandy loam; weakly calcareous.

The profile is highly stratified, and the strata vary in thickness and texture. Silt loam, fine sandy loam, and silty clay loam are the dominant textures, but there are isolated strata of other textures, most commonly sand. In some places the color of the upper 30 inches has a hue of 7.5YR. Some profiles contain a thin, buried A1 horizon. The depth to mottling ranges from 15 to 20 inches. The reaction is neutral to moderately alkaline. The depth to carbonates ranges from 1 foot to 4 feet.

Eel soils are less acid than Lobdell soils. They are less wet and have browner colors and fewer gray mottles than Sloan and Shoals soils.

Eel silt loam (Ee).—This soil is on the higher parts of valleys along the Huron River and other streams. The largest acreage is between Fries Landing and Huron in the valley of the Huron River. The areas are inaccessible, and most are cut up by old stream channels. On the surface in some areas are fresh deposits of light-colored soil material. The slope range is 0 to 2 percent.

Included in mapping were numerous areas of the very poorly drained Sloan soils and the somewhat poorly drained Shoals soils, which occur in depressions, drainageways, and abandoned stream channels.

Inaccessibility and the old stream channels limit the use of this soil for crops. Some of the wider, less dissected areas are farmed. All the main field crops can be grown. Most other areas are pasture or woodland. Flooding is infrequent. (Capability unit IIw–7)

Elliott Series

The Elliott series consists of nearly level, dark-colored, medium-textured to moderately fine textured, somewhat poorly drained soils that formed in glacial till of clay loam to silty clay loam texture. The original vegetation consisted of a thin hardwood forest and a dense cover of grass beneath the trees. These soils occur on small knolls within large areas of Pewamo soils and also as extensive nearly level areas. Pewamo soils occupy the depressions within these nearly level areas, and Cardington soils commonly occupy the nearby hillsides. The largest acreage of Elliott soils is in Groton and Oxford Townships.

A typical profile in a cultivated area has an 8-inch plow layer of black, friable silt loam. Below this is a 6-inch layer of very dark gray, friable silt loam. The subsoil consists of 2 inches of grayish-brown, mottled, friable silt loam over mottled, firm silty clay loam that is yellowish brown in the uppermost 7 inches and dark yellowish-brown in the lower 13 inches. The underlying material consists of 24 inches of yellowish-brown, mottled, firm, limy glacial till of clay loam texture.

Runoff and permeability are slow, and the available moisture capacity is high. The organic-matter content is high, and so is the supply of plant nutrients. Tilth is good. If adequately drained, these soils are productive.

Most areas have been cleared and drained and are used for corn, small grain, soybeans, and hay.

A typical profile of an Elliott silt loam, in a cultivated field, 1,000 feet east and 200 feet north of the intersection of Billings Road and Smith Road; sec. 4, lot 1, Groton Township.

Ap—0 to 8 inches, black (10YR 2/1) silt loam; strong, medium, crumb structure; friable; slightly acid; abrupt, smooth boundary.

A12—8 to 14 inches, very dark gray (10YR 3/1) silt loam; strong, medium, crumb structure; friable; slightly acid; clear, smooth boundary.

B1—14 to 16 inches, grayish-brown (10YR 5/2) silt loam; few, medium, faint mottles of brown (10YR 5/3); weak, medium, platy structure; friable; medium acid; clear, smooth boundary.

B21t—16 to 23 inches, yellowish-brown (10YR 5/4) silty clay loam; many, medium, distinct mottles of grayish brown (10YR 5/2); moderate, medium, angular blocky structure; firm; moderately thick, continuous, dark grayish-brown (10YR 4/2) clay films on ped surfaces; medium acid; clear, smooth boundary.

B22t—23 to 36 inches, dark yellowish-brown (10YR 4/4) silty clay loam; many, medium, distinct mottles of grayish brown (10YR 5/2); moderate, medium to coarse, angular blocky structure; firm; thin, discontinuous, gray (10YR 5/1) clay films on ped surfaces; slightly acid; clear, smooth boundary.

C1—36 to 43 inches, yellowish-brown (10YR 5/6) clay loam; common, medium, distinct mottles of grayish brown (10YR 5/2); weak, thick, platy structure; firm; calcareous; gradual, smooth boundary.

C2—43 to 60 inches, yellowish-brown (10YR 5/6) clay loam (glacial till): common, medium, distinct mottles of grayish brown (10YR 5/2); massive; firm; calcareous.

The A1 or Ap horizon ranges from 10 to 16 inches in thickness. It is black (10YR 2/1), very dark brown (10YR 2/2), very dark grayish brown (10YR 3/2), or very dark gray (10YR 3/1) silt loam or silty clay loam. The B horizon ranges from medium acid to neutral. In some cultivated areas, there is no B1 horizon. The B2t horizon, which is the zone of clay accumulation, ranges from heavy silty clay loam to clay in texture. The clay content of this horizon is more than 35 percent. The C horizon consists of glacial till of clay loam or silty clay loam texture. The depth to carbonates ranges from 26 to 40 inches. Shale fragments are numerous in the underlying material, and pebbles occur throughout the profile.

Elliott soils have a darker colored surface layer than Bennington soils. They have a brighter colored subsoil than the very poorly drained Pewamo soils. Elliott soils formed in glacial till that contains less silt and fine sand than the water-laid, pebble-free deposits in which the Darroch soils formed.

Elliott silt loam, 0 to 2 percent slopes (EhA).—This soil is mainly in the western part of the county. It has the profile described as typical of the series.

Included were areas of the dark-colored, very poorly drained Pewamo soils, which occupy small natural drainageways, and a few small areas of the light-colored, somewhat poorly drained Bennington soils.

Most areas have been cleared and are used for crops, principally corn, wheat, soybeans, and hay. (Capability unit IIw–4)

Elliott silty clay loam, 0 to 2 percent slopes (EkA).—This soil is in the western part of Erie County.

Included in mapping were a few small areas of the light-colored, somewhat poorly drained Bennington soils; areas of the dark-colored, very poorly drained Pewamo soils, which occupy small natural drainageways; and a few small areas of acid soils that are underlain by shale at a depth of 4 to 5 feet.

Most areas of this soil have been cleared and are used for crops. Corn, small grain, soybeans, and hay are grown. (Capability unit IIw–4)

Ellsworth Series

The Ellsworth series consists of nearly level to steep, light-colored, moderately well drained to well drained soils that formed in low-lime glacial till. These soils are in the southeastern part of the county.

A typical profile of a moderately eroded Ellsworth soil in a cultivated area has a 7-inch plow layer of brown, firm silt loam. The subsoil consists of 5 inches of dark yellowish-brown, very firm silty clay loam over 6 inches of yellowish-brown, mottled, very firm silty clay loam. Below this is 10 inches of dark grayish-brown, mottled, firm clay loam. The underlying material is dark grayish-brown, mottled, firm, limy clay loam.

Permeability is slow, and the available moisture capacity is medium.

Most areas that have slopes of less than 18 percent are cultivated. The steeper areas are in woods or pasture.

A typical profile of Ellsworth silt loam, 6 to 12 percent slopes, moderately eroded, in a cultivated field, on the west side of the Florence-Wakeman Road, 300 feet north of Burr Road; lot 28, sec. 4, Florence Township.

Ap—0 to 7 inches, brown (10YR 4/3) heavy silt loam; cloddy breaking to weak, coarse, subangular blocky structure, which in turn breaks to weak, fine, granular structure; firm; neutral (limed); abrupt, smooth boundary.

B21t—7 to 12 inches, dark yellowish-brown (10YR 4/4) heavy silty clay loam; weak, medium, prismatic structure breaking to moderate, fine, angular blocky; very firm; thick, continuous, dark-brown (7.5YR 4/2) clay films on vertical and horizontal ped faces; medium acid; gradual boundary.

B22tg—12 to 18 inches, yellowish-brown (10YR 5/4) heavy silty clay loam; common, medium, faint mottles of grayish brown (10YR 5/2); weak, medium, prismatic structure breaking to moderate, fine, angular blocky; very firm; discontinuous dark grayish-brown (10YR 4/2) clay films on ped surfaces; medium acid; gradual boundary.

B3—18 to 28 inches, dark grayish-brown (10YR 4/2) heavy clay loam; many, medium, faint mottles of dark yellowish brown (10YR 4/4) and common, medium, distinct mottles of yellowish brown (10YR 5/6); moderate, thick, platy structure breaking to weak, fine, subangular blocky; firm; neutral; clear, wavy boundary.

C—28 to 60 inches, dark grayish-brown (10YR 4/2) heavy clay loam; common, medium and coarse, prominent mottles of strong brown (7.5YR 5/6); common, medium, prominent mottles of light brownish gray (10YR 6/2); and many, coarse, distinct mottles of yellowish brown (10YR 5/4); massive; firm; calcareous.

In uneroded uncultivated areas, the Ap or A1 horizon ranges from 2 to 6 inches in thickness and is dark grayish brown (10YR 4/2), and the A2 horizon ranges from 3 to 10 inches in thickness and is pale brown (10YR 6/3). The Bt horizon, which is the horizon of clay accumulation, ranges from 9 to 30 inches in thickness and from heavy clay loam to clay in texture. The C horizon consists of till derived mainly from sandstone and shale and ranging from clay loam to light clay in texture. The carbonate content of the till ranges from 5 to 15 percent. The depth to carbonates ranges from 24 to 48 inches. Except where lime has been used, the A horizon and the upper part of the Bt horizon range from slightly acid to strongly acid; the moderately eroded soils are less acid than the slightly eroded soils. The depth to mottling ranges from 15 to 24 inches. Coarse fragments are numerous throughout the profile. The soils that have slopes of 12 percent or less are moderately well drained, but the steeper soils are well drained. In a few places, sandstone is within 5 feet of the surface.

Ellsworth soils occur near Mahoning soils and, on steep slopes, near Chili soils. They have better natural drainage and are less gray than Mahoning soils. Ellsworth soils are finer textured and less gravelly than Chili soils. They are more acid and have a denser subsoil than Alexandria and Cardington soils.

Ellsworth silt loam, 0 to 2 percent slopes (ElA).—This soil occurs as small areas on till plains in the southeastern part of the county. Many areas are only between 5 and 10 acres in size. Most areas are adjacent to deep valleys and are bounded by steep slopes on one or more sides. The surface layer is darker colored than the one in the typical profile. Generally, runoff is slow.

Included in mapping were areas in which the surface layer is fine sandy loam or silt loam; small areas of the somewhat poorly drained Mahoning soils, which are in depressions and natural drainageways; and a few small areas in which sandstone or shale is within 5 feet of the surface. Also included were numerous small areas of soils that are nonacid in the upper part of the profile and small areas that have slopes of slightly more than 2 percent.

This soil is used for crops and pasture along with surrounding soils. It is moderately productive. (Capability unit IIw–2)

Ellsworth silt loam, 2 to 6 percent slopes (ElB).—This soil occurs on the till plains in the southeastern part of the county. Many of the areas are only between 5 and 10 acres in size. The surface layer is darker colored than that in the typical profile.

Included in mapping were numerous small areas in which the surface layer is fine sandy loam or loam; small areas of the somewhat poorly drained Mahoning soils, which occur in minor natural drainageways; a few small areas in which sandstone or shale is within 5 feet of the surface; and numerous small areas of soils that are nonacid in the upper part of the profile. Also included were a few spots of eroded soils that have a light grayish-brown to yellowish-brown surface layer and small areas that have slopes of either less than 2 percent or more than 6 percent.

This soil is used for crops and pasture along with the surrounding soils. Runoff is medium, and erosion is a

severe hazard in areas that do not have a plant cover. Productivity is moderate. (Capability unit IIIe–2)

Ellsworth silt loam, 6 to 12 percent slopes, moderately eroded (ElC2).—This soil occurs as small areas on the sides of natural drainageways on till plains in the southeastern part of the county. It has the profile described as typical of the series.

Included in mapping were small areas of slightly eroded soils that have a dark grayish-brown surface layer and areas of severely eroded soils that have a brown or yellowish-brown surface layer. The areas most severely eroded are generally on the upper parts of the slopes. Also included were small areas that have slopes of either less than 6 percent or more than 12 percent.

Most of this soil is used for crops. In cultivated areas, runoff is rapid and erosion is a very severe hazard. Manure and other organic residues are needed to replenish the supply of organic matter. Productivity is low to moderate. (Capability unit IVe–1)

Ellsworth silt loam, 12 to 18 percent slopes, moderately eroded (ElD2).—This soil occurs as long narrow areas on the sides of stream valleys on the till plains in the southeastern part of the county.

Included in mapping were numerous small slightly eroded areas, which are most numerous toward the bottom of slopes and in woods or pasture; a few small areas of severely eroded soils that have a surface layer of brown or yellowish-brown silty clay loam and that are more numerous in cultivated fields and on the upper part of slopes than in other areas; a few small gullies; and small areas that have slopes of either less than 12 percent or more than 18 percent.

Most of the larger areas are in woodland or pasture, but some of the smaller areas are within cropped fields. Runoff is rapid. Erosion is a hazard, and the gullies that start in this soil can cut into the level soils above. Productivity is generally low. (Capability unit VIe–1)

Ellsworth and Chili soils, 18 to 50 percent slopes (EwF).—The Chili soil in this unit is gravelly, and the Ellsworth soil is clayey. These soils are on the sides of valleys cut by the Vermilion River and its tributaries through alternate layers of clayey glacial till and gravelly outwash. In the large areas along Green Road, the gravelly Chili soil is downslope from the till-derived Ellsworth soil. The slope range is dominantly 25 to 50 percent.

Included in mapping were some vertical banks and rock outcrops.

Most areas of these soils are forested. Cultivation is not practical, because of the slope. The gravelly layers are generally not thick enough to be commercial sources of gravel. Erosion is a very severe hazard unless a cover of vegetation is kept on the surface. The gullies that start in these soils can cut back into farmland. (Capability unit VIIe–1)

Fries Series

The Fries series consists of dark-colored, very poorly drained soils that formed in thin lakebed deposits or thin layers of till and are underlain by shale at a depth of 20 to 40 inches. The original vegetation consisted of swamp grass and sedges. These soils are generally in the lowest parts of the landscape. Allis and Prout soils occupy higher areas nearby.

A typical profile in a cultivated area has an 8-inch plow layer of very dark gray, firm silty clay loam. The subsoil consists of 5 inches of very dark gray, very firm clay over 7 inches of yellowish-brown, mottled, very firm clay. The underlying material is yellowish-brown, mottled, very firm clay. At a depth of 25 inches is gray, mottled, weathered shale.

Runoff and permeability are slow, and the available moisture capacity is low. The water table is high in winter and spring. Productivity is generally low.

Most areas of these soils are in pasture or woodland or are idle, but some areas are used for crops. Artificial drainage and large applications of lime are necessary for the economic production of most crops.

A typical profile of Fries silty clay loam, in a cultivated field, half a mile east of Bogart Corners and 600 feet north of Bogart Road; lot 21, sec. 4, Huron Township.

Ap—0 to 8 inches, very dark gray (10YR 3/1) silty clay loam; moderate, medium, granular structure; firm, plastic; slightly acid; abrupt, smooth boundary.

B21g—8 to 13 inches, very dark gray (N 3/0) clay; weak, medium, angular blocky structure; very firm, very plastic; medium acid; clear, wavy boundary.

B22tg—13 to 20 inches, yellowish-brown (10YR 5/8) clay; common, medium, distinct mottles of light gray (2.5Y 7/2); weak, medium, angular blocky structure; very firm, very plastic; thick very dark gray (N 3/0) clay-organic coatings on ped surfaces; strongly acid; gradual boundary.

C1—20 to 25 inches, yellowish-brown (10YR 5/6) clay; common, medium, prominent mottles of gray (N 6/0); massive, but breaks to weak, thin, platy structure; very firm, very plastic; strongly acid; clear, smooth boundary.

IIR—25 to 48 inches, gray (5Y 5/1) weathered shale, increasing in hardness with depth; many, coarse, prominent mottles of yellowish brown (10YR 5/8); laminar structure; very strongly acid; gradual boundary.

The A1 horizon in unplowed areas ranges from 4 to 6 inches in thickness and is black (10YR 2/1). Except for the A1 horizon, which is silt loam in some areas, the soil material overlying the shale ranges from silty clay loam to clay in texture. In places where the soil is shallow over shale, the Bg horizon has a platy structure, and there is either no C horizon or a very thin one. In almost all places, shale-derived material (the IIR horizon) is within 30 inches of the surface, but the depth to hard shale is as much as 40 inches in some places. The thickness of the weathered shale ranges from a few inches to several feet. The reaction ranges from slightly acid, where the shale-derived material is thick, to very strongly acid, where the shale-derived material is thin. Where the parent material was glacial till, pebbles and cobblestones are common in the upper part of the profile.

Fries soils are usually wetter than Allis soils and have a darker colored surface layer. They are finer textured and shallower to shale than Miner soils. They are wetter, grayer, and finer textured than Prout soils.

Fries silt loam (Fr).—This soil occurs in small closed depressions and minor natural drainageways. The areas are small. In some areas the surface layer is black. The depth to silty clay or clay is 18 inches or less. In most areas the depth to hard shale is between 24 and 40 inches.

Included in mapping were small areas in which the surface layer is silty clay loam and a few spots in which the depth to shale is either less than 24 inches or more than 40 inches.

The use of most areas is governed by the use of the surrounding soils. (Capability unit IIIw–7)

Fries silty clay loam (Fs).—This soil has the profile described as typical of the series. It occurs on level plains,

in closed depressions, and in natural drainageways. The areas range from 2 to 100 acres in size. The larger areas are on the level plains, and the smaller areas are in the depressions and natural drainageway. The plow layer is silty clay loam, and just below it is clay. In most places the depth to hard shale is between 24 and 40 inches. Large boulders are on the surface in a few small areas.

Included in mapping were small areas in which the surface layer is silt loam or silty clay and a few spots in which the depth to hard shale is either less than 24 inches or more than 40 inches.

The larger areas in the eastern part of the county are mostly pasture or woodland, and those in the south-central part of the county are cropland. The use of small areas is governed by the use of the surrounding soils. (Capability unit IIIw–7)

Fulton Series

The Fulton series consists of light-colored, somewhat poorly drained soils that formed in lake-laid clay and silty clay. These soils are in nearly level areas and on low knolls on lake plains in the northwestern part of the county. Toledo soils occupy lower areas nearby.

A typical profile in a cultivated field has a 9-inch plow layer of dark grayish-brown, firm silty clay loam. The subsoil consists of 8 inches of yellowish-brown, mottled, very firm clay over 19 inches of light olive-brown, mottled, very firm silty clay. The underlying material consists of limy silty clay that is light olive brown and mottled in the uppermost 11 inches, is mottled with light olive brown, gray, and brown in the middle 21 inches, and is light olive brown and mottled in the lower 10 inches.

The water table is high during part of the year. Runoff is slow, permeability is very slow, and the available moisture capacity is medium. The organic-matter content is moderate, and tilth is generally good. The supply of lime and plant nutrients is good. If adequately drained, these soils are productive.

Most areas of these soils have been cleared and drained and are used for crops. Vegetables and sugar beets are grown, as well as the common field crops. Artificial drainage is necessary for the successful production of most crops.

A typical profile of Fulton silty clay loam (Er–5), 480 feet west and 572 feet north of intersection of lane to barn and highway at the North Central Substation of the Ohio Agricultural Research and Development Center at Castalia.

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) silty clay loam; uppermost 6 inches is massive but breaks to weak, medium to coarse, granular structure, and lower 3 inches has weak, medium, subangular blocky structure; firm; numerous roots; slightly acid; abrupt, smooth boundary.

B21tg—9 to 17 inches, yellowish-brown (10YR 5/4) clay; many, coarse, distinct mottles of grayish brown (10 YR 5/2); massive in place but breaks to moderate, fine, subangular blocky structure; very firm; continuous grayish-brown (10YR 5/2) clay films on ped surfaces; common roots; medium acid; clear, smooth boundary.

B22tg—17 to 30 inches, light olive-brown (2.5Y 5/4) silty clay; many, medium, distinct mottles of dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/8); strong, fine and medium, subangular blocky and angular blocky structure; very firm; thick dark grayish-brown (10YR 4/2) clay films on ped surfaces; some roots; mildly alkaline; clear, wavy boundary.

B3g—30 to 36 inches, light olive-brown (2.5Y 5/4) silty clay; many, coarse, distinct mottles of gray (10YR 5/1); weak, coarse, prismatic structure breaking to weak to moderate, subangular blocky; very firm; peds have gray (N 6/0) coatings; few very thin clay films on vertical ped faces; calcareous; clear, smooth boundary.

C1—36 to 47 inches, light olive-brown (2.5Y 5/4) silty clay; many, coarse, distinct, gray (N 6/0) coatings on prism faces; few splotches of light-gray lime; calcareous; smooth, gradual boundary.

C2—47 to 68 inches, mottled light olive-brown (2.5Y 5/4), gray (10YR 5/1), and brown (2.5Y 5/4) silty clay; laminar structure, with few vertical cleavages; some black stains on surfaces of lamellae; calcareous; gradual boundary.

C3—68 to 78 inches, light olive-brown (2.5Y 5/4) silty clay; common, medium, distinct mottles of grayish brown (10YR 5/2); massive; very firm; calcareous.

The A1 horizon, in uncultivated areas, ranges from 2 to 4 inches in thickness and is dark gray (10YR 4/1). Below this is an A2 horizon of grayish-brown (10YR 5/2) silty clay loam. The color hue is 10YR or 2.5Y throughout the profile. The solum ranges from medium acid to mildly alkaline. In the lower part of the C horizon in some places are lenses of silty clay loam, and silty clay loam becomes dominant where Fulton soils grade to Del Rey soils. The depth to calcareous material ranges from 24 to 36 inches. Stones and pebbles are uncommon.

Fulton soils are lighter colored than Toledo soils. They have a finer textured subsoil than Del Rey soils and are less acid than Allis or Mahoning soils.

Fulton silty clay loam, 0 to 2 percent slopes (FuA).—This soil is on low knolls and small ridges on lake plains in the northwestern part of the county. It has the profile described as typical of the series. Most areas are between 10 and 100 acres in size and are surrounded by areas of Toledo soils.

Included in mapping were small areas in which very dark gray to black colors extend to a depth of 10 to 18 inches and a few spots in which the soils are limy to a depth of 18 to 24 inches. Also included were areas of the very poorly drained Toledo soils, which occupy small closed depressions and minor natural drainageways, and numerous small areas in which silty clay loam, rather than silty clay, is below a depth of 42 inches. Other inclusions were a few small areas that have slopes of slightly more than 2 percent.

Most areas are used for crops, but a rather large area in the city of Sandusky is used for residential and industrial purposes. Corn, small grain, fruits, and vegetables are the principal crops. Wetness is a severe limitation. (Capability unit IIIw–2)

Fulton silty clay loam, 2 to 6 percent slopes (FuB).—This soil occurs on the side slopes of knolls and as long, narrow areas along natural drainageways on the lake plain in the northwestern part of the county. In a few eroded areas, the surface layer is dark brown.

Included in mapping were areas of the very poorly drained Toledo soils, which occur in narrow drainageways, and a few areas in which silty clay loam, rather than silty clay, is below a depth of 42 inches.

Many of the areas along major streams are in woods or pasture, but most areas along minor drainageways are used for crops along with the surrounding soils. Wetness is a severe limitation, and erosion is a hazard. (Capability unit IIIw–2)

Galen Series

The Galen series consists of nearly level to gently sloping, light-colored, moderately well drained soils that formed in water-laid sandy deposits. The original vegetation was a hardwood forest. These soils are on uplands in all parts of the county. Arkport and Oakville soils occupy the nearby higher ridges, and Darroch, Kibbie, and Gilford soils occupy nearby depressions.

A typical profile in a cultivated field has a 10-inch plow layer of dark grayish-brown, very friable loamy fine sand over a 10-inch layer of brownish-yellow, very friable loamy fine sand. Below this is 24 inches of yellowish-brown, mottled, friable, stratified fine sand and loamy fine sand and 16 inches of yellowish-brown, mottled, loose fine sand.

Even though sandy, these soils are not extremely droughty. Runoff is slow, and permeability is rapid to moderately rapid. Tilth is good. The response to lime and fertilizer is good, and productivity is moderate.

Most of the acreage is cropland, and a sizable part is used for vegetables. The response to irrigation is good.

Typical profile of Galen loamy fine sand, 0 to 2 percent slopes, in a cultivated field, 0.2 mile east of Rye Beach Road and 0.1 mile north of Fox Road; lot 14, sec. 2, Huron Township.

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) loamy fine sand; weak, fine, crumb structure; very friable; neutral; abrupt, smooth boundary.

A2—10 to 20 inches, brownish-yellow (10YR 6/6) loamy fine sand; weak, medium, platy structure; very friable; neutral; abrupt, wavy boundary.

A&B21t—20 to 44 inches, yellowish-brown (10YR 5/4), stratified fine sand and loamy fine sand; common, coarse, faint mottles of grayish brown (10YR 5/2); single grain; loose; three 2-inch Bt horizons of brown (7.5YR 4/4) fine sandy loam; massive; friable; clay bridgings between the sand grains; neutral; gradual boundary.

A&B22t—44 to 60 inches, yellowish-brown (10YR 5/4) fine sand; common, medium, distinct mottles of dark grayish brown (10YR 4/2); single grain; loose; three ½-inch Bt horizons of brown (7.5YR 4/4) fine sandy loam; mildly alkaline.

More than 90 percent of the sand particles in the profile are fine or very fine in size. The A1 or Ap horizon ranges from dark grayish brown (10YR 4/2) to grayish brown (10YR 5/2) in color and is loamy fine sand or fine sandy loam in texture. Within the profile are 2 to more than 20 distinct Bt horizons, and the combined thickness of these horizons ranges from 6 to 10 inches. The depth to the first Bt horizon ranges from 15 to 40 inches. In some areas, Bt material occurs as irregularly shaped masses. The depth to mottling ranges from 15 to 24 inches. Mottling occurs largely in the A2 horizon, between the bands of Bt material. The reaction in the upper part of the profile ranges from medium acid to neutral. Below a depth of 48 inches in some areas are free carbonates. In some places the soil material is 10 to 20 percent gravel.

Galen soils are more mottled and have slightly duller colors than Arkport soils. They are less mottled and have brighter colors than Darroch soils, coarse subsoil variant. Galen soils are coarser textured than Tuscola soils. They contain more fine sand and less coarse sand and gravel than Oshtemo, Bogart, and Belmore soils.

Galen loamy fine sand, 0 to 2 percent slopes (GaA).—This soil has the profile described as typical of the series. It occurs as small areas on outwash plains and deltas in all parts of the county. In a few small areas the surface layer is light brownish gray as a result of wind erosion.

Included in mapping were small areas in which the surface layer is fine sand or fine sandy loam; small areas of sandy soil that is underlain by silt or clay at a depth of 40 to 60 inches; and areas of the somewhat poorly drained Darroch and Kibbie soils, which occupy shallow depressions and minor natural drainageways. Also included were a few small areas that have slopes of more than 2 percent.

Most of the acreage is used for crops, principally corn, small grain, and vegetables. (Capability unit IIs–1)

Galen loamy fine sand, 2 to 6 percent slopes (GaB).—This soil occurs as small areas on the lake plain and on beach ridges and deltas in all parts of the county. In a few areas the surface layer is light brownish gray, as a result of erosion.

Included in mapping were small areas of the somewhat poorly drained Darroch and Kibbie soils, which are in lower positions; small areas of the well-drained Arkport soils, which are in higher positions; and a few areas in which the surface layer is fine sandy loam or fine sand. Also included were small areas of sand that is directly underlain by silt or clay at a depth of 40 to 60 inches, numerous small areas that have slopes of less than 2 percent, and a few small areas that have slopes of more than 6 percent.

Most areas of this soil are cultivated along with the surrounding soils. Wind erosion is a slight to moderate hazard, and in some areas, blowing sand damages early vegetables. (Capability unit IIs–1)

Galen loamy fine sand, limestone substratum, 0 to 6 percent slopes (GfB).—This soil occurs as small areas on hills in the western part of the county. The limestone bedrock is at a depth of 40 to 60 inches, and above the limestone is a 1- to 3-inch layer of reddish-brown, limy silty clay loam. In some areas the lowermost few inches of sand is limy also, and in a few small areas the surface layer is fine sandy loam.

Included in mapping were small areas of Arkport soils, moderately shallow variant, which are underlain by limestone at a depth of less than 40 inches, and small areas of typical Galen soils in which the depth to rock is more than 60 inches. Also included were a few small areas that have slopes of slightly more than 6 percent.

The use of this soil is governed by the use of surrounding soils. (Capability unit IIs–1)

Galen loamy fine sand, shale substratum, 0 to 6 percent slopes (GlB).—This soil occurs as small areas on sand-covered shale ridges. Most areas are near Bogart Corners, but some are within the NASA Plum Brook reserve. The lowermost few inches of sandy material is acid and the underlying bedrock of acid gray shale is at a depth of 40 to 60 inches. Between the sandy material and the shale, in most areas, is a 2- to 10-inch layer of gray, firm clay loam. In numerous areas the surface layer is fine sandy loam. Some profiles lack the bands of brown fine sandy loam. In some areas no mottling occurs above a depth of 30 or 40 inches. In some areas the sandy part of the profile contains loose shale fragments.

Included in mapping were areas of soils that have a dark-colored surface layer, a few small areas in which the depth to shale is either less than 40 inches or more than 60 inches, and areas of Kibbie soils, acid variant, and Prout soils, which occupy some low spots. Also

included were small areas that have slopes of slightly more than 6 percent.

The areas within the Plum Brook reserve are idle, but other areas are farmed along with the surrounding soils. (Capability unit IIs–1)

Gilford Series

The Gilford series consists of dark-colored, very poorly drained soils. The original vegetation consisted of a lowland hardwood forest and, in the wetter areas, marsh grass. These soils occupy depressions and natural drainageways. Darroch soils, coarse subsoil variant, Galen soils, and other better drained soils occupy the adjacent higher areas.

A typical profile in a cultivated field has a 9-inch plow layer of black, friable fine sandy loam. Below this is 7 inches of black, friable fine sandy loam. The 14-inch subsoil is grayish-brown, mottled, friable fine sandy loam. The underlying material consists of grayish-brown, mottled, very friable loamy fine sand that contains a few thin layers of fine sandy loam.

Runoff is very slow, permeability is moderately rapid, and the available moisture capacity is high. The water table is high. The organic-matter content is high, and tilth is good. If adequately drained, these soils are productive.

Most areas of these soils are cultivated along with the surrounding soils. Special care is needed to maintain the alinement of drainage tile in these soils.

Typical profile of Gilford fine sandy loam, in a cultivated field, on the north side of Bogart Road, just west of Bogart; lot 1, sec. 2, Perkins Township.

Ap—0 to 9 inches, black (10YR 2/1) fine sandy loam; weak, medium, crumb structure; friable; neutral; abrupt, smooth boundary.

A12—9 to 16 inches, black (10YR 2/1) fine sandy loam; weak, medium, granular structure; friable; mildly alkaline; gradual, smooth boundary.

B2g—16 to 30 inches, grayish-brown (2.5Y 5/2) fine sandy loam; many fine, faint mottles of light olive brown (2.5Y 5/4) and common, fine, distinct mottles of yellowish brown (10YR 5/6); very weak, coarse, prismatic structure; friable; very dark gray (10YR 3/1) organic coatings on ped surfaces; mildly alkaline; gradual boundary.

IICg—30 to 60 inches, grayish-brown (2.5Y 5/2) loamy fine sand; many, medium, distinct mottles of light olive brown (2.5Y 5/4); single grain; very friable; few thin lenses of fine sandy loam; mildly alkaline.

The dark-colored A horizon ranges from 10 to 22 inches in thickness and is thickest in areas that receive overwash from adjacent higher areas. It is black (10YR 2/1) or very dark gray (10YR 3/1). The B2 horizon is fine sand, loamy fine sand, or fine sandy loam and has a color hue of 10YR or 2.5Y, a value of 4 or 5, and a chroma of 2. In some places the B horizon contains several bands or irregularly shaped bodies of fine sandy loam, but they are not of sufficient thickness to be considered Bt horizons. The solum ranges from slightly acid to mildly alkaline.

Gilford soils have a darker colored surface layer and a grayer subsoil than Darroch soils, coarse subsoil variant. They are coarser textured than Colwood soils. They are coarser textured than Millgrove soils, and they are not gravelly.

Gilford fine sandy loam (Go).—This soil occurs in depressions and natural drainageways on outwash plains in the western and central parts of the county. The surface layer is very fine sandy loam in places. The slope range is 0 to 1 percent.

Included in mapping were small areas of Colwood soils and areas in which silty or clayey material occurs at a depth of 24 to 60 inches. Also included were a few areas that are limy at the surface.

The use of this soil is governed by the use of adjacent soils, because the areas are too small to be farmed separately. A high water table is a moderate limitation. (Capability unit IIw–5)

Gravel Pits

Gravel pits (Gp) is a land type made up of areas where gravel is being or has been mined for use in construction. The pits commonly occupy beach ridges, kames, and outwash areas. Most are between 3 and 10 acres in size. Those now being mined are continually being enlarged.

The material was removed from stratified layers of gravel and sand that vary in thickness and in orientation and, in some layers, appreciable amounts of silt and sand. The gravel consists dominantly of quartz, granite, and other siliceous material. That in any one layer is of fairly uniform composition but, in many places, differs from that in adjacent layers. Some dolomite aggregate occurs in most pits, and, locally, some shale aggregate. In a few areas weakly bonded dolomite conglomerate is dominant.

The soil material commonly has poor physical properties. The organic-matter content is low. The available moisture capacity is low. Erosion is a hazard in most areas, and instability results in gullying and siltation.

Areas not currently being mined ought to be resurfaced with soil material in which vegetation could be established. If protected from pollution and siltation, ponded gravel pits have potential for wildlife and recreational developments. (Not placed in a capability unit)

Haskins Series

The Haskins series consists of level to gently sloping, light-colored, medium-textured soils that formed partly in outwash and partly in glacial till of clay loam texture. Finer textured material is at a depth of 18 to 40 inches.

A typical profile has an 8-inch plow layer of dark grayish-brown, friable loam. Below the plow layer is a 5-inch layer of light brownish-gray, friable loam. Below this is a 5-inch transitional layer of yellowish-brown, firm silt loam. The subsoil consists of 10 inches of yellowish-brown, firm clay loam over 8 inches of mottled yellowish-brown and light brownish-gray, friable, stratified sandy clay loam and sandy loam. Below this is 4 inches of mottled dark yellowish-brown, very firm clay loam to clay. The underlying material is mottled dark yellowish-brown and dark-brown, very firm clay loam.

The water table is seasonally high. Runoff is slow. The available moisture capacity is medium to high, depending on the depth to the substratum. Permeability is moderate in the upper part of the subsoil and very slow in the lower part of the subsoil and in the substratum. These soils are productive.

Most of the acreage is cropland. Artificial drainage is beneficial to most crops.

Typical profile of Haskins loam, 0 to 2 percent slopes, in a cultivated field, 0.4 mile east of Florence-Wakeman Road, 0.8 mile north of the Huron County line; lot 39, sec. 4, Florence Township.

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) loam; weak, fine, granular structure; friable; neutral; abrupt, smooth boundary.

A2—8 to 13 inches, light brownish-gray (10YR 6/2) loam; many, coarse, distinct mottles of brownish-yellow (10YR 6/6); moderate, thick and medium, platy structure; friable; slightly acid; clear, irregular boundary.

B&A—13 to 18 inches, yellowish-brown (10YR 5/4) heavy silt loam; many, coarse, prominent mottles of strong brown (7.5YR 5/8); moderate, medium, angular blocky structure; firm; thick, very pale brown (10YR 7/3) silt films indicative of degradation; slightly acid; gradual boundary.

B2tg—18 to 28 inches, yellowish-brown (10YR 5/4) clay loam; many, coarse, prominent mottles of strong brown (7.5YR 5/6); weak, coarse, prismatic structure breaking to moderate, medium, blocky; firm; continuous dark grayish-brown (10YR 4/2) clay films on prism faces; medium acid; gradual boundary.

IIB31g—28 to 36 inches, mottled yellowish-brown (10YR 5/6) and light brownish-gray (10YR 6/2), stratified sandy clay loam and sandy loam; many, coarse, prominent mottles of dark reddish brown (2.5YR 3/4); laminar structure because of stratification; friable; neutral; abrupt, smooth boundary.

IIB32—36 to 40 inches, mottled dark yellowish-brown (10YR 4/4) and dark-brown (7.5YR 3/2) heavy clay loam to light clay; few, medium, prominent mottles of dark reddish brown (2.5YR 3/4); massive; very firm; neutral; gradual boundary.

IIC—40 to 60 inches, mottled dark yellowish-brown (10YR 4/4) and dark-brown (7.5YR 3/2) heavy clay loam; few, medium, prominent mottles of dark reddish brown (2.5YR 3/4); massive; very firm; calcareous, especially around carbonate concretions.

In the part of the profile above the IIB horizon, the texture ranges from sandy loam to light clay loam, and in many areas this part of the soil is gravelly. Degradation of the B horizon has not taken place in all areas. In some places there is a contact line of gravel just above the IIB horizon. The depth to the IIB horizon ranges from 18 to 48 inches. The IIC horizon ranges from heavy clay loam to clay in texture and originally consisted either of till or of lacustrine deposits. The lacustrine deposits generally are stratified. The uppermost 2 to 6 inches of this material is leached of carbonates and in some places has the structure of a B horizon.

Haskins soils have a finer textured substratum than Jimtown and Kibbie soils. They have a coarser textured subsoil than Mahoning, Bennington, and Del Rey soils.

Haskins loam, 0 to 2 percent slopes (HsA).—This soil has the profile described as typical of the series. It occurs as small areas in all parts of the county. Most areas are adjacent to Pewamo, Bennington, or Mahoning soils.

Included in mapping were areas in which the surface layer is silt loam or fine sandy loam; areas in which the loamy outwash material is more than 40 inches thick over glacial till; and a few spots, mostly in the western part of the county, of soils that have a black or very dark gray surface layer. Other inclusions were small areas of the dark-colored, very poorly drained Mermill soils, which occur in depressions and minor natural drainageways, and a few small areas that have slopes of more than 2 percent.

Most areas are cropland. All the main field crops are grown, and in a few areas, vegetables are grown. (Capability unit IIw–3)

Haskins loam, 2 to 6 percent slopes (HsB).—This soil occurs as small areas on knolls and ridges, mainly in the till plains. Most areas are less than 5 acres in size. The surface is gravelly in spots.

Included in mapping were areas of the moderately well drained Rawson soils, which are on some of the knolls, and areas of the very poorly drained, dark-colored Mermill or Pewamo soils, which occur in depressions and minor natural drainageways. Also included were numerous small areas in which the loamy outwash material is either less than 18 inches or more than 40 inches thick over glacial till. The thickness is generally greatest on the top of a knoll or ridge and decreases down the slope. Other inclusions were a few small areas that have slopes of less than 2 percent.

The use of this soil is governed largely by the use of surrounding soils. Erosion is only a very slight hazard, and most areas of this soil are so small that the use of special erosion control measures is not practical. (Capability unit IIw–6)

Haskins Series, Dark Surface Variant

The Haskins series, dark surface variant, consists of nearly level, dark-colored, medium-textured, somewhat poorly drained soils. The uppermost 18 to 40 inches of the profile formed in loamy to gravelly outwash, and the lower part formed in compact glacial till or clayey lakebed deposits. The original vegetation consisted of a thin stand of hardwood forest and a dense ground cover of grass. Near these soils are Mermill, Darroch, Lenawee, Wilmer, and typical Haskins soils.

A typical profile in a cultivated area has an 8-inch plow layer of black, friable loam. Below the plow layer is a 5-inch layer of very dark brown, friable fine sandy loam. The uppermost 7 inches of the subsoil consists of friable loam that is very dark grayish brown in the upper part and light olive brown and mottled in the lower part. Below this is 8 inches of yellowish-brown, mottled, friable clay loam over 6 inches of grayish-brown, mottled, firm silty clay loam. The underlying material is yellowish-brown, mottled, firm silty clay loam.

The available moisture capacity is high. Permeability is very slow in the substratum. The organic-matter content is high, and tilth is good. Productivity is good, if adequate drainageways have been provided.

Corn, small grain, soybeans, hay, and vegetables are grown. Most areas are artificially drained because of a seasonally high water table.

Typical profile of Haskins loam, dark surface variant, 0 to 2 percent slopes, in a cultivated field, 100 feet west of Camp Road, 2,700 feet south of Fox Road; lot 4, sec. 4, Huron Township.

Ap—0 to 8 inches, black (10YR 2/1) loam; weak, medium, granular structure; friable; mildly alkaline; abrupt, smooth boundary.

A1—8 to 13 inches, very dark brown (10YR 2/2) fine sandy loam; weak, medium, subangular blocky structure; friable; mildly alkaline; clear, irregular boundary.

B1—13 to 16 inches, very dark grayish-brown (10YR 3/2) loam; weak, coarse, prismatic structure; friable; black (10YR 2/1) organic coatings on ped surfaces; mildly alkaline; gradual, wavy boundary.

B21t—16 to 20 inches, light olive-brown (2.5Y 5/4) loam; common, medium, distinct mottles of yellowish brown (10YR 5/8); weak, very coarse, prismatic structure breaking to weak, medium, subangular blocky; friable; dark grayish-brown (10YR 4/2) clay films on ped surfaces; mildly alkaline; gradual boundary.

B22t—20 to 28 inches, yellowish-brown (10YR 5/4) light clay loam; many, fine, faint mottles of yellowish brown (10YR 5/6); few, fine, faint mottles of grayish brown (10YR 5/2); moderate, fine, subangular blocky struc-

ture; friable, sticky; dark grayish-brown (10YR 4/2) clay films on ped surfaces.

IIBt—28 to 34 inches, grayish-brown (10YR 5/2) heavy silty clay loam; many, medium, distinct mottles of yellowish brown (10YR 5/8); weak, coarse, prismatic structure breaking to moderate, medium, subangular blocky; firm; few dark grayish-brown (10YR 4/2) clay films on prism surfaces; mildly alkaline; clear, irregular boundary.

IIC—34 to 60 inches, yellowish-brown (10YR 5/4) silty clay loam; many, fine, faint mottles of yellowish brown (10YR 5/6 and 5/8); massive; firm; calcareous.

The A1 or Ap horizon ranges from 10 to 16 inches in thickness and is black (10YR 2/1), very dark brown (10YR 2/2), or very dark grayish brown (10YR 3/2). The A horizon and the upper part of the B horizon range from sandy loam to light clay loam in texture (clay content 18 to 35 percent). In some areas these horizons contain considerable gravel, and in these areas clay bridgings, rather than clay films, are dominant in the Bt horizon. The reaction in the upper part of the profile is slightly acid to mildly alkaline. The depth to the underlying material ranges from 18 to 40 inches. The underlying material ranges from clay loam to silty clay in texture and is free of carbonates in the uppermost 1 inch to 10 inches. In most areas structure development and clay films are evident in the uppermost part of the underlying material. This material was originally till or lacustrine deposits.

Haskins soils, dark surface variant, although similar in texture and drainage, have a darker colored surface layer than the typical Haskins soils. They are coarser textured and more gravelly in the upper part of the subsoil than Elliott soils and have a coarser textured subsoil than Darroch soils. Haskins soils, dark surface variant, are underlain by finer textured material than Wilmer soils. They have a brighter colored subsoil than the very poorly drained Mermill soils.

Haskins loam, dark surface variant, 0 to 2 percent slopes (HtA).—This soil is on the lake plain and on till plains in all parts of the county, but it is most extensive in the central and western parts. The texture to a depth of about 13 inches is loam, silt loam, or fine sandy loam. Each of these textures predominates in some rather large areas. In many areas the subsoil is gravelly.

Included in mapping were small areas of the very poorly drained Mermill or Pewamo soils, which occur in depressions and minor drainageways, and a few areas in which the thickness of loamy soil material is either less than 18 inches or more than 40 inches.

Most areas of this soil are cropland. Vegetables and the common field crops are grown. (Capability unit IIw–4)

Jimtown Series

The Jimtown series consists of nearly level, light-colored, somewhat poorly drained soils that formed in acid, sandy to gravelly outwash. These soils are on the lower slopes of beach ridges and on outwash plains, mostly in the eastern part of the county.

A typical profile in a cultivated field has a 10-inch plow layer of dark grayish-brown, friable loam. Below the plow layer is a 4-inch transitional layer of brown, mottled, friable loam. The subsoil consists of 3 inches of yellowish-brown, mottled, firm coarse sandy loam over 10 inches of brown, mottled, firm coarse gravelly sandy clay loam. Below this is 13 inches of multicolored, very friable to loose, stratified gravelly loam that contains thin strata of fine sandy loam and loamy fine sand. The underlying material is multicolored, very friable, stratified gravelly sandy loam and gravelly loam.

Surface runoff is slow. Permeability is moderately rapid above the gravelly material but rapid in it. The available moisture capacity is low to medium, depending upon the content of coarse fragments. The water table is high during part of the year. Reaction is acid, and the supply of plant nutrients is low. Productivity is low to moderate.

These soils are used chiefly for hay and pasture. Artificial drainage is beneficial.

A typical profile of Jimtown loam, 0 to 2 percent slopes, in a cultivated field, on the south side of Main Road, one-fourth mile east of Wright Road; lot 5, sec. 4, Florence Township.

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) loam; weak, medium, granular structure; friable; medium acid; abrupt, smooth boundary.

B&A—10 to 14 inches, brown (10YR 5/3) loam; many, fine, faint mottles of grayish brown (10YR 5/2) and few, fine, prominent mottles of strong brown (7.5YR 5/8); moderate, medium, platy structure; friable; vesicular; medium acid; clear, smooth boundary.

B1t—14 to 17 inches, yellowish-brown (10YR 5/4) coarse sandy loam; common, fine, distinct mottles of grayish brown (10YR 5/2) and yellowish brown (10YR 5/8); weak, medium, subangular blocky structure; firm; few, thin, patchy, dark yellowish-brown (10YR 4/4) clay films on ped surfaces; strongly acid; clear, wavy boundary.

IIB2t—17 to 27 inches, brown (7.5YR 4/4) coarse gravelly sandy clay loam; common, medium, distinct mottles of brown (10YR 5/3); moderate, very coarse, prismatic structure breaking to weak, medium, angular blocky; firm; thick light brownish-gray (2.5Y 6/2) films on some microped surfaces, and thin, discontinuous, brown (7.5YR 4/2) films on others; strongly acid; clear, smooth boundary.

IIB3—27 to 40 inches, multicolored, stratified gravelly loam; 50 to 70 percent gravel; single grain; very friable to loose; thin strata of fine sandy loam and loamy fine sand; strongly acid; clear, smooth boundary.

IIC—40 to 60 inches, multicolored, stratified gravelly sandy loam and gravelly loam; 60 to 80 percent gravel; structureless; very friable; slightly acid.

In uncultivated areas, the A1 horizon ranges from 4 to 6 inches in thickness. The B horizon consists of gravelly sandy loam, gravelly loam, gravelly sandy clay loam, or gravelly clay loam. The color of this horizon has hues of 10YR and 7.5YR, values of 4 to 5, and dominant chromas of 4 to 5; where there are definite peds, the ped exteriors have dominant chromas of 2 or less. The B horizon ranges from friable to firm. The content of gravel or coarser material is as much as 30 percent in the B horizon and as much as 80 percent in the C horizon. The C horizon consists of loamy sand, sandy loam, or loam, 10 to 80 percent gravel and cobblestones, and scattered thin layers of finer textured material. Most of the gravel consists of rounded sandstone pebbles, but some of it consists of flat shale fragments. The C horizon ranges from friable to loose. The content of fragments more than 3 inches in diameter in the soil is as much as 20 percent. The reaction throughout the profile ranges from slightly acid to very strongly acid.

Jimtown soils contain more coarse fragments and generally have a more sandy and gravelly subsoil than Kibbie soils, acid variant. They contain less sand throughout the profile and more gravel in the substratum than Galen soils, and they have a finer textured subsoil. Jimtown soils differ from Haskins soils in not having a substratum of limy clay loam. They are more acid than Digby soils. They have a lighter colored surface layer than Wilmer soils.

Jimtown loam, 0 to 2 percent slopes (JtA).—This soil occupies areas between beach ridges on outwash plains, mostly in the eastern part of the county and to a lesser extent in the southeastern part of Oxford Township. In sizable areas the dominant texture of the surface layer

is fine sandy loam, rather than loam, and in scattered spots the surface is gravelly or sandy.

Included in mapping were spots of the less acid Digby soils; areas of the very poorly drained, dark-colored Millgrove soils, which occupy small depressions and narrow natural drainageways; and a few small areas in which sandstone is at a depth of 40 to 60 inches. Also included were some spots in which glacial till is present at a depth of 40 inches or more and a few small areas that have slopes of more than 2 percent.

Most areas of this soil have been cleared and are used for crops or pasture. Hay and oats are the main crops, but corn and wheat are also grown. Pumpkins, sweet corn, and other vegetables are grown in some areas, mainly in the southeastern part of Oxford Township. (Capability unit IIw–3)

Joliet Series

The Joliet series consists of nearly level, dark-colored, very poorly drained soils that formed in thin lakebed deposits and in material weathered from limestone. These soils are shallow over limestone. The original vegetation was swamp grass. These soils are in the western part of the county. They occupy the lowest parts of the landscape. Pyrmont soils, moderately shallow variant, and Castalia and Ritchey soils occupy nearby higher areas.

A typical profile has an 8-inch plow layer of black, friable silt loam. The subsoil consists of 8 inches of very dark grayish-brown, firm silty clay loam that contains numerous limestone fragments. Below this, at a depth of 16 inches, is solid limestone bedrock. These soils are limy throughout the profile.

These soils are naturally wet. Runoff is slow, permeability is moderate, and the available moisture capacity is low to medium. Productivity is low.

Most of the acreage is used for pasture or hay. Artificial drainage is difficult because of the shallowness to bedrock.

Typical profile of Joliet silt loam, on the south side of Strecker Road, a quarter of a mile east of State Route 4; Groton Township.

Ap—0 to 8 inches, black (10YR 2/1) silt loam; moderate, medium, crumb structure; friable; calcareous; abrupt, smooth boundary.

Bg—8 to 16 inches, very dark grayish-brown (2.5Y 3/2) channery silty clay loam; many, fine, distinct mottles of yellowish brown (10YR 5/6); weak, medium, subangular blocky structure; firm; calcareous; 25 percent limestone fragments 3 to 8 inches in diameter; abrupt, smooth boundary.

IIR—16 inches +, solid limestone bedrock.

The A1 or Ap horizon ranges from 8 to 14 inches in thickness and is silt loam or silty clay loam in texture. The Bg horizon ranges from 1 inch to 10 inches in thickness and is 10 to 50 percent limestone fragments. Above the solid rock in some areas are a few inches of highly fractured limestone rubble. The depth to solid rock ranges from 14 to 20 inches. The Joliet soils in Erie County are calcareous, but those elsewhere generally are not.

Joliet soils are wetter than Romeo soils; they have a thin B horizon, and Romeo soils have none. They are shallower over limestone than Millsdale soils. They are wetter and have a grayer subsoil than Ritchey soils.

Joliet silt loam (Jo).—This soil is nearly level and very wet. Most areas are small. In some spots the depth to bedrock is less than 10 inches and numerous limestone fragments are on the surface. In a few areas the uppermost 1 foot to 2 feet of rock is broken up into thin flat slabs, and natural drainage is generally slightly better in these areas than in the areas where the upper part of the rock is solid. Some areas are slightly higher than most, and in these areas the subsoil is dark grayish-brown loam or silt loam. There are a few sinkholes.

Most areas of this soil are used for pasture or hay or are idle. (Capability unit IVw–2)

Kibbie Series

The Kibbie series consists of nearly level to gently sloping, light-colored, somewhat poorly drained soils that formed in lake-laid silt and fine sand. Presumably, the original vegetation was a hardwood forest. Colwood soils occupy nearby depressions, and Tuscola and Galen soils occupy nearby slopes.

A typical profile in a cultivated area has an 8-inch plow layer of dark grayish-brown, very friable fine sandy loam. Below the plow layer is a 6-inch transitional layer of pale-brown, mottled, friable fine sandy loam. The subsoil consists of 8 inches of brown, mottled, firm silty clay loam over 18 inches of yellowish-brown, mottled, friable silt loam. The underlying material consists of yellowish-brown, mottled, very friable, limy, stratified silt and very fine sand.

The organic-matter content is moderately good, and tilth is generally good. The water table is seasonally high. Runoff is slow, permeability is moderate, and the available moisture capacity is high. If adequately drained, these soils are productive.

Most areas of these soils have been drained and are used for corn, small grain, soybeans, and vegetables.

Typical profile of Kibbie fine sandy loam, 0 to 2 percent slopes, in a cultivated field, east of Berlin Road between Darrow Road and Sprowl Road; lot 13, sec. 1, Huron Township.

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) fine sandy loam; weak, medium, crumb structure; very friable; neutral; abrupt, smooth boundary.

A2&B—8 to 14 inches, pale-brown (10YR 6/3) fine sandy loam; few, coarse, prominent mottles of yellowish red (5YR 4/6) and common, medium, distinct mottles of yellowish brown (10YR 5/4); moderate, medium, platy structure; friable; horizon is 20 percent isolated chunks of brown (7.5YR 5/4) silty clay loam from the B horizon, in a matrix of A2 material; neutral; abrupt, irregular boundary.

B2t—14 to 22 inches, brown (7.5YR 5/4) light silty clay loam; common, fine, distinct mottles of yellowish brown (10YR 5/6); moderate, medium and fine, angular blocky structure; firm; moderate, patchy, grayish-brown (10YR 5/2) clay films covering 60 percent of ped surfaces; neutral; gradual boundary.

B3—22 to 40 inches, yellowish-brown (10YR 5/4) silt loam; many, medium, faint mottles of yellowish brown (10YR 5/6) and few, coarse, distinct mottles of brown (7.5YR 4/4); massive; friable; neutral; gradual boundary.

C—40 to 60 inches, yellowish-brown (10YR 5/4), stratified silt and very fine sand; many, coarse, faint mottles of yellowish brown (10YR 5/6) and distinct mottles of light brownish gray (10YR 6/2); laminar structure because of stratification; very friable; calcareous.

The Ap or A1 horizon ranges from 6 to 10 inches in thickness. Some cultivated areas have no A2 horizon. The B horizon, which is the horizon of clay accumulation, is silt loam or silty clay loam (clay content of the control section is 18 to 35 per-

cent). The total thickness of layers of silty clay loam is less than 20 inches. The B3 horizon and the C horizon vary considerably in thickness and texture. The C horizon has strata of fine sand, very fine sand, loamy fine sand, fine sandy loam, loam, silt loam, silt, and silty clay loam, but rarely do all the textures occur in the same profile. The depth to carbonates ranges from 24 to 48 inches. The solum is slightly acid to neutral. The Kibbie soils in Erie County have a lighter colored surface layer than typical Kibbie soils in other areas.

Kibbie soils contain less clay and more silt in the B horizon and more fine sand in the C horizon than Del Rey soils. They contain more silt and clay and less sand in the B horizon than Darroch soils, coarse subsoil variant. They contain more silt and less gravel than Digby soils. Kibbie soils have a lighter colored surface layer than typical Darroch soils. They are less well drained than Tuscola soils and better drained than Colwood soils.

Kibbie fine sandy loam, 0 to 2 percent slopes (KbA).—This soil has the profile described as typical of the series. It is on the lake plain and on deltas. It occurs as irregularly shaped areas of various sizes. In some rather large areas in Perkins and Margaretta Townships, the surface layer is loam and the soil contains more medium sand and coarse sand and more pebbles than is typical of Kibbie soils. Below a depth of 3 feet in some areas are rather thick layers of fine sand. In a few places limestone underlies the soil at a depth of 40 to 60 inches.

Included in mapping were small areas of the very poorly drained Colwood soils, which occur in depressions and minor natural drainageways; spots in which the surface layer is black or very dark gray sandy loam, loam, or very fine sandy loam; small areas of Del Rey soils; and small areas of Darroch soils, coarse subsoil variant, which consists of loamy fine sand stratified with fine sandy loam. Also included were a few small areas that have slopes of more than 2 percent.

Most areas of this soil have been drained and are used for corn, small grain, hay, and vegetables. (Capability unit IIw–3)

Kibbie fine sandy loam, 2 to 6 percent slopes (KbB).—This soil occurs as small scattered areas on the sides of knolls and minor natural drainageways on the lake plain and on deltas. In a few areas the surface layer is very fine sandy loam or silt loam, and in a few small areas, limestone bedrock occurs at a depth of 40 to 60 inches.

Included in mapping were small areas of the moderately well drained Tuscola soils, which are on the higher knolls, and small areas of the very poorly drained Colwood soils, which are in minor natural drainageways. Also included were numerous small areas that have slopes of less than 2 percent and a few spots in which the surface layer is black or very dark gray.

The use of most areas is governed by the use of the surrounding level soils. In some areas erosion is a slight hazard, but generally the areas are too small to warrant special erosion control practices. (Capability unit IIw-6)

Kibbie silt loam, 0 to 2 percent slopes (KeA).—This soil occurs as small areas on the lake plain and on deltas. It has a profile similar to the one described for the series, but the texture in the upper part of the profile is silt loam. In most areas the silt loam extends down to the layer of silty clay loam. In a few places limestone is below a depth of 40 inches.

Included in mapping were small areas in which the surface is black or very dark gray; areas of the very poorly drained, dark-colored Colwood soils, which occupy small depressions and minor natural drainageways; and small areas of Del Rey soils, which are more clayey and less silty than Kibbie soils. Also included were a few small areas that have slopes of slightly more than 2 percent.

Areas of this soil are used mainly for crops, principally corn, soybeans, vegetables, small grain, and hay. (Capability unit IIw–3)

Kibbie Series, Moderately Shallow Variant

The Kibbie series, moderately shallow variant, consists of nearly level, light-colored, somewhat poorly drained soils that formed in lakelaid silts and fine sands and are underlain at a depth of 20 to 40 inches by limestock bedrock. The original vegetation was a hardwood forest. These soils are around the base of limestone hills. Lewisburg soils, moderately shallow variant, are on the nearby slopes, and Millsdale soils in nearby depressions.

A typical profile in a cultivated field has a 10-inch plow layer of dark grayish-brown, friable fine sandy loam. The subsoil consists of 14 inches of yellowish-brown, mottled, firm silt loam. The underlying material consists of brown, mottled, firm, limy silty clay loam. Limestone bedrock is at a depth of 30 inches.

Runoff is slow, permeability is moderate, and the available moisture capacity is medium. The water table is seasonally high. Productivity is moderate.

Most of the acreage is cropland. Crops benefit from artificial drainage.

Typical profile of Kibbie fine sandy loam, moderately shallow variant, 0 to 2 percent slopes, on the northwest side of State Route 101, 700 feet south of the overpass over State Route 2; Margaretta Township.

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) fine sandy loam; weak, medium, granular structure; friable; neutral; abrupt, smooth boundary.

B2t—10 to 24 inches, yellowish-brown (10YR 5/4) silt loam; common, medium, distinct mottles of grayish brown (10YR 5/2); moderate, medium, subangular blocky structure; firm; grayish-brown (10YR 5/2) clay films cover 75 percent of ped surfaces; mildly alkaline; abrupt, wavy boundary.

IIC—24 to 30 inches, brown (10YR 5/3) silty clay loam; many, coarse, faint mottles of grayish brown (10YR 5/2); weak, coarse, subangular blocky structure; firm; strongly calcareous; abrupt, smooth boundary.

IIIR—30 inches +, solid limestone bedrock.

In cultivated areas the A1 or Ap horizon ranges from fine sandy loam to loam in texture. In undisturbed areas the A1 horizon is very dark grayish brown (10YR 3/2), and there is a brown (10YR 5/3) A2 horizon that ranges from 2 to 5 inches in thickness. In many places the B2t horizon is stratified, dominantly with fine sandy loam, loam, very fine sandy loam, and silt loam. Ped interiors have a color hue of 10YR, a value of 4 or 5, and a chroma of 4 to 6. Ped exteriors have a color hue of 10YR, a value of 4 or 5, and a chroma of 2. The IIC horizon ranges from 2 to 8 inches in thickness and is clay loam, silty clay loam, or silty clay in texture. In some areas it has a hue as red as 7.5YR. The A and B horizons range from slightly acid to mildly alkaline. The depth to carbonates coincides with the depth to the IIC horizon, and the depth to the IIC horizon ranges from 20 to 36 inches.

Kibbie soils, moderately shallow variant, differ from typical Kibbie soils in having limestone at a depth of 20 to 40 inches. They have a finer textured subsoil than Pyrmont soils, moderately shallow variant. They have a lighter colored surface layer and a coarser textured, brighter colored subsoil than Millsdale soils.

Kibbie fine sandy loam, moderately shallow variant, 0 to 2 percent slopes (KfA).—This soil occurs as small areas around the base of limestone hills. In a few spots the surface layer is very dark gray or black; a few areas are pebbly on the surface; and in a few areas the underlying limestone is cracked or broken. In numerous areas the depth to limestone is more than 40 inches, but in only a few is it more than 60 inches.

Included in mapping were small areas in which the surface layer is loam or silt loam or the subsoil is silty clay loam. Also included were areas of the very poorly drained Millsdale soils, which occupy depressions, and a few small ridges that have slopes of slightly more than 2 percent.

Most areas are used for crops or pasture. Hay and small grain are the principal crops where the soil is shallow over limestone. Some corn and vegetables are grown where it is deeper over limestone. (Capability unit IIw–3)

Kibbie Series, Acid Variant

The Kibbie series, acid variant, consists of nearly level, light-colored, somewhat poorly drained soils that formed in lakebed deposits. The original vegetation was a hardwood forest. These soils are in nearly level parts of the lake plain. Colwood soils, acid variant, occupy nearby depressions and natural drainageways. Among the soils in nearby sloping areas are Bogart and Chili soils and Prout soils, brown subsoil variant.

A typical profile in a cultivated field has an 8-inch plow layer of dark grayish-brown, friable silt loam. Beneath the plow layer is a 2-inch layer of brown, mottled, friable silt loam. The 22-inch subsoil consists of yellowish-brown, mottled, firm silty clay loam. The underlying material consists of mottled yellowish-brown and grayish-brown, firm silty clay loam that contains thin lenses of silt loam, silt, and very fine sand. Below this is grayish-brown, mottled, friable silt loam that contains thin lenses of silty clay loam and fine sandy loam.

Runoff is slow, permeability is moderate, and the available moisture capacity is high. The water table is seasonally high.

Most areas have been cleared and artificially drained and are used for field crops. Undrained areas are used for pasture.

Typical profile of Kibbie silt loam, acid variant, 0 to 2 percent slopes, on the west side of Thomas Road, 1,500 feet south of Ohio Turnpike; Oxford Township.

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

A2—8 to 10 inches, brown (10YR 5/3) silt loam; common, medium, faint mottles of grayish brown (10YR 5/2) and prominent mottles of yellowish brown (10YR 5/8); weak, thick, platy structure breaking to weak, fine, subangular blocky; friable; strongly acid; clear, irregular boundary.

B21tg—10 to 22 inches, yellowish-brown (10YR 5/4) silty clay loam; many, medium, distinct mottles of grayish brown (10YR 5/2) and few, fine, distinct mottles of yellowish brown (10YR 5/8); weak, coarse, prismatic structure breaking to moderate, medium, subangular blocky; firm; grayish-brown (10YR 5/2) clay films that are thick and continuous on prism faces and moderately thick and nearly continuous on blocks; strongly acid; gradual boundary.

B22tg—22 to 32 inches, yellowish-brown (10YR 5/4 and 5/6) light silty clay loam; many, coarse, distinct mottles of grayish brown (10YR 5/2); moderate, medium, subangular blocky structure; firm; few lenses of friable silt loam; grayish-brown (10YR 5/2) clay films on ped surfaces; medium acid; clear, irregular boundary.

C1—32 to 48 inches, mottled yellowish-brown (10YR 5/6 and 5/4) and grayish-brown (10YR 5/2) light silty clay loam; massive, but has weakly expressed horizontal cleavage planes; firm; contains ½-inch to 1-inch lenses of silt loam, silt, and very fine sand; medium acid; gradual boundary.

C2—48 to 60 inches, grayish-brown (10YR 5/2) silt loam; many, coarse, distinct mottles of yellowish brown (10YR 5/6); massive; friable; thin lenses of silty clay loam and fine sandy loam; slightly acid but grades to neutral with depth.

The A horizon ranges from silt loam to very fine sandy loam in texture. In some cultivated areas there is no A2 horizon. The B2t horizon ranges from heavy silt loam to silty clay loam in texture. It has a clay content that ranges from 22 to 33 percent. The base color has a hue of 10YR or 2.5Y, a value of 4 or 5, and a chroma of 5 or 6. Ped coatings have dominant chromas of 2 or less. In unlimed areas, the solum is medium acid to strongly acid and the C horizon strongly acid to mildly alkaline. Carbonates, if present, are below a depth of 48 inches.

Kibbie soils, acid variant, are more acid than typical Kibbie soils. They differ from Prout soils in lacking shale in the lower part of the profile. They have a lighter colored surface layer and a brighter colored subsoil than Colwood soils, acid variant. They are siltier and less gravelly than Jimtown soils.

Kibbie silt loam, acid variant, 0 to 2 percent slopes (KhA).—This soil occurs as small areas on the lake plain. In a few places shale is at a depth of 4 to 5 feet.

Included in mapping were numerous areas in which the surface layer is loam or fine sandy loam, and numerous areas in which the surface layer is very dark grayish brown or very dark gray. Also included were areas of the very poorly drained Colwood soils, which occur in some depressions and minor natural drainageways, a few areas of the more gravelly Jimtown soils, and a few small areas that have slopes of slightly more than 2 percent.

Most areas are cropland. Many have been drained. The principal crops are corn, small grain, and hay. (Capability unit IIw–3)

Lenawee Series

The Lenawee series consists of dark-colored, medium-textured and moderately fine textured, very poorly drained soils that formed in lakebed deposits. The original vegetation consisted of lowland hardwoods and, in the wetter areas, marsh grass. These soils occupy broad nearly level areas and small closed depressions and natural drainageways, across the northern part of the county. Del Rey or Kibbie soils generally occupy adjacent higher areas.

A typical profile has an 8-inch plow layer of very dark gray, friable silty clay loam. Below the plow layer is 4 or more inches of very dark gray, friable silty clay loam. The subsoil consists of 6 inches of dark-gray, mottled, firm silty clay loam over 12 inches of dark-gray, mottled, very firm silty clay. Below this is 10 inches of gray, mottled, firm silty clay loam. The underlying material consists of yellowish-brown, firm, limy silty clay loam.

Runoff is slow, permeability is moderately slow, and the available moisture capacity is high. The water table is high much of the year. The organic-matter content is high, and tilth is generally good. The supply of plant nutrients is good. If adequately drained, these soils are very productive.

Most areas of these soils have been drained and are used for field crops and special crops. Artificial drainage is needed for the successful production of most crops.

Typical profile of Lenawee silty clay loam, in a cultivated field, on the west side of Coen Road, 0.2 mile south of the railroad crossing; lot 31, sec. 28, Vermilion Township.

Ap—0 to 8 inches, very dark gray (10YR 3/1) silty clay loam; compound structure of moderate, medium, crumb and moderate, coarse, subangular blocky; friable; moderately alkaline (limed); abrupt, smooth boundary.

A1—8 to 12 inches, very dark gray (10YR 3/1) silty clay loam; moderate, fine, subangular blocky structure; friable; neutral; gradual, smooth boundary.

B21g—12 to 18 inches, dark-gray (10YR 4/1) silty clay loam; many, coarse, prominent mottles of dark yellowish brown (10YR 4/4); moderate, medium, angular blocky structure; firm; mildly alkaline; gradual, smooth boundary.

B22g—18 to 30 inches, dark-gray (10YR 4/1) light silty clay; many, coarse, prominent mottles of dark yellowish brown (10YR 4/4); weak, medium, prismatic structure breaking to strong, medium, angular blocky; very firm; mildly alkaline; gradual, smooth boundary.

B23g—30 to 40 inches, gray (10YR 5/1) silty clay loam; many, coarse, prominent mottles of yellowish brown (10YR 5/6) and few, medium, prominent mottles of dark brown (7.5YR 4/4); weak, medium, subangular blocky structure; firm; mildly alkaline; clear, smooth boundary.

Cg—40 to 60 inches, yellowish-brown (10YR 5/4) silty clay loam; common, medium, distinct mottles of light brownish gray (10YR 6/2) and many, medium, prominent mottles of strong brown (7.5YR 5/6); massive; firm; calcareous.

The surface layer ranges from black (10YR 2/1) to very dark gray (10YR 3/1) in color. The A horizon ranges from fine sandy loam to silty clay loam in texture and from 10 to 14 inches in thickness. The B horizon ranges from heavy silty clay loam to light silty clay in texture. Typically the B horizon is finer textured than the A horizon, but definite evidence of illuviation is lacking. In the lower part of the B horizon and in the C horizon in many areas are strata of silt, silt loam, and fine sand. These strata are numerous where Lenawee soils grade to Colwood soils. The solum ranges from 24 to 48 inches. The Lenawee soils in Erie County commonly have a thicker dark-colored surface layer than is typical of Lenawee soils elsewhere.

Lenawee soils have a darker colored surface layer and a grayer subsoil than Del Rey soils. They contain less clay than Toledo soils and less silt that Colwood soils. Lenawee soils lack pebbles, which are common in Pewamo soils.

Lenawee silt loam (La).—This soil is in broad level areas, small closed depressions, and minor natural drainageways on the lake plain. In some areas the dark color extends only to the depth of plowing. Below a depth of 30 inches in many areas are thin layers of silt loam, silt, or fine sand, and below a depth of 3 feet in a few areas, the texture is dominantly silt loam. In some areas toward the eastern part of the county, the 40- to 60-inch layer is not limy.

Included in mapping were small areas in which the surface layer is loam or very fine sandy loam. Such areas are most common along small natural drainageways and toward the edges of closed depressions. Also included were small knolls and ridges that are occupied by the light-colored Del Rey soils.

Most of the large nearly level areas have been tile drained and are used for corn and small grain. The areas in depressions are used in the same way as the surrounding soils. Most strips in natural drainageways that have steep sides are used as pasture, but those in drainageways that have gently sloping sides are generally within cropped fields and are drained if the surrounding soils are drained. (Capability unit IIw–5)

Lenawee silty clay loam (lc).—This soil has the profile described as typical of the series. It occurs in nearly level areas of the lake plain, in depressions, and as narrow strips along minor natural drainageways. In a few areas it is dark colored only to the depth of plowing. In some areas toward the east side of the county, the 40- to 60-inch layer is not limy.

Included in mapping were small areas of the finer textured Toledo soils and small areas in which the surface layer is loam or silt loam, which are most numerous in the long narrow areas that parallel the drainageways. Also included were a few small knolls and ridges that are occupied by the light-colored, somewhat poorly drained Del Rey soils.

Nearly all the large areas are cropland, and nearly all of these areas have been tile drained. The principal crops are corn and small grain. Many of the narrow strips are used as part of cultivated fields along with better drained soils. Areas along drainageways that have steep sides are commonly used as pasture. (Capability unit IIw–5)

Lewisburg Series

The Lewisburg series consists of nearly level to gently sloping, light-colored, medium-textured, moderately well drained soils that formed in high-lime glacial till. The original vegetation was hardwood forest. These soils are generally in deep pockets in the limestone bedrock, on Kelleys Island and south of Crystal Rock. Nearby are mainly Lewisburg soils, moderately shallow variant.

A typical profile has a 4-inch plow layer of dark grayish-brown, friable silt loam. The subsoil consists of 13 inches of brown silty clay loam that is mottled in the lower part. The underlying material consists of reddish-brown and brown, firm, limy glacial till of clay loam texture.

Runoff is slow to moderately rapid, permeability is moderately slow, and the available moisture capacity is medium. The supply of natural lime is good. Productivity is moderate if the soils are properly fertilized.

Most areas of these soils were once used for grapes, but most vineyards have been abandoned. A small acreage is used for grapes and field crops.

A typical profile of Lewisburg silt loam, 2 to 6 percent slopes, in a field, 150 feet north and 60 feet east of the corner of Titus Road and Westshore Drive, on Kelleys Island.

Ap—0 to 4 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine, crumb structure; friable; neutral; abrupt, smooth boundary.

B21t—4 to 10 inches, brown (7.5YR 5/4) silty clay loam; weak, medium, angular blocky structure breaking to moderate, fine, angular blocky; firm; medium, continuous, reddish-brown (5YR 5/3) clay films on ped surfaces; moderately alkaline; clear, smooth boundary.

B22t—10 to 17 inches, brown (7.5YR 5/4) silty clay loam; common, medium, distinct mottles of grayish brown (10YR 5/2); moderate, medium, angular blocky structure; medium, continuous, reddish-brown (5YR 5/3) clay films on ped surfaces; moderately alkaline; clear, smooth boundary.

C1—17 to 22 inches, reddish-brown (5YR 5/4) clay loam; moderate, thick, platy structure; firm; few, thin, discontinuous, grayish-brown (10YR 5/2) clay films on vertical ped faces; calcareous; gradual, smooth boundary.

C2—22 to 60 inches +, brown (7.5YR 5/4) clay loam; common, medium, distinct mottles of grayish brown (10YR 5/2); massive; firm; calcareous.

In some wooded areas there is a thin A2 horizon. The B horizon has a color line of 10YR, 7.5YR, or 5YR, a value of 5, and a chroma of 4 or 5. The solum ranges from moderately alkaline to neutral. The depth to carbonates ranges from 12 to 18 inches. The Lewisburg soils in Erie County have grayish-brown mottles in the lower part of the subsoil, but Lewisburg soils that represent the established concept do not.

Lewisburg soils are shallower over limy material than Alexandria or Cardington soils, and they are less acid in the upper part of the subsoil. They are deeper to rock than Lewisburg soils, moderately shallow variant, in which the depth to limestone is less than 40 inches. Typical Lewisburg soils are less mottled in the upper part of the subsoil than Pyrmont soils and have a brighter colored subsoil.

Lewisburg silt loam, 0 to 2 percent slopes (LeA).—This soil occurs both on Kelleys Island and in Margaretta Township, but most of it is on Kelleys Island. Limestone bedrock is at a depth of less than 10 feet in most areas.

Included in mapping were small areas of the somewhat poorly drained Pyrmont soils and small areas of the very poorly drained Pewamo soils, which occur in depressions and minor natural drainageways. Also included were numerous areas where depth to limestone bedrock ranges from 40 to 60 inches, and a few small areas that have slopes of slightly more than 2 percent.

The small areas of this soil that are still cultivated are used for corn, small grain, and hay. A few grapes are grown. Grapes were once the major crop, but most vineyards have been abandoned. Some areas have been subdivided for housing, and others are idle. (Capability unit I–1)

Lewisburg silt loam, 2 to 6 percent slopes (LeB).—This soil occurs both on Kelleys Island and in Margaretta Township, but most of it is on Kelleys Island. It has the profile described as typical of the series. A few small moderately eroded areas have a lighter colored surface layer.

Included in mapping were small areas of the dark-colored, very poorly drained Pewamo soils, which occur in depressions and minor natural drainageways, and a few small areas that have slopes of either less than 2 percent or more than 6 percent.

Most areas of this soil either are idle or have been subdivided for housing. A few small areas, particularly in Margaretta Township, are used for the common field crops. A few grapes are grown. Grapes were once the main crop, but most vineyards have been abandoned. (Capability unit IIe–1)

Lewisburg Series, Moderately Shallow Variant

The Lewisburg series, moderately shallow variant, consists of nearly level to moderately sloping, light-colored, medium-textured, well drained to moderately well drained soils that formed in high-lime glacial till or lakebed deposits and are underlain at a depth of 20 to 40 inches by solid limestone bedrock. The original vegetation was hardwood forest. These soils occur on hills in the western part of the county. The shallower Ritchey and Romeo soils, the wetter Pyrmont soils, moderately shallow variant, and Millsdale soils occur nearby.

A typical profile in a cultivated area has a 9-inch plow layer of dark-brown, friable silt loam. The subsoil consists of 6 inches of reddish-brown, firm clay loam. The underlying material is yellowish-brown, firm, limy clay loam. Beneath this, at a depth of 24 inches, is gray limestone bedrock.

The supply of lime and plant nutrients is good. Natural drainage is usually adequate. Runoff is medium, permeability is moderate, and the available moisture capacity is low. Erosion is a hazard in moderately sloping areas. Productivity is moderate.

Most areas have been cleared and are used for small grain, hay, and pasture.

Typical profile of Lewisburg silt loam, moderately shallow variant, 0 to 2 percent slopes, south side of U.S. Route 6 bypass, 1,400 feet west of the railroad overpass; northwest corner of Baldwin 1,386 acre tract, sec 3, Perkins Township.

Ap—0 to 9 inches, dark-brown (10YR 4/3) silt loam; weak, coarse, crumb structure; friable; neutral; abrupt, smooth boundary.

Bt—9 to 15 inches, reddish-brown (5YR 4/4) heavy clay loam; moderate, medium, angular blocky structure; firm; clay films on ped surfaces; moderately alkaline; clear, wavy boundary.

C—15 to 24 inches, yellowish-brown (10YR 5/4) clay loam; massive; firm; calcareous; abrupt, smooth boundary.

IIR—24 inches +, gray (10YR 6/1) limestone.

In some places the plow layer is dark grayish brown instead of dark brown, and in some places it is loam instead of silt loam. Some profiles have a grayish-brown (10YR 5/2) A2 horizon 2 or 3 inches thick. The B horizon ranges from heavy clay loam to silty clay in texture and is 5 to 12 inches thick. It shows evidence of clay accumulation and has an overall clay content of 25 to 35 percent. The color of this horizon has a hue of 5YR to 10YR. In some places the C horizon is stratified glacial till, and in others it is a lacustrine deposit that contains numerous angular pebbles. This horizon also contains fragments of limestone. In moderately well drained areas, the lower part of the C horizon is mottled. In some areas the uppermost foot or two of the limestone bedrock is broken. To a depth of 12 to 18 inches, the reaction is neutral or alkaline; the lower part of the profile is limy.

Lewisburg soils, moderately shallow variant, are deeper over limestone than Ritchey soils. They are finer textured than Galen soils, limestone substratum. They are less mottled and generally have a lighter colored subsoil than Pyrmont soils, moderately shallow variant. They are shallower over limestone than typical Lewisburg soils. Lewisburg soils, moderately shallow variant, differ from Loudonville soils and Prout soils, brown subsoil variant, in being nonacid and being underlain by limestone instead of sandstone or shale.

Lewisburg silt loam, moderately shallow variant, 0 to 2 percent slopes (LgA).—This soil occurs as small areas in the northwestern part of the county. It has the profile described as typical of the Lewisburg series, moderately

shallow variant. The texture of the surface layer is silt loam, loam, or fine sandy loam. In some areas silt loam extends down to the bedrock. The color of the surface layer is dark brown, dark grayish brown, or reddish brown. Variations in color occur within most of the larger areas. Some profiles are mottled below a depth of 2 feet. In some areas there are a few open sinkholes.

Included in mapping were small areas of Ritchey soils, in which the depth to limestone is less than 20 inches; very small areas where soil material extends into cracks and pockets in the underlying rock to a depth of more than 40 inches; and areas of the somewhat poorly drained Pyrmont soils, moderately shallow variant, which occupy shallow depressions and are mottled just below the surface layer. Other inclusions were areas, surrounding closed depressions and sinkholes, that have slopes of more than 2 percent. The surface layer is lighter colored on these slopes than in the surrounding level areas.

Most areas of this soil are used for crops or pasture. Hay and small grain are the principal crops. Droughtiness is a hazard. (Capability unit IIs–3)

Lewisburg silt loam, moderately shallow variant, 2 to 6 percent slopes (LgB).—This soil occurs as large areas on the tops and sides of hills in the northwestern part of the county. In numerous areas, some rather large, the surface layer is loam or fine sandy loam instead of silt loam. There are spots where the silt loam extends to within a few inches of bedrock. In a few eroded spots the surface layer is lighter colored. There are a few open sinkholes.

Included in mapping were small areas of Ritchey soils, which are less than 20 inches deep over limestone; very small areas where the soil material extends into cracks and pockets in the underlying rock to a depth of more than 40 inches; and a few small areas of Casco soils, very flaggy subsoil variant, which are underlain by broken limestone instead of solid bedrock. Also included were numerous small areas that have slopes of either less than 2 percent or more than 6 percent.

Most areas of this soil are used for crops or pasture. Hay and small grain are the principal crops. Continued cultivation can cause erosion and a substantial decrease in productivity, especially where the soil is shallowest. (Capability unit IIe–3)

Lewisburg silt loam, moderately shallow variant, 6 to 12 percent slopes (LgC).—This soil is on the sides of hills and on the side slopes of stream valleys in the northwestern part of the county. In some areas the surface layer is grayish brown, and in small eroded areas it is reddish brown. The texture of the surface layer is loam, fine sandy loam, or loamy fine sand. In some areas loamy fine sand or fine sandy loam extends down to within a few inches of the rock.

Included in mapping were small areas of Romeo and Ritchey soils, which are underlain by limestone at a depth of less than 20 inches, and a few small areas in which the soil material extends into cracks in the underlying rock to a depth of more than 40 inches. Also included were numerous areas, some long and narrow and some small, that have slopes of either less than 6 percent or more than 12 percent.

Most areas of this soil are in permanent pasture or are used for hay and small grain with surrounding more nearly level soils. Even small losses of soil material through erosion can substantially decrease the productivity of such a shallow soil as this one. Erosion and droughtiness are hazards. (Capability unit IIIe–3)

Lobdell Series

The Lobdell series consists of light-colored, medium-textured, moderately well drained soils that formed in low-lime stream deposits. The original vegetation was a hardwood forest in which there was a mixture of upland and lowland species. These soils are in the valleys of the larger streams in the eastern part of the county. They occupy the higher parts of stream bottoms and are flooded occasionally. Lower areas nearby are occupied by Orrville and Wayland soils.

A typical Lobdell soil in a cultivated field has a 9-inch plow layer of dark grayish-brown, friable silt loam. The underlying material is brown, friable silt loam that contains thin layers of loam, fine sandy loam, sandy loam, and gravelly loam. Mottling occurs below a depth of 20 to 36 inches. The reaction throughout the profile is acid.

Runoff is slow, permeability is moderate, and the available moisture capacity is high. These soils are productive. Only a few of the more accessible areas are farmed.

Typical profile of Lobdell silt loam, 350 feet west of the Vermilion River, 400 feet north of the Huron County line, in Florence Township.

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine, crumb structure; friable; slightly acid; abrupt, smooth boundary.

C1—9 to 22 inches, brown (7.5YR 5/4) silt loam; very weak, medium, subangular blocky structure; friable; medium acid; clear, smooth boundary.

C2—22 to 30 inches, brown (7.5YR 4/4) silt loam; common, coarse, faint mottles of grayish brown (10YR 5/2); laminar structure resulting from stratification; friable; thin strata of loam and fine sandy loam; medium acid; clear, smooth boundary.

C3—30 to 60 inches, brown (10YR 4/3) silt loam; laminar structure resulting from stratification; friable; thin strata of loam, sandy loam, and gravelly loam, and some strata that are brown (7.5YR 4/4) or grayish brown (10YR 5/2); slightly acid.

These soils range from slightly acid to medium acid throughout the profile. The number of strata and the thickness, color, and texture of the strata vary considerably within small areas. Some profiles contain buried A horizons. Lenses of sand and gravel are common, and in some of these the sand and gravel are composed largely of shale fragments.

Lobdell soils are similar to Eel soils but are acid rather than neutral to alkaline. They are deeper to mottling and generally brighter colored than Orrville soils.

Lobdell silt loam (Lm).—This soil occurs as small areas. It occupies the higher parts of the valleys of the Vermilion River and other streams in the eastern part of the county. The slope is dominantly less than 2 percent, but there are steep slopes on the sides of old stream channels. On the surface in some areas are fresh deposits of light-colored soil material. In some areas along the Vermilion River, south of Birmingham, this soil is red because it formed in alluvium that has hues as red as 5YR. The alluvium is derived from a local formation of reddish shale.

Included in mapping were numerous areas in which the surface layer is loam or fine sandy loam and numerous

areas, in depressions and old stream channels, of the more poorly drained Orrville soils.

Most areas are pasture or woodland, but a few areas in the valley of the Vermilion River are cropland. (Capability unit IIw–7)

Loudonville Series

The Loudonville series consists of moderately deep, light-colored, medium-textured, well drained to moderately well drained soils that formed in glacial till of clay loam texture and are underlain by sandstone bedrock at a depth of 20 to 40 inches. These soils are on the sides and tops of hills in the eastern part of the county.

A typical profile in an uncultivated area has an 8-inch surface layer of friable loam that is dark grayish brown in the uppermost few inches and pale brown in the lower part. The subsoil consists of 12 inches of brown, firm clay loam over 4 inches of brown, friable loam that contains sandstone fragments. Below this is sandstone bedrock.

Permeability is moderate. The available moisture capacity is low to medium, depending upon the thickness of the soil material above the rock.

These soils are good for orchard crops. Because they are somewhat droughty, they are less well suited to field crops.

The more gently sloping areas are used for hay, small grain, corn, and orchard crops. The moderately sloping areas are in woods or permanent pasture.

Typical profile of Loudonville loam, 2 to 6 percent slopes, in a wooded area, southwest of Smoky Road, west of Frailey Road; lot 11, subrange 4, Berlin Township.

A1—0 to 3 inches, dark grayish-brown (10YR 4/2) loam; weak, medium, granular structure; friable; slightly acid; abrupt, wavy boundary.

A2—3 to 8 inches, pale-brown (10YR 6/3) loam; weak, medium, platy structure; friable; medium acid; clear, smooth boundary.

B2t—8 to 20 inches, brown (7.5YR 4/4) light clay loam; weak, medium, subangular blocky structure; firm; thin patchy clay films on ped surfaces; medium acid; abrupt, smooth boundary.

IIB3—20 to 24 inches, brown (7.5YR 4/4) loam; massive; friable; 30 percent sandstone fragments; medium acid; gradual boundary.

IIR—24 inches +, fine-grained, acid sandstone bedrock.

The content of sandstone fragments more than 2 inches in diameter in the A and B horizons is as much as 40 percent. The B2t horizon is weakly expressed; clay films are evident on only a small proportion of the ped surfaces. The texture of the A and B horizons ranges from loam to clay loam. The underlying sandstone is solid in some areas and broken in others. Where the sandstone is broken, the content of sandstone fragments more than 10 inches in diameter is more than 75 percent. The solum ranges from slightly acid to strongly acid.

Loudonville soils have a finer textured subsoil than Dekalb soils. They have a finer textured subsoil and are deeper over sandstone than Berks soils. Loudonville soils differ from Lewisburg soils, moderately shallow variant, in being acid and in being underlain by sandstone instead of limestone.

Loudonville loam, 0 to 2 percent slopes (loA).—This soil occurs on the sandstone hills in the southeastern part of the county. It has large stones on the surface in a few small areas. In most areas it is moderately well drained and is mottled at a depth of 15 to 24 inches. In some areas the subsoil is neutral in reaction. A few small areas are underlain by broken sandstone rather than solid rock.

Included in mapping were a few small areas of shallow soils, in which the depth to rock is less than 20 inches; areas of a soil in which the depth to rock is more than 40 inches, and areas of Mitiwanga soils, which occur in depressions and minor natural drainageways. Also included were small areas in which the surface layer is silt loam or fine sandy loam and small areas that have slopes of more than 2 percent.

Some areas are used for cultivated crops, and some for orchards. The stony areas are in pasture or woodland. Runoff is slow to moderate, and droughtiness in summer is a limitation. (Capability unit IIs–3)

Loudonville loam, 2 to 6 percent slopes (loB).—This soil has the profile described as typical of the series. It occurs on the sandstone hills in the southeastern part of the county. It has large stones and boulders on the surface in a few small areas. A few areas are eroded and have a light brownish-gray surface layer. Mottling occurs below a depth of 24 inches in some areas. In a few small areas the underlying sandstone is not solid but consists of loose boulders.

Included in mapping were a few small areas of Berks soils, in which the depth to rock is less than 20 inches; areas of a soil in which the depth to rock is more than 40 inches; and small areas that have slopes of either less than 2 percent or more than 6 percent. Also included were numerous areas in which the surface layer is silt loam and a few small areas in which the surface layer is fine sandy loam.

Many areas of this soil are used for cultivated crops or orchard crops, but the shallow areas and the stony areas are in pasture or woodland. In areas that are not protected by a cover of vegetation, runoff is medium and erosion is a hazard. Local wetness caused by small springs or seep spots is a limitation in some areas. (Capability unit IIe–3)

Loudonville loam, 6 to 12 percent slopes (loC).—This soil occurs as small areas on the sandstone hills in the southeastern part of the county. It has a few rock outcrops and, in a few areas, large stones and boulders on the surface. On some of the hills, there are springs and seep spots. A few small areas are eroded and have a thin, light grayish-brown surface layer.

Included in mapping were numerous small areas of shallow soils, in which the depth to sandstone is less than 20 inches, and a few small areas of a soil in which the depth to sandstone is more than 40 inches. Also included were small areas that have slopes of either less than 6 percent or more than 12 percent and areas in which the surface layer is fine sandy loam or silt loam.

Most areas of this soil are in pasture or woodland, but a few areas are used for cultivated crops or orchards. Droughtiness and erosion are hazards. Local wetness caused by springs and seep spots interferes with cultivation and with the management of orchards in some places. Drainage is difficult because the soil is shallow over rock. (Capability unit IIIe–3)

Made Land

Made land (Ma) consists of areas from which soil material has been removed or in which it has been deposited as fill. These areas are commonly associated with construction operations or debris disposal. Most of the areas

are 3 to 10 acres in size. Areas used for debris disposal are continually being enlarged.

In the areas from which soil material has been removed, the remaining soil material is commonly similar to that in the substratum of adjacent soils. In areas of fill or debris disposal, the soil material generally consists of mixtures of material from the subsoil and substratum of nearby soils. The soil material commonly has poor physical properties. It is generally calcareous. The available moisture capacity is low. The organic-matter content is low. Erosion is a hazard in most areas, and instability results in gullying and siltation.

Made land is used for expressways and adjacent areas, interchanges, ramps, parking lots, factory sites, shipping centers, and other purposes. Resurfacing with soil material more favorable for plants would be beneficial in establishing vegetation. Some areas would be suitable for recreation developments, and remote areas have potential as wildlife habitat. (Not placed in a capability unit)

Mahoning Series

The Mahoning series consists of nearly level to gently sloping, light-colored, somewhat poorly drained soils that formed in low-lime glacial till. These soils are on uplands and are most extensive in the southeastern part of the county. Ellsworth soils occupy nearby slopes, and Trumbull and Miner soils occupy nearby depressions and natural drainageways.

A typical profile in a cultivated area has a 9-inch plow layer of dark grayish-brown, friable silt loam. Below the plow layer is a 5-inch layer of brown, mottled, friable loam. The subsoil consists of 8 inches of dark-brown, mottled, very firm clay over 8 inches of dark-brown, mottled, very firm clay loam. The underlying material is brown, mottled, firm, limy clay loam. Pebbles are throughout the profile.

The water table is seasonally high. Runoff and permeability are slow, and the available moisture capacity is medium. The organic-matter content and the supply of plant nutrients and lime are rather low. Productivity is moderate.

A large part of the acreage is cropland. The smaller areas are pasture and woodland. Artificial drainage is necessary for the production of most crops.

Typical profile of Mahoning silt loam, 0 to 2 percent slopes, in a cultivated field, west of Green Road, about 0.2 mile south of the Vermilion River; lot 98, sec. 1, Florence Township.

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

A2—9 to 14 inches, brown (10YR 5/3) loam; many, fine, faint mottles of yellowish brown (10YR 5/6) and few, coarse, prominent mottles of dark brown (7.5YR 4/4); moderate, medium, platy structure; friable; vesicular; strongly acid; abrupt, irregular boundary.

B21t—14 to 22 inches, dark yellowish-brown (10YR 4/4) clay; many, coarse, distinct mottles of yellowish brown (10YR 5/6); few, coarse, prominent mottles of dark reddish brown (5YR 3/4), and few, coarse, distinct mottles of light brownish gray (10YR 6/2); moderate, coarse, prismatic structure; very firm; dark grayish-brown (10YR 4/2) clay films are moderately thick and continuous on vertical ped faces but patchy on horizontal ped faces; strongly acid; gradual boundary.

B22t—22 to 30 inches, dark yellowish-brown (10YR 4/4) heavy clay loam; many, coarse, distinct mottles of strong brown (7.5YR 5/6) and few, coarse, distinct mottles of light brownish gray (10YR 6/2); moderate, coarse, angular blocky structure; very firm: few, discontinuous, dark grayish-brown (10YR 4/2) clay films on vertical ped surfaces; neutral; clear, wavy boundary.

C—30 to 60 inches, brown (10YR 5/3) heavy clay loam; common, fine, prominent mottles of strong brown (7.5YR 5/6); massive; firm; calcareous.

The B and C horizons range from clay loam to clay in texture. The size, number, and color of the mottles vary. The glacial till in which these soils formed was derived largely from sandstone and shale. Generally the content of carbonates in the till ranges from 5 to 15 percent, and the depth to the carbonates ranges from 24 to more than 60 inches, but shale substratum and sandstone substratum phases are mapped, and in these the till is not calcareous. The solum ranges from neutral to very strongly acid. There are pebbles throughout the profile.

Mahoning soils have poorer natural drainage than Ellsworth soils. They have an A2 horizon, but the Ellsworth soils do not. They have better natural drainage and are less gray than Trumbull soils. Mahoning soils are deeper over bedrock than Allis soils. They are more acid than Bennington soils and have a denser subsoil. Mahoning soils have a thinner surface layer than Haskins soils.

Mahoning loam, 0 to 2 percent slopes (MfA).—This soil occurs in the eastern part of the county. The surface layer is 8 to 14 inches thick. In some areas in Florence Township, the reaction in the uppermost 36 inches of the profile is slightly acid to neutral.

Included in mapping were a few small areas of silt loam; areas of the dark-colored, very poorly drained Miner soils and the light-colored, poorly drained Trumbull soils, which occupy small depressions and narrow drainageways; and small areas of Haskins loam, in which the loam surface layer is more than 18 inches thick. Also included were a few small areas that have slopes of more than 2 percent.

About 75 percent of the acreage has been cleared and is used for crops and permanent pasture. Corn, small grain, and hay are the crops grown. (Capability unit IIIw–3)

Mahoning silt loam, 0 to 2 percent slopes (MgA).—This soil has the profile described as typical of the series. It occurs in nearly level areas and on low knolls, mainly in the eastern part of the county. In extensive areas near Florence, the reaction in the uppermost 36 inches of the profile is slightly acid to neutral. The clay content is higher and pebbles are fewer in areas in the southwestern part of Vermilion Township than in the more extensive areas to the south and west.

Included in mapping were areas of the light-colored, poorly drained Trumbull soils and the dark-colored, very poorly drained Miner soils, which occupy small depressions and narrow drainageways. Also included were a few small areas that have slopes of more than 2 percent.

About 75 percent of the acreage has been cleared and is used for crops and permanent pasture. Corn, small grain, and hay are the crops grown. (Capability unit IIIw–3)

Mahoning silt loam, 2 to 6 percent slopes (MgB).—This soil is on low knolls and on the side slopes of small natural drainageways in the eastern part of the county.

Included in mapping were a few small areas of nearly level Mahoning silt loam; areas of the very poorly drained Miner soils and the poorly drained Trumbull soils, which

occupy small natural drainageways and depressions; and a few small areas of the moderately well drained Ellsworth soils, which are generally on the higher knolls. Also included were numerous areas in which the surface layer is loam.

About 75 percent of the acreage has been cleared and is used for crops and permanent pasture. Corn, small grain, and hay are the crops grown. Seasonal wetness is the main limitation. Erosion is a slight hazard. (Capability unit IIIw–3)

Mahoning stony silt loam, 0 to 2 percent slopes (MhA).—This soil occurs in the eastern part of the county. The profile is 20 to 25 percent sandstone fragments that are 2 to 6 inches thick and 1 foot to 3 feet in diameter.

Included in mapping were numerous areas in which the surface layer is loam and small areas of the moderately well drained Ellsworth soils.

Most areas of this soil are too stony to be cultivated and are in woodland or in permanent pasture or are idle. Seasonal wetness is the main limitation. (Capability unit IIIw–3)

Mahoning loam, sandstone substratum, 0 to 2 percent slopes (MkA).—This soil occurs near the base of sandstone hills in the eastern part of the county. It has a profile similar to the one described as typical of the series, but broken or solid sandstone bedrock is at a depth of 40 to 60 inches. Just above the sandstone is loam or clay loam, or, in some areas, sandy loam. The surface layer is loam or silt loam. This soil is very acid and is low in fertility. Stones are numerous below a depth of 2 feet in most areas.

Included in mapping were small areas of Mahoning loam, in which the depth to sandstone is more than 60 inches, and a few spots of a dark-colored soil.

About half of the acreage has been cleared and is used for permanent pasture, corn, small grain, and hay. Soft maple and elm are the dominant trees in wooded areas. Drainage tile is difficult to install because of the limited depth to sandstone. (Capability unit IIIw–3)

Mahoning silt loam, shale substratum, 0 to 2 percent slopes (MlA).—This soil occurs in the eastern and central parts of the county. The surface layer is light-colored silt loam or loam in most areas in the eastern part of the county, but it is dark-colored silty clay loam in large areas in Oxford Township. Hard shale is at a depth of 40 to 60 inches. Just above it is a 6- to 18-inch layer of shale-derived silty clay. The reaction is acid throughout the profile.

Included in mapping were a few small stony areas in the eastern part of the county; small areas of the poorly drained Allis soils and the very poorly drained Fries soils, which occur in depressions and minor natural drainageways; and areas in which the depth to shale is either less than 40 inches or more than 60 inches. Also included were a few small areas that have slopes of more than 2 percent.

Except for the included stony areas, the entire acreage has been cleared and is used for crops and permanent pasture. Corn, small grain, and hay are the principal crops. Sugar beets are grown on the dark-colored, finer textured soils in Oxford Township. The stony areas are used mainly as woodland. In these areas of dark-colored soil, the content of organic matter is higher than is typical but the plow layer is finer textured, and consequently maintenance of tilth is a problem. (Capability unit IIIw–3)

Marsh

Marsh (Mm) is along the shore of Lake Erie. The largest area is between Sandusky and Bay View, but sizable areas occur near Whites Landing and at the mouth of the Huron River and of Old Woman Creek. These areas are submerged part of the year, but they are dry long enough to permit the growth of cattails, sedges, and other water-tolerant plants. The soil material underlying the marsh varies considerably. In the areas west of Sandusky, it is similar to the material in the lower part of the profile of Toledo soils, but in the areas east of Sandusky, it is similar to the material in the lower part of the profile of Lenawee and Colwood soils.

These areas provide good habitat for duck, muskrat, and other kinds of wildlife, if they are protected from land-filling operations and from pollution. (Not placed in a capability unit)

Mermill Series

The Mermill series consists of dark-colored, very poorly drained soils that formed mostly in 20 to 40 inches of loamy to gravelly outwash but partly in underlying firm glacial till or lake-laid clay. The original vegetation consisted of lowland hardwoods and, in the wetter areas, swamp grass. These soils occur in level areas, closed depressions, and minor natural drainageways in all parts of the county. Typically they are on the lowest parts of the landscape, and Digby, Jimtown, or Haskins soils are in the higher areas nearby.

A typical profile has an 8-inch plow layer of black, friable silt loam. Beneath the plow layer is a 3-inch layer of black, friable silt loam. The subsoil consists of 3 inches of very dark brown, mottled, friable loam over mottled gravelly clay loam that is yellowish brown and firm in the uppermost 8 inches, light olive brown and friable in the middle 6 inches, and dark yellowish brown and firm in the lower 7 inches. Below this is 3 inches of strongly mottled, brown and yellowish-brown, firm silty clay loam. The underlying material is strongly mottled, brown and yellowish-brown, firm, limy silty clay loam. There is an abrupt boundary between the upper part of the subsoil and the lowermost 3 inches.

The water table is at or near the surface in winter and spring. Runoff is slow to ponded, and the available moisture capacity is high. Permeability is moderate in the upper part and very slow in the underlying material. Tilth is generally good. If adequately drained, these soils are productive.

Most of the acreage has been cleared and drained and is used for crops. Artificial drainage is necessary for the successful production of most crops.

Typical profile of Mermill silt loam, 600 feet north of Fox Road and 0.6 mile west of Camp Road; lot 12, sec. 4, Huron Township.

A1p—0 to 8 inches, black (10YR 2/1) silt loam; weak, coarse, subangular blocky structure breaking to weak, fine, granular; friable; neutral; abrupt, smooth boundary.

A12—8 to 11 inches, black (10YR 2/1) silt loam; weak, coarse, subangular blocky structure; friable; neutral; diffuse, wavy boundary.

B1g—11 to 14 inches, very dark brown (10YR 2/2) loam; many, coarse, distinct mottles of dark grayish brown (10YR 4/2); weak, coarse, subangular blocky structure; friable; neutral; clear, smooth boundary.

B21tg—14 to 22 inches, yellowish-brown (10YR 5/4) gravelly clay loam; few, fine, distinct mottles of yellowish brown (10YR 5/6) and grayish brown (10YR 5/2); massive but breaks to weak, medium, subangular blocky structure; firm; moderately thick, dark-gray (10YR 4/1), clay-organic coatings; neutral; gradual boundary.

B22tg—22 to 28 inches, light olive-brown (2.5Y 5/4) gravelly clay loam; common, coarse, distinct mottles of brownish yellow (10YR 6/6); massive but breaks to weak, fine, subangular blocky structure; friable; very dark gray (10YR 3/1) root channels; discontinuous, very dark grayish-brown (10YR 3/2), clay-organic coatings; neutral; clear, smooth boundary.

B31—28 to 35 inches, dark yellowish-brown (10YR 4/4) gravelly clay loam; many, coarse, prominent mottles of yellow (10YR 7/6) and common, medium, distinct mottles of yellowish brown (10YR 5/6); massive; firm; neutral; abrupt, smooth boundary.

IIB32—35 to 38 inches, strongly mottled, brown (10YR 5/3) and yellowish-brown (10YR 5/6) silty clay loam; many, medium, distinct mottles of light gray (10YR 7/2); massive; firm; neutral; clear, smooth boundary.

IIC—38 to 60 inches, strongly mottled, brown (10YR 5/3) and yellowish-brown (10YR 5/6) light silty clay loam; many, medium, distinct mottles of light gray (10YR 7/2); massive; very firm; calcareous.

The A or Ap horizon ranges from 8 to 15 inches in thickness and from black (10YR 2/1) to very dark gray (10YR 3/1) in color. The texture is silt loam, loam, or silty clay loam. The Bg horizon ranges from heavy loam to gravelly clay loam or sandy clay loam. The color is dominantly in hues of 10YR to 2.5Y, values of 4 or 5, and chromas of 1 to 4. In many areas this horizon contains thin layers of sand and gravel. The IIB and IIC horizons range from silty clay loam to silty clay in texture and are of till or lacustrine origin. Where of lacustrine origin, they are stratified. The uppermost 2 to 12 inches of these horizons is leached of carbonates but shows no other evidence of alteration. The A and B horizons range from medium acid to neutral. The Mermill soils in Erie County have a thicker black surface layer than typical soils of the series.

Mermill soils are much more clayey in the lower part than Millgrove soils. They have a darker colored surface layer and a grayer subsoil than Haskins soils. They are gravelly in the B horizon, whereas Colwood soils are not gravelly. They are finer textured than Gilford soils, which are not gravelly.

Mermill silt loam (Mn).—This soil has the profile described as typical of the Mermill series. It occurs in level to depressional areas and in minor natural drainageways in all parts of the county.

Included in mapping were numerous areas in which the surface layer is loam, small areas in which the depth to firm silty clay loam is either more than 42 inches or less than 18 inches, and a few low knolls and ridges occupied by the light-colored Haskins and Digby soils.

Most of the larger areas have been artificially drained and are used for crops. Corn, small grain, and hay are the principal crops grown. (Capability unit IIw–5)

Mermill silty clay loam (Mo).—This soil occurs in nearly level to depressional areas on till plains and the lake plain. The areas are small; the largest are adjacent to Pewamo soils in Groton Township. Below the silty clay loam surface layer, the texture is gravelly loam or gravelly clay loam to a depth of 18 to 40 inches.

374–857—71——9

Included in mapping were small areas in which the surface layer is silt loam, small areas of Millgrove soils in which the depth to firm silty clay loam or silty clay is more than 40 inches, and small areas of Pewamo and Lenawee soils in which the depth to firm silty clay loam or silty clay is less than 18 inches.

This soil is farmed with surrounding soils. Most areas are used for crops. (Capability unit IIw–5)

Metea Series

The Metea series consists of nearly level to moderately sloping, light-colored, moderately well drained, sandy soils that are underlain at a depth of 18 to 40 inches by finer textured materials. The original vegetation was a hardwood forest. These soils are most commonly on low sand ridges. Rimer, Kibbie, and Tuscola soils occupy adjacent lower areas.

A typical profile has an 8-inch plow layer of dark grayish-brown, very friable loamy fine sand. Below the plow layer is an 8-inch layer of pale-brown, very friable loamy fine sand. The subsoil consists of 8 inches of dark yellowish-brown, very friable loamy fine sand over 8 inches of dark yellowish-brown, mottled, firm silty clay loam. The underlying material consists of yellowish-brown, mottled, very firm, limy silty clay loam over brown, mottled, firm, limy, stratified silt loam, fine sandy loam, and silty clay loam.

Runoff is slow, and the available moisture capacity is medium to low. Permeability is rapid to moderately rapid in the upper part of the profile and moderately slow in the lower part. In dry years the moisture supply is not adequate for shallow-rooted crops. Wind erosion is a hazard. The organic-matter content is low. Productivity is moderate.

Most of the acreage is cropland. Both field crops and vegetables are grown. Artificial drainage is not generally needed.

Typical profile of Metea loamy fine sand, 2 to 6 percent slopes, 200 feet south and 60 feet east of the corner of Barrows Road and Darrow Road in Berlin Annex.

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) loamy fine sand; weak, fine, crumb structure; very friable; neutral; abrupt, smooth boundary.

A2—8 to 16 inches, pale-brown (10YR 6/3) loamy fine sand; single grain; very friable; neutral; abrupt, irregular boundary.

B1—16 to 24 inches, dark yellowish-brown (10YR 4/4) loamy fine sand; very weak, fine, subangular blocky structure; very friable; some clay bridging between sand grains; neutral; abrupt, wavy boundary.

IIBt—24 to 32 inches, dark yellowish-brown (10YR 4/4) silty clay loam; common, coarse, faint mottles of yellowish brown (10YR 5/6); moderate, coarse, angular blocky structure; firm; few patchy clay films on ped surfaces; mildly alkaline; abrupt, wavy boundary.

IIC1—32 to 40 inches, yellowish-brown (10YR 5/4) silty clay loam; many, coarse, distinct mottles of light brownish gray (10YR 6/2); massive; very firm; calcareous; clear, smooth boundary.

IIIC2—40 to 60 inches, brown (10YR 5/3), stratified silt loam, fine sandy loam, and silty clay loam; many, coarse, distinct mottles of yellowish brown (10YR 5/6); laminar structure resulting from stratification; firm; calcareous.

The soil material in the upper part of the profile ranges from sand to loamy fine sand in texture and in places contains

a thin textural B horizon of fine sandy loam. This soil material ranges from medium acid to mildly alkaline. The soil material in the lower part of the profile is mainly silty clay loam or clay loam, but where this material is lacustrine in origin, there are also strata of silt loam, fine sandy loam, or silt. The uppermost 2 to 10 inches of soil material in the nonconforming lower part of the profile is free of carbonates and shows evidence of clay accumulation.

Metea soils have fewer mottles in the subsoil than Rimer soils. They are finer textured in the lower part of the profile than Galen or Arkport soils. They have a coarser textured upper subsoil than Tuscola soils.

Metea loamy fine sand, 0 to 2 percent slopes (MrA).—This soil occurs on deltas and on very low sand ridges on the lake plain. Several areas near Huron are between 50 and 100 acres in size, but scattered throughout the county are many very small areas. In most areas the thickness of sandy material ranges from 18 to 40 inches, and in a few areas the sand is underlain by dense glacial till of silty clay loam texture.

Included in mapping were numerous small areas in which the surface layer is fine sandy loam; small areas, especially on small ridges, in which the thickness of sandy material is either less than 18 inches or more than 40 inches; and areas of the dark-colored, somewhat poorly drained Rimer soils, which occupy some depressions and natural drainageways and the lower slopes of some small ridges. Also included, most commonly within the larger areas of this soil, were areas of Tuscola loamy fine sand that is underlain by silty material. Other inclusions were a few small areas that have slopes of slightly more than 2 percent.

Most areas of this soil are used for crops. Corn, pumpkins, cabbage, other vegetables, and all the common field crops are grown successfully. Droughtiness is the main limitation. Wind erosion is a slight hazard in a few areas. (Capability unit IIs–1)

Metea loamy fine sand, 2 to 6 percent slopes (MrB).—This soil has the profile described as typical of the series. It occurs throughout the county as small areas on low ridges on the lake plain and on deltas. The thickness of the sandy material is between 18 and 40 inches in most places. It is greatest at the center of a ridge and decreases toward the edges.

Included in mapping were areas in which the surface layer is fine sandy loam; areas of Tuscola loamy fine sand; and areas, on some of the higher ridges, of Galen soils, in which the loamy fine sand is more than 40 inches thick. Also included were areas, on ridgetops, that have slopes of less than 2 percent. Other inclusions were a few small areas that have slopes of more than 6 percent. In some areas in the southeastern part of the county, the underlying material is firm glacial till of silty clay loam texture.

Most areas of this soil are used for crops. Some vegetables and all the common field crops are grown. Wind erosion is a hazard in areas not protected by a cover of vegetation, and the blowing sand can damage crops in nearby areas. (Capability unit IIs–1)

Meta loamy fine sand, 6 to 12 percent slopes (MrC).—This soil occurs as small areas on the lake plain and on till plains. In most areas the thickness of the sandy material is between 18 and 24 inches. It is generally least in the steepest areas. In numerous areas only the surface layer is loamy fine sand, and in a few areas only the plow layer is sandy.

Included in mapping were areas in which the surface layer is fine sandy loam, a few small areas that have slopes of less than 6 percent, and numerous areas that have slopes of more than 12 percent. In most areas in the southeastern part of the county, the underlying material is firm glacial till of silty clay loam texture.

This soil is used for crops or pasture, depending on the use of surrounding soils. In areas not protected by a cover of vegetation, wind erosion and water erosion are moderate to severe hazards. (Capability unit IIIe–1)

Millgrove Series

The Millgrove series consists of dark-colored, very poorly drained soils that formed in loamy to gravelly outwash more than 40 inches thick. The original vegetation consisted of lowland hardwoods and, in the wetter areas, swamp grass. These soils occupy level areas, closed depressions, and small natural drainageways in all parts of the county. Generally they occupy the lowest parts of the landscape. Digby, Jimtown, Bogart, and Belmore soils are in surrounding higher areas.

A typical profile has a 10-inch plow layer of very dark gray, friable loam. The subsoil consists of 10 inches of very dark grayish-brown, mottled, firm sandy clay loam. Below this is 8 inches of yellowish-brown, mottled, firm gravelly sandy clay loam. The underlying material is grayish brown, friable, mottled, stratified gravelly sandy loam, gravelly sandy clay loam, and gravelly loam.

The water table is high much of the year. Runoff is slow to ponded, permeability is moderate, and the available moisture capacity is high. The content of organic matter is high, and tilth is good. The supply of lime and plant nutrients is good. If adequately drained, these soils are productive.

Most of the acreage has been drained and is used for field crops and vegetables. Artificial drainage is necessary for the successful production of most crops.

Typical profile of Millgrove loam, in a cultivated field, 600 feet south and 100 feet west of the corner of Mason and Cemetery Roads; lot 2, sec. 2, Vermilion Township.

Ap—0 to 10 inches, very dark gray (10YR 3/1) loam; weak, fine, granular structure; friable; neutral; abrupt, wavy boundary.

B1g—10 to 20 inches, very dark grayish-brown (10YR 3/2) loam; many, coarse, faint mottles of dark brown (10YR 3/3); weak, medium, subangular blocky structure; friable; neutral; clear, wavy boundary.

B2tg—20 to 30 inches, grayish-brown (2.5Y 5/2) sandy clay loam; common, coarse, distinct mottles of yellowish brown (10YR 5/6); weak, fine, subangular blocky structure; firm; dark-gray (10YR 4/1) clay films on ped surfaces; neutral; clear, wavy boundary.

B3g—30 to 38 inches, yellowish-brown (10YR 5/4) gravelly sandy clay loam; many, coarse, faint mottles of grayish brown (10YR 5/2); massive; firm; neutral; clear, wavy boundary.

IICg—38 to 60 inches, grayish-brown (10YR 5/2), stratified gravelly sandy loam, gravelly sandy clay loam, and gravelly loam; many, coarse, prominent mottles of yellowish brown (10YR 5/8); massive; friable; neutral.

The A or Ap horizon ranges from 8 to 15 inches in thickness and from very dark gray to black in color. The Bg horizon ranges from 24 to 36 inches in thickness and is loam, sandy

clay loam, clay loam, gravelly loam, gravelly sandy clay loam, or gravelly clay loam. Stratification is common, and there are commonly strata of gravel and sand in addition to the other soil materials mentioned in the preceding sentence. The Bg horizon is dull gray and unmottled in places. Stratification is generally evident in the C horizon. The A and B horizons range from slightly acid to mildly alkaline, and the C horizon is neutral to mildly alkaline. The depth to calcareous material is at least 48 inches.

Millgrove soils differ from Mermill soils in not being underlain by clayey material. They have a darker colored surface layer than Digby and Jimtown soils and a grayer subsoil than Digby, Jimtown, and Wilmer soils. Millgrove soils are gravelly in the lower part of the B horizon and in the IIC horizon, but Colwood soils are not.

Millgrove loam (Ms).—This soil has the profile described as typical of the series. It occupies nearly level to depressional areas on outwash plains and between beach ridges. In numerous areas the surface layer is dominantly silt loam or sandy loam rather than loam. There are a few gravelly spots. Below a depth of 48 inches in some areas adjacent to areas of Bennington and Pewamo soils is glacial till of clay loam texture. In some areas in the eastern part of the county, numerous angular sandstone fragments occur in the lower part of the profile, and in other areas in this part of the county, the surface layer and the upper part of the subsoil are acid.

Most areas of this soil have been cleared and drained and are used for corn, soybeans, wheat, oats, and hay. Tomatoes, peas, sweet corn, pumpkins, cabbage, and other special crops are grown. (Capability unit IIw–5)

Millgrove silty clay loam (Mt).—This soil occurs in nearly level to depressional areas on outwash plains. The silty clay loam surface layer extends to a depth of 8 to 18 inches and is distinct from the sandy and gravelly soil material below. Below a depth of 48 inches in some areas is glacial till of clay loam texture.

The use and management of this soil are governed by the use and management of adjacent soils. Most areas have been cleared and drained and are used for corn, soybeans, wheat, oats, and hay. (Capability unit IIw–5)

Millsdale Series

The Millsdale series consists of dark-colored, very poorly drained soils that formed in glacial till or lakebed deposits and are underlain at a depth of 20 to 40 inches by limestone bedrock. The original vegetation consisted of lowland hardwoods and swamp grass. These soils occupy level to depressional areas and drainageways. Some of them are in stream valleys that have been cut down close to the limestone bedrock. These soils commonly occupy the lowest parts of the landscape. Lewisburg soils, moderately shallow variant, and Pyrmont soils, moderately shallow variant, generally occupy surrounding higher areas.

A typical profile has an 8-inch plow layer of black, friable silt loam. Beneath the plow layer is a 4-inch layer of black, firm silt loam. The subsoil consists of 4 inches of grayish-brown, mottled, firm silty clay loam over 6 inches of dark grayish-brown, mottled, firm, limy clay loam. Underlying this is limestone bedrock.

Runoff is slow to ponded, permeability is moderately slow, and the available moisture capacity is medium. The water table is high much of the year. The organic-matter content is high, and tilth is generally good. The supply of lime and plant nutrients is good. If adequate drainage can be provided, these soils are productive.

Most of the acreage is pasture. Artificial drainage is necessary for the production of most crops. Locally, some areas are occasionally flooded.

Typical profile of Millsdale silt loam, in a cultivated field, west side of Maple Avenue, 150 feet south of the Parkertown limestone quarry; lot 32, sec. 2, Groton Township.

A1p—0 to 8 inches, black (10YR 2/1) heavy silt loam; weak, very coarse, subangular blocky structure, breaking to weak, medium and fine, crumb; friable; moderately alkaline; abrupt, smooth boundary.

A12—8 to 12 inches, black (10YR 2/1) silt loam; weak, medium, subangular blocky structure; firm; moderately alkaline; abrupt, smooth boundary.

B1tg—12 to 16 inches, grayish-brown (2.5Y 5/2) heavy silty clay loam; few, fine, prominent mottles of yellowish brown (10YR 5/6); weak, coarse, prismatic structure breaking to weak, fine, angular blocky; firm; dark grayish-brown (2.5Y 4/2) clay-organic coatings on ped surfaces; moderately alkaline; clear, wavy boundary.

B2tg—16 to 22 inches, dark grayish-brown (2.5Y 4/2) heavy clay loam; common, fine, prominent mottles of yellowish brown (10YR 5/4); weak, fine, subangular blocky structure; firm; thin very dark gray (10YR 3/1) clay-organic coatings on ped surfaces; weakly calcareous; abrupt, smooth boundary.

IIR—22 inches +, limestone bedrock; extremely firm; solid; flat bedded.

The A1 horizon ranges from 8 to 15 inches in thickness, and from black to very dark grayish brown (10YR 3/2) in color. It is mucky in some areas. The Bg horizon ranges from heavy clay loam to light silty clay in texture. In the lower part of this horizon the limestone fragments create calcareous pockets. Above the limestone in some places is a thin calcareous C horizon. The soil material in this C horizon resembles till, even where the A and B horizons are of lacustrine origin. The uppermost 1 foot to 2 feet of the underlying limestone is cracked in some areas.

Millsdale soils differ from Pewamo and Colwood soils in being underlain by limestone within 40 inches of the surface. They are deeper over limestone than Joliet soils. They have a darker colored surface layer and a grayer subsoil than Pyrmont soils, moderately shallow variant.

Millsdale silt loam (Mu).—This soil has the profile described as typical of the series. It occurs in low areas along streams and in depressions. In some areas along streams the black surface layer extends down to rock, and in some areas there are also thin layers of sand and gravel. Some areas that are occasionally flooded have lighter colored surface deposits.

Included in mapping were numerous small areas of Joliet soils, in which the depth to rock is less than 20 inches. These areas are most numerous along major streams. Also included were a few very small areas where soil material extends into cracks and pockets in the rock to a depth of more than 40 inches.

Most areas of this soil are used as permanent pasture, but small areas are part of cultivated fields. (Capability unit IIIw–6)

Millsdale silty clay loam (Mv).—This soil occurs along streams and in depressions. In places the subsoil is silty clay. In some areas along major streams, the black surface layer extends down to the rock, and along streams in some areas, there are also thin layers of sand and gravel. The few areas that are occasionally flooded have lighter colored surface deposits.

Included in mapping were numerous small areas of Joliet soils, in which the depth to rock is less than 20 inches. These areas are most numerous along the major streams. Also included were areas, within some of the larger areas of this soil, in which the depth to rock is more than 40 inches.

The deeper areas of this soil are parts of cultivated fields, but the shallower areas are in permanent pasture. (Capability unit IIIw–6)

Miner Series

The Miner series consists of dark-colored, very poorly drained soils that formed in low-lime glacial till. The original vegetation was swamp hardwoods. These soils occur in nearly level areas, depressions, and minor natural drainageways, but only in the eastern part of the county. Generally they occupy the lowest parts of the upland. Mahoning soils are on nearby knolls.

A typical profile has an 8-inch plow layer of very dark grayish-brown, firm silty clay loam. The subsoil consists of 20 inches of mottled, very firm silty clay that is dark gray in the upper part and grayish brown in the lower part. Below this is 10 inches of grayish-brown, mottled, firm silty clay loam. The underlying material is grayish-brown, mottled, firm silty clay loam.

Because of a high water table and occasional ponding, these soils are naturally very wet. Permeability is very slow. Productivity is generally moderate.

Most of the acreage is woodland, permanent pasture, or abandoned cropland. Artificial drainage is necessary for the successful production of most crops.

Typical profile of Miner silty clay loam, in a cultivated field, 200 feet south of Mason Road, 800 feet west of the Lorain County line; lot 2, sec. 1, Vermilion Township.

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) silty clay loam; moderate, medium, granular structure; firm; slightly acid; abrupt, smooth boundary.

B21tg—8 to 16 inches, dark-gray (10YR 4/1) silty clay; many, coarse, distinct mottles of yellowish brown (10YR 5/4); moderate, coarse, angular blocky structure; very firm; thick, continuous, dark grayish-brown (10YR 4/2) clay coatings on ped surfaces; medium acid; gradual, smooth boundary.

B22tg—16 to 28 inches, grayish-brown (10YR 5/2) silty clay; many, medium, distinct mottles of yellowish brown (10YR 5/6); weak, coarse, prismatic structure breaking to moderate, medium, angular blocky; very firm; thick, continuous, dark grayish-brown (10YR 4/2) clay coatings on ped surfaces; medium acid; clear, wavy boundary.

B3g—28 to 38 inches, grayish-brown (10YR 5/2) silty clay loam; many, medium, distinct mottles of yellowish brown (10YR 5/6); weak, coarse, subangular blocky structure; firm; medium acid; gradual, wavy boundary.

C1—38 to 48 inches, grayish-brown (10YR 5/2) silty clay loam; many, medium, distinct mottles of yellowish brown (10YR 5/6) and few, medium, prominent mottles of strong brown (7.5YR 5/8); massive; firm; slightly acid; clear, irregular boundary.

C2—48 to 60 inches, grayish-brown (10YR 5/2) silty clay loam; many, coarse, distinct mottles of yellowish brown (10YR 5/6) and strong brown (7.5YR 5/8); massive; firm; weakly calcareous.

The A1 or Ap horizon ranges from 4 to 10 inches in thickness and is black (10YR 2/1), very dark gray (10YR 3/1), or very dark grayish brown (10YR 3/2) in color. In places the B horizon is unmottled. The B horizon extends to a depth of 36 to 54 inches. The B2t horizon ranges from heavy clay loam to light silty clay in texture. The C horizon is clay loam instead of silty clay loam in places. It has distinct platy or laminar structure in some places. The solum ranges from slightly acid to strongly acid. The depth to carbonates ranges from 36 to 60 inches. Generally there are sharp pebbles throughout the profile. In some places the positive recognition of clay films is not possible because of the presence of organic films.

Miner soils have a thinner dark-colored surface layer than Pewamo soils, and they have a subsoil that is more acid in the upper part. They have a darker colored surface layer than Trumbull soils and a grayer subsoil than Mahoning soils.

Miner silty clay loam (Mw).—This soil occurs in nearly level to depressional areas on till plains and on the lake plain. The size of the areas ranges from an acre or two in depressions to several hundred acres in broad level areas. In small areas southwest of Berlin Heights, large stones and boulders are numerous on the surface and throughout the profile.

Included in mapping were a few small areas of acid, water-deposited clay. These areas are most numerous on the lake plain, southwest of Vermilion. Also included were a few small areas in which the surface layer is silt loam or silty clay. In most areas that are silt loam, a thin deposit of soil material has been washed in from higher areas nearby. Other inclusions were a few areas, in drainageways or at the base of slopes, that have been overwashed with light-colored silt loam; a few areas, along drainageways north of Florence, that are underlain by gravel at a depth of 4 to 6 feet; and small areas of the light-colored, somewhat poorly drained Mahoning soils.

A large part of the acreage is woodland or permanent pasture, but a small part is cropland. The crops are corn, small grain, and hay. Excessive wetness is the main limitation. (Capability unit IIIw–7)

Mitiwanga Series

The Mitiwanga series consists of nearly level, light-colored, somewhat poorly drained soils that are underlain at a depth of 20 to 40 inches by sandstone bedrock. The original vegetation was a hardwood forest. These soils occupy wet areas around the base of sandstone hills. Loudonville soils are on the upper parts of the slopes, and Mahoning and Jimtown soils are in nearby areas.

A typical profile has a 7-inch plow layer of dark grayish-brown, friable loam. Below the plow layer is a 4-inch layer of brown, friable loam. The subsoil consists of 4 inches of yellowish-brown, mottled, friable silt loam over 11 inches of yellowish-brown, mottled, firm clay loam. It contains sandstone fragments. Below this, at a depth of 26 inches, is sandstone bedrock.

Runoff is slow, permeability is moderately slow, and the available moisture capacity is medium. The water table is high during part of the year.

Areas of these soils are used for pasture or crops or have been abandoned. Artificial drainage is beneficial to most crops, but setting tile is difficult because of the limited depth to bedrock.

Typical profile of Mitiwanga loam, 0 to 2 percent slopes, in an abandoned field, 1,200 feet north of the Ohio Turnpike, 900 feet west of Harrison Road; lot 62, sec. 1, Florence Township.

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) loam; weak, fine, crumb structure; friable; 5 percent sandstone fragments; medium acid; abrupt, smooth boundary.

A2—7 to 11 inches, brown (10YR 5/3) loam; common, medium, distinct mottles of yellowish brown (10YR 5/6); weak, medium, platy structure; friable; strongly acid; clear, wavy boundary.

B21t—11 to 15 inches, yellowish-brown (10YR 5/4) silt loam; common, medium, faint mottles of yellowish brown (10YR 5/6); weak, medium, prismatic structure breaking to weak, fine, subangular blocky; friable; thin, discontinuous, dark grayish-brown (10YR 4/2) clay films on vertical ped faces; 10 percent sandstone fragments; strongly acid; gradual boundary.

B22t—15 to 26 inches, yellowish-brown (10YR 5/4) clay loam; common, fine and medium, faint mottles of grayish brown (10YR 5/2) and yellowish brown (10YR 5/8); moderate, coarse, angular blocky structure; firm; thin, discontinuous, dark grayish-brown (10YR 4/2) clay films on ped surfaces; 10 percent sandstone fragments; strongly acid; abrupt, wavy boundary.

IIR—26 to 60 inches +, sandstone bedrock.

The A1 or Ap horizon ranges from loam to silt loam in texture, from dark grayish brown to grayish brown (10YR to 2.5Y hue) in color. In some cultivated areas, there is either a thin A horizon or none. The B horizon is silt loam, clay loam, or sandy clay loam. Color chroma of 2 or less are dominant on ped exteriors, and those of 4 to 6 are dominant in ped interiors. The A and B horizons formed either in till or in meltwater deposits. The soil material above the rock is 5 to 25 percent sandstone fragments, mostly less than 4 inches in diameter. Where the sandstone fragments have begun to decompose, there are small pockets of sandy material. In some places the underlying sandstone is solid; in others it is extensively broken. It weathers to grains of sand that are dominantly fine to very fine in size.

Mitiwanga soils are shallower over rock than Jimtown and Mahoning soils. They have a grayer subsoil and are mottled nearer the surface than Loudonville soils. They differ from Prout soils in being underlain by sandstone rather than shale.

Mitiwanga loam, 0 to 2 percent slopes (MxA).—This soil occurs as small areas at the base of sandstone hills in the southeastern part of the county. In some areas there are layers of sandy loam or gravelly loam in the profile. Numerous small areas are underlain by loose, flat fragments of sandstone instead of solid sandstone.

Included in mapping were areas in which the surface layer is silt loam or fine sandy loam; numerous small areas in which the depth to rock is either less than 20 inches or more than 40 inches; and small areas of the better drained Loudonville soils, which are on low knolls and ridges. Also included were a few small stony areas and a few areas that have slopes of as much as 6 percent.

This soil is used for crops, orchards, pasture, and woodland. Some areas are idle. (Capability unit IIw–2)

Oakville Series

The Oakville series consists of light-colored, well-drained soils that formed in water-laid and wind-deposited fine sand. The original vegetation was an oak-hickory forest. These soils occupy the tops and sides of sandy ridges in the western and southern parts of the county. They are generally on the highest parts of the landscape. Galen, Kibbie, Gilford, and Colwood soils occupy nearby lower areas.

A typical profile in a cultivated area has a 10-inch plow layer of dark grayish-brown, very friable loamy fine sand. The underlying material consists of yellowish-brown, very friable loamy fine sand over light yellowish-brown, loose, stratified fine sand and loamy fine sand. This material extends to a depth of 5 feet.

Runoff is slow, permeability is rapid, and the available moisture capacity is low to medium. The organic-matter content is low. Wind erosion is a hazard unless the soil is protected by a cover of vegetation. Lack of moisture damages crops in average years as well as in dry years. Productivity is moderate in gently sloping areas and low in the moderately sloping and moderately steep areas.

Gently sloping areas of these soils are used for corn, small grain, hay, and vegetables. More strongly sloping areas are in permanent pasture or are idle. Crops can be irrigated successfully.

Typical profile of Oakville fine sand, 2 to 6 percent slopes, in a cultivated field, 0.5 mile east of U.S. Route 250 and 0.7 mile south of Bogart Road; lot 15, sec. 4, Huron Township.

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) loamy fine sand; weak, fine, crumb structure; very friable; slightly acid; abrupt, smooth boundary.

C1—10 to 22 inches, yellowish-brown (10YR 5/4) loamy fine sand; very weak, coarse, subangular blocky structure; very friable; neutral; gradual boundary.

C2—22 to 60 inches, light yellowish-brown (10YR 6/4), stratified fine sand and loamy fine sand; single grain; loose; neutral.

In uncultivated areas, the A1 horizon is 1 inch to 4 inches in thickness and is very dark gray (10YR 3/1). In eroded areas the surface layer is grayish brown (10YR 5/2) or yellowish brown (10YR 5/4). In some areas the B and C horizons contain thin strata of medium sand or very fine sand. In some areas adjacent sand strata have different colors.

Oakville soils differ from Arkport and Galen soils in lacking bands (Bt horizons) of fine sandy loam below the surface layer.

Oakville loamy fine sand, 2 to 6 percent slopes (OaB).—This soil has the profile described as typical of the series. It occurs as long, narrow areas of small acreage on beach ridges.

Included in mapping were numerous small areas in which thin bands of reddish-brown fine sandy loam occur at depths below 3 feet; small eroded areas in which the surface layer is light brownish gray; and areas of the moderately well drained Galen soils, which occupy the lower slopes of some ridges. Some of these lower areas are underlain by silt at a depth of 4 to 5 feet. Also included were a few small areas that have slopes of either less than 2 percent or more than 6 percent.

Most areas of this soil are cropped with surrounding soils. Vegetables and the common field crops are grown. (Capability unit IVs–1)

Oakville loamy fine sand, 6 to 12 percent slopes (OaC).—This soil occurs as long, narrow areas of small acreage on beach ridges.

Included in mapping were numerous small areas in which thin bands of reddish-brown fine sandy loam occur below a depth of 3 feet; numerous eroded areas in which the surface layer is light brownish gray; and a few small areas that have slopes of either less than 6 percent or more than 12 percent.

Most areas of this soil are cropped with surrounding soils. (Capability unit IVs–1)

Oakville loamy fine sand, 12 to 25 percent slopes (OaE).—This soil occurs as small areas on the sides of hills and beach ridges. The surface layer is lighter colored than that of the other Oakville soils because of the effects of wind erosion.

Included in mapping were areas in which a few thin bands of reddish-brown fine sandy loam occur below a depth of 2 feet; small slightly eroded areas; and small areas that have slopes of either less than 12 percent or more than 25 percent.

The steeper areas are used for pasture; a few of the less sloping areas are parts of cultivated fields. Wind erosion is active in some areas, and the blowing sand can damage crops in adjacent areas. Some areas of this soil are potential sources of molding sand. (Capability unit IVs-1)

Orrville Series

The Orrville series consists of nearly level, light-colored, medium-textured, somewhat poorly drained soils that formed in low-lime stream deposits. These soils are on stream bottoms in the eastern part of the county and are flooded periodically. Lobdell and Wayland soils occur in the same general area.

A typical profile has a 9-inch plow layer of dark grayish-brown, friable silt loam. Below the plow layer is a 5-inch layer of dark grayish-brown, friable silt loam. The underlying material consists of grayish-brown, mottled, friable silt loam over strongly mottled grayish-brown, strong-brown, and yellowish-red, friable loam that contains thin strata of sandy loam and clay loam. Below this is gray, very friable coarse sandy loam that contains thin strata of sandy clay loam and loam.

Runoff is slow, and the available moisture capacity is high. Permeability is moderately slow. The water table is seasonally high. The organic-matter content is moderately high, and tilth is good. Productivity is moderate to high.

Permanent pasture is the dominant use. Artificial drainage is necessary for the successful production of most crops, because of the seasonally high water table.

Typical profile of Orrville silt loam, in a cultivated field, north of Harmon Road, just west of the bridge over Chappel Creek; lot 37, sec. 4, Florence Township.

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; weak, very fine, granular structure; friable; neutral (limed); abrupt, smooth boundary.

A12—9 to 14 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, subangular blocky structure; friable; neutral; clear, wavy boundary.

C1g—14 to 30 inches, grayish-brown (10YR 5/2) silt loam; many, medium, prominent mottles of strong brown (7.5YR 5/6) and yellowish red (5YR 4/6); very weak, coarse, subangular blocky structure; friable; medium acid; clear, smooth boundary.

IIC2g—30 to 40 inches, strongly mottled, grayish-brown (10YR 5/2), strong-brown (7.5YR 5/6), and yellowish-red (5YR 5/8) loam; thin strata of sandy loam and clay loam; massive; friable; slightly acid; clear, smooth boundary.

IIIC3g—40 to 60 inches, gray (10YR 5/1) coarse sandy loam; thin strata of sandy clay loam and loam; massive; very friable; slightly acid.

These soils are highly stratified, and the texture, thickness, and sequence of the strata differ from place to place. The texture in the uppermost 2 feet of the profile ranges from loam to silty clay loam, but at greater depths, coarser textures are more common. In the lower part of the profile in some areas are buried A horizons. The C horizon is dull gray and unmottled in places. The uppermost 1 foot to 3 feet of the profile formed largely in local alluvium, but the lower part formed in stream alluvium. The reaction ranges from strongly acid to neutral.

Orrville soils are grayer and more mottled than the moderately well drained Lobdell soils. They are less gray than the poorly drained Wayland soils and are more acid than Shoals soils.

Orrville silt loam (Or).—This soil occurs as long, narrow areas on bottoms in the larger stream valleys in the eastern part of the county. The slope is dominantly less than 2 percent. Deep in the profile in some areas are thin, dark-colored, buried former surface layers. On the surface in a few areas are boulders and stones.

Included in mapping were numerous areas, some fairly large, in which the surface layer is loam or silty clay loam; a few areas in which light-colored soil material has been freshly deposited on the surface; and some areas, mostly along Chappel Creek, in which the depth to shale bedrock is as little as 3 feet. Also included were numerous areas of the poorly drained Wayland soils, which are in depressions and old stream channels; areas of the moderately well drained Lobdell soils, which occur in some higher areas; a few very short slopes of more than 2 percent; and vertical banks on the sides of the stream channels.

Use varies, depending upon the width of the particular area and the extent to which it is dissected by old stream channels. Most areas are used for pasture. A few are used for woodland or crops. (Capability unit IIw-1)

Oshtemo Series

The Oshtemo series consists of light-colored, well-drained soils that formed in deep deposits of glacial outwash. The original vegetation consisted of upland hardwoods. These soils are on beach ridges and outwash plains. They are generally on the highest parts of the landscape. Digby, Bogart, Jimtown, and Haskins soils are in adjacent lower areas.

A typical profile has a 9-inch plow layer of dark grayish-brown very friable sandy loam. Below the plow layer is a 5-inch layer of yellowish-brown, very friable sandy loam. The subsoil consists of 13 inches of yellowish-brown, very friable sandy loam over 5 inches of brown, firm, coarse gravelly sandy clay loam. Beneath this is 28 inches of yellowish-brown, friable to loose, stratified gravelly loam, gravelly sandy loam, and gravelly loamy coarse sand.

Runoff is slow, permeability is moderately rapid, and the available moisture capacity is low. The moisture supply is occasionally inadequate for shallow-rooted crops.

These soils are used for field crops, vegetables, and orchard crops.

Typical profile of Oshtemo sandy loam, 2 to 6 percent slopes, on south side of Bryan Road, 400 feet west of State Route 113; lot 13, sec. 4, Milan Township.

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

A2—9 to 14 inches, yellowish-brown (10YR 5/4) sandy loam; moderate, thin, platy structure; very friable; medium acid; clear, smooth boundary.

B21t—14 to 27 inches, yellowish-brown (10YR 5/4) sandy loam; weak, coarse, subangular blocky structure; very friable; 20 percent irregularly shaped masses that are slightly sticky and have evident clay bridgings; medium acid; abrupt, wavy boundary.

B22t—27 to 32 inches, brown (7.5YR 4/4) coarse gravelly sandy clay loam; massive; firm, sticky; thick clay bridgings and clay coatings on sand and gravel; medium acid; clear, irregular boundary.

IIB3—32 to 60 inches, yellowish-brown (10YR 5/4), stratified gravelly loam, gravelly sandy loam, and gravelly loamy coarse sand; massive; individual strata are friable, very friable, or loose; medium acid.

The A1 or Ap horizon ranges from loamy sand to sandy loam in texture. In some areas the A2 horizon is as much as 10 inches thick, but in other areas there is no A2 horizon. The B21t horizon ranges from 12 to 24 inches in thickness, and in some places it contains strata of loamy sand, loose sand, and gravel. The B22t horizon ranges from 1 inch to 8 inches in thickness. It is not within the uppermost 20 inches of the B2t horizon in all places. The overall clay content of the B2t horizon is less than 18 percent. The content of sand and gravel in the C horizon, which at a greater depth than described in the typical profile, is extremely variable, and individual strata range from loose sand to gravelly loam in texture. The A horizon and the upper part of the B horizon range from neutral to medium acid, depending upon the amount of lime that has been applied; the lower part of the B horizon ranges from strongly acid to medium acid; and the C horizon ranges from slightly acid to neutral. The gravel content ranges from almost none to 40 percent. Below a depth of 4 feet in some places is calcareous gravel.

Oshtemo soils are generally sandier throughout the profile than Chili or Belmore soils. They contain more gravel, more clay, and less fine sand than Arkport soils. They are coarser textured, brighter colored, and less mottled than Bogart soils.

Oshtemo loamy sand, 0 to 2 percent slopes (OsA).—This soil occurs on beach ridges and terraces. The largest areas are west of Avery and in the southwestern part of Berlin Township. In some areas the uppermost part of the subsoil is loamy sand and contains considerable gravel. In most areas the layer of gravelly sandy clay loam is either missing or very thin. In some areas the loamy sand contains bands or irregularly shaped bodies of sandy loam or loam.

Included in mapping were small areas of the somewhat poorly drained Digby and Wilmer soils, which occur in depressions and natural drainageways, and a few areas that are underlain at a depth of 4 to 5 feet by silt.

Most areas of this soil are used for crops, principally corn, small grain, and hay. Pumpkins, melons, sweet corn, cabbage, tomatoes, and other vegetables are grown in areas near Milan. The soil is well suited to sprinkler irrigation, and several areas in which vegetables are grown are irrigated. Wind erosion is a hazard in some areas. The included spots underlain by silt are apt to remain wet after periods of wet weather. (Capability unit IIIs–1)

Oshtemo loamy sand, 2 to 6 percent slopes (OsB).—This soil occurs as small areas on beach ridges, terraces, and outwash plains. The largest areas are south of Castalia and northwest of Milan. In some areas the uppermost layer of the subsoil is loamy sand. In some areas this soil is gravelly throughout the profile, but in others it is gravel free.

Included in mapping were small areas of the less sandy Chili and Belmore soils; a few areas of the somewhat poorly drained Digby and Wilmer soils, which are in depressions; and a few areas, west of Milan, that are underlain at a depth of 4 to 5 feet by silt. Also included were small areas that have slopes of either less than 2 percent or more than 6 percent, and some beach ridges that have side slopes of more than 6 percent.

Most areas of this soil are used for crops, mainly field crops. Sweet corn, melons, pumpkins, cabbage, tomatoes, and other vegetables are grown in some areas, mostly near Milan. In some years the moisture supply is not adequate for field crops. Vegetables are irrigated in some areas. Wind erosion is a hazard. (Capability unit IIIs–1)

Oshtemo sandy loam, 0 to 2 percent slopes (OtA).—This soil occurs as small areas on beach ridges and outwash plains. The largest areas are northwest of Milan. The surface is gravelly in spots.

Included in mapping were small areas in which the surface layer is loamy sand; small areas of the somewhat poorly drained Digby and Wilmer soils, which occur in depressions and minor natural drainageways; and areas of the less sandy Belmore soils. Also included were a few small areas underlain at a depth of 4 to 5 feet by silt or clay and a few small areas that have slopes of more than 2 percent.

This soil is more productive than the other Oshtemo soils in Erie County. Corn, small grain, soybeans, hay, and other field crops are grown. Sweet corn, cabbage, melons, pumpkins, and sugar beets are grown in some areas. (Capability unit IIIs–1)

Oshtemo sandy loam, 2 to 6 percent slopes (OtB).—This soil has the profile described as typical of the series. It occurs as small areas on beach ridges and outwash plains throughout the county. The surface is gravelly in spots.

Included in mapping were areas in which the surface layer is loamy sand; small areas of the moderately well drained Bogart soils, which are on the lower slopes of some of the ridges; and areas of the less sandy Belmore and Chili soils. Also included were a few small areas that are underlain at a depth of 4 to 5 feet by silt or clay and a few small areas that have slopes of either less than 2 percent or more than 6 percent.

All the common field crops are grown. In areas toward the eastern part of the county are numerous apple, peach, and cherry orchards. Sweet corn, melons, and pumpkins are grown in the areas near Milan. Water erosion is a slight hazard unless the soil is protected by a cover of vegetation. (Capability unit IIIs–1)

Pewamo Series

The Pewamo series consists of dark-colored, very poorly drained soils that formed in high-lime glacial till. These soils occupy nearly level areas, small depressions, and natural drainageways, mostly in the southwestern part of the county. The light-colored Bennington and Cardington soils occupy higher positions nearby.

A typical profile in a cultivated area has a 9-inch plow layer of very dark gray, firm silty clay loam. Below the plow layer is a 3-inch layer of very dark gray, firm silty clay loam. The subsoil consists of 4 inches of grayish-brown, mottled, firm silty clay loam over 8 inches of grayish-brown, mottled, very firm silty clay. Below this is 10 inches of mottled yellowish-brown and light brownish-gray, firm clay loam. The underlying material consists of mottled yellowish-brown and light brownish-gray, firm, limy clay loam over gray, mottled, very firm, limy silty clay loam.

Runoff is slow, permeability is moderately slow, and the available moisture capacity is very high. The water table is seasonally high, and as a result, the soils are seasonally wet. The organic-matter content is high. The supply of plant nutrients is good. If drained, these soils are productive.

Most areas of these soils have been drained and are used for hay, grain, and soybeans. Artificial drainage is necessary for the successful production of most crops.

Typical profile of Pewamo silty clay loam, in a cultivated field, east of Billings Road, 0.1 mile south of Strecker Road; sec. 1, Groton Township.

A1p—0 to 9 inches, very dark gray (10YR 3/1) silty clay loam; cloddy; weak, medium and fine, crumb structure; firm; neutral; abrupt, smooth boundary.

A1—9 to 12 inches, very dark gray (10YR 3/1) silty clay loam; weak, medium, subangular blocky structure breaking to weak, fine, crumb; firm; neutral; abrupt, irregular boundary.

B1tg—12 to 16 inches, grayish-brown (2.5Y 5/2) silty clay loam; many, coarse, prominent mottles of yellowish brown (10YR 5/6); moderate, medium, platy structure; firm; dark-gray (10YR 4/1) tongues and coating between peds; neutral; abrupt, irregular boundary.

B2tg—16 to 24 inches, grayish-brown (2.5Y 5/2) light silty clay; many, coarse, prominent mottles of yellowish brown (10YR 5/6); massive but breaks to moderate, very fine, angular blocky structure; very firm; thin, dark-gray (10YR 4/1) tongues between peds; neutral; gradual boundary.

B3g—24 to 34 inches, mottled yellowish-brown (10YR 5/6) and light brownish-gray (10YR 6/2) clay loam; massive; firm; neutral; gradual boundary.

C1g—34 to 44 inches, mottled yellowish-brown (10YR 5/6) and light brownish-gray (10YR 6/2) clay loam that has gray (N 5/0) streaks; massive; firm; weakly calcareous.

C2g—44 to 60 inches, gray (10YR 5/1) silty clay loam; many, coarse, prominent mottles of yellowish brown (10YR 5/6); massive; very firm; calcareous.

The A1 horizon ranges from very dark gray (10YR 3/1) to black (10YR 2/1) in color. In most areas this horizon extends slightly below the plow depth. The Bg horizon ranges from 10 to 30 inches in thickness and from heavy clay loam to light clay in texture. The solum ranges from neutral to slightly acid. The depth to carbonates ranges from 30 to 48 inches. In some profiles the B and C horizons are dull gray and unmottled. There are small pebbles throughout the profile.

Pewamo soils have a thicker dark-colored surface layer than Miner soils and are less acid. They have a darker colored surface layer and a grayer subsoil than Bennington soils. They have a grayer subsoil than Elliott soils. Pewamo soils are less silty than Lenawee soils, and they have small pebbles throughout the profile. They are more clayey, especially in the B horizon, and less gravelly than Millgrove soils.

Pewamo silty clay loam (Pc).—This soil has the profile described as typical of the series. It occurs on nearly level plains in the southwestern part of the county and in small closed depressions and small natural drainageways in other parts of the county.

Included in mapping were small areas in which the surface layer is silt loam or silty clay; a few small areas, in Groton Township, in which the surface layer is black and very thick; and spots, in the southwest corner of the county, that are cloddy and lighter colored. Also included were a few areas, in drainageways, that have been overwashed with light-colored soil material and a few areas, in the southwest corner of the county, in which the substratum is loam.

Most areas of this soil have been cleared and drained and are used for crops. Corn, small grain, and soybeans are the principal crops. Forage crops are grown for use as green manure. Sugar beets, although suitable, are grown on only a small acreage. (Capability unit IIw–5)

Pewamo silty clay (Pe).—This soil occurs in nearly level to depressional areas in the southwestern part of the county. It is finer textured to a depth of 36 inches than the soil that has the typical profile, and it has less organic matter in the surface layer. After it is plowed, the surface layer is lighter colored than that of the surrounding Pewamo silty clay loam.

Included in mapping were a few small areas of Pewamo silty clay loam.

Most areas of this soil have been cleared and are used for crops. Use and management are governed by the use and management of the more extensive adjacent areas of Pewamo silty clay loam. Water becomes ponded in the depressions in winter and early in spring, and surface drainage is generally needed to remove the excess water. Productivity is generally less in this soil than in Pewamo silty clay loam. Clods form if the soil is plowed when too wet. (Capability unit IIIw–5)

Pewamo silty clay loam, limestone substratum (Ph).—This soil is nearly level. It occurs in natural drainageways and in stream valleys near areas of limestone outcrops. It is underlain by limestone bedrock at a depth of 40 to 60 inches.

Included in mapping were small areas of the very poorly drained Millsdale silty clay loam, in which the depth to limestone bedrock is 20 to 40 inches; numerous small areas in which the surface layer is silt loam; and a few small areas in which the depth to rock is more than 60 inches.

Most areas of this soil have been cleared and are used for crops. Corn, wheat, and soybeans are the main crops. (Capability unit IIw–5)

Prout Series

The Prout series consists of nearly level to gently sloping, dark-colored, somewhat poorly drained soils that formed in glacial till or lakebed deposits and are underlain at a depth of 20 to 40 inches by shale. The original vegetation was a hardwood forest in which oak and maple were dominant. These soils commonly are on the highest parts of low-relief landscapes. A few higher ridges are occupied by Prout soils, brown subsoil variant.

A typical profile has a 6-inch plow layer of very dark grayish-brown loam. The subsoil consists of a 4-inch layer of brown, mottled, friable very fine sandy loam over 14 inches of yellowish-brown, mottled, firm silty clay loam. Below this is weathered shale that grades to hard shale at a depth of about 30 inches. In many places there are shale chips throughout the profile.

Permeability is moderately slow. The available moisture capacity is medium to low, depending on the depth to shale. Runoff is slow. The reaction is very strongly acid throughout, unless lime has been applied. Because of the acidity and a seasonal high water table, productivity is low to moderate.

Most of the acreage is used for field crops. Liming and artificial drainage are generally needed. The underlying

shale is generally soft enough to be dug through with a tiling machine.

Typical profile of Prout loam, in an abandoned field, 300 feet west and 100 feet south of the corner of Columbus Avenue and Scheid Road; Plum Brook Ordnance Works; Oxford Township.

Ap—0 to 6 inches, very dark grayish-brown (10YR 3/2) loam; moderate, fine, granular structure; friable; strongly acid; abrupt, smooth boundary.

B1—6 to 10 inches, brown (10YR 5/3) very fine sandy loam; many, coarse, prominent mottles of strong brown (7.5YR 5/8); weak, fine, subangular blocky structure; friable; very strongly acid; clear, wavy boundary.

B2t—10 to 24 inches, yellowish-brown (10YR 5/6) light silty clay loam; common, medium, distinct mottles of grayish brown (10YR 5/2); moderate, fine, subangular blocky structure; firm; continuous films of dark grayish-brown (10YR 4/2) clay on ped surfaces; very strongly acid; abrupt, irregular boundary.

IIC—24 to 30 inches, brown (7.5YR 5/4) weathered shale; laminar structure that follows the bedding planes of the shale; easily crushed; thick strong-brown coatings of weathering products along bedding planes; extremely acid; gradual boundary.

IIR—30 to 40 inches, very dark grayish-brown (10YR 3/2) shale; laminar structure; hard (not easily crushed); dark-brown (7.5YR 4/4) and strong-brown (7.5YR 5/8) iron stains on bedding planes; extremely acid.

The A horizon ranges from fine sandy loam to silt loam in texture and from dark grayish brown (10YR 4/2) to very dark grayish brown (10YR 3/2) in color. The B horizon ranges from silt loam to coarse silty clay loam. In the B2t horizon, the ped surfaces are dominantly dark grayish brown (10YR 4/2) or grayish brown (10YR 5/2) and the ped interiors have hues of 10YR and 7.5YR, chromas of 4 to 6, and values of 4 to 5. In the A and B horizons the content of shale chips ranges from 5 to 20 percent.

The glacial and lacustrine material in which the solum formed ranges from slightly acid to very strongly acid in reaction. In some places, the solum rests directly on unweathered shale, but more commonly it is underlain by weathered shale. Above the shale, in most places, is a layer of shale-derived silty clay loam or silty clay. The depth to shale-derived material is at least 15 inches. The depth to hard shale ranges from 2 to 5 feet. The shale is black, gray, or very dark grayish brown and ranges from medium acid to extremely acid.

Prout soils are coarser textured and have a darker colored surface layer than Allis soils, and they have better tilth. They are shallower over shale than Prout soils, deep variant. They differ from Prout soils, brown subsoil variant, in having a mottled subsoil.

Prout loam, 0 to 2 percent slopes (PmA).—This soil is most extensive in the south-central part of the county, but small areas are scattered through the northeastern part. The areas range from less than 5 acres to more than 50 acres in size.

This soil has the profile described as typical of the Prout series. In some areas the surface layer is black or very dark brown.

Included in mapping were numerous areas in which the surface layer is silt loam or fine sandy loam and numerous small areas of the finer textured Allis soils and of the very poorly drained, dark-colored soils of the Colwood series, acid variant. Also included were a few narrow ridges that have slopes of slightly more than 2 percent.

Most of the acreage is cropland. The principal crops are corn, soybeans, and small grain. (Capability unit IIIw–4)

374–857—71——10

Prout channery loam, 0 to 2 percent slopes (PrA).—This soil is in the northeastern part of the county. It has a profile similar to the one described as typical of the series, but the soil material above the shale is very channery loam or silt loam. The content of flat sandstone fragments 3 to 6 inches in length ranges from 50 to 80 percent, and more than half the surface is covered with stones. Some of the fragments are as much as 10 inches long. Between the fragments is friable loam or silt loam that grades to firm silty clay loam at a depth of 2 or 3 feet. The available moisture capacity is lower than that of Prout loam, 0 to 2 percent slopes.

Included in mapping were a few small areas that have slopes of slightly more than 2 percent. Also included were a few spots in which the depth to hard shale is more than 40 inches. In most such areas, there is soft or weathered shale above the hard shale.

Most of the acreage is wooded; a small acreage is used for orchards. (Capability unit IIIw–4)

Prout Series, Brown Subsoil Variant

The Prout series, brown subsoil variant, consists of light-colored, moderately well drained soils that formed in a mixture of weathered shale and medium-textured to moderately fine textured lake deposits. Shale is at a depth of 20 to 40 inches. The original vegetation was a hardwood forest. These soils are on low ridges. Fries, Colwood, and other Prout soils are in the lower areas between the ridges, and Colyer soils are on the steeper slopes nearby.

A typical profile has a 6-inch plow layer of dark grayish-brown, friable loam. Below this is a 4-inch subsurface layer of grayish-brown, friable very fine sandy loam. The subsoil is yellowish-brown, friable silt loam. Underlying this is weathered shale. The depth to hard shale is not more than 40 inches.

Permeability is moderate, and the available moisture capacity is medium to low. Runoff is medium. Tilth is generally good. The reaction is very strongly acid throughout, unless lime has been applied. Because of the acidity, productivity is low to moderate.

Typical profile of Prout loam, brown subsoil variant, west of Taft Road, just south of the NASA fence; Lay Tract, sec. 2, Oxford Township.

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) loam; moderate, medium, granular structure; friable; strongly acid; abrupt, smooth boundary.

A2—6 to 10 inches, grayish-brown (10YR 5/2) very fine sandy loam; weak, fine, subangular blocky structure; friable; very strongly acid; clear, wavy boundary.

B2t—10 to 20 inches, yellowish-brown (10YR 5/4) silt loam; weak, medium, subangular blocky structure; friable; very thin, discontinuous films of clay on ped surfaces; very strongly acid; abrupt, smooth boundary.

IIR1—20 to 30 inches, brown (7.5YR 5/4) weathered shale; laminar structure that follows the bedding planes of the shale; easily crushed; thick strong-brown (7.5YR 5/8) coatings of weathering products along the bedding planes; extremely acid; gradual boundary.

IIR2—30 inches +, very dark grayish-brown (10YR 3/2) shale; laminar structure; hard (not easily crushed); dark-brown (7.5YR 4/4) and strong-brown (7.5YR 5/8) iron stains on bedding planes; extremely acid.

In wooded areas there is a very dark grayish-brown A1 horizon that is 3 to 4 inches thick. In some cultivated areas there is only a very thin A2 horizon or none. The B horizon ranges

from silt loam to light silty clay loam in texture, and its clay content is 20 to 35 percent. In some areas there are continuous, thin clay films in the B horizon. Base saturation is less than 35 percent. The depth to hard shale ranges from 20 to 40 inches. This shale is gray, black, or very dark grayish brown and ranges from medium acid to extremely acid.

In some areas the solum is directly over unweathered shale, but more commonly it is underlain by weathered shale or shale that has been displaced by glacial action. Above the shale in many areas is a layer of shale-derived silty clay loam or silty clay. The depth to this shale-derived material is at least 15 inches but not more than 40 inches.

Prout soils, brown subsoil variant, have better natural drainage and a brighter colored subsoil than typical Prout soils. They are deeper to shale than Colyer soils. They differ from Loudonville soils and from Lewisburg soils, moderately shallow variant, in being underlain by shale rather than by limestone or sandstone.

Prout loam, brown subsoil variant, 0 to 2 percent slopes (PsA).—This soil occurs as long, narrow areas on ridgetops, mainly in Perkins, Huron, and Oxford Townships. It has the profile described as typical of the Prout series, brown subsoil variant. In spots the surface layer contains numerous shale fragments. In some places there is a thin layer of silty clay between the subsoil and the shale bedrock.

Included in mapping were small areas of Colyer soils, which are only 6 to 10 inches deep over shale. Also included were small areas that have slopes of more than 2 percent and numerous areas in which the surface layer is silt loam or fine sandy loam.

The areas of this soil are too narrow to be worked as separate units, so their use is governed by the use of the surrounding soils. (Capability unit IIs–3)

Prout loam, brown subsoil variant, 2 to 6 percent slopes (PsB).—This soil is on the side slopes of narrow ridges, mainly in the south-central part of the county. In some places there is a thin layer of silty clay between the subsoil and the shale. A few small areas have been slightly eroded and have a dark-brown surface layer. Above the solid shale, in most areas, is a layer that is about half loam and half shale fragments.

Included in mapping were small areas of Colyer soils, which are only 6 to 10 inches deep over shale, small areas that have slopes of less than 2 percent, and small areas that have slopes of more than 6 percent.

Erosion is a hazard in unprotected areas.

The areas of this soil are too narrow to be worked as units, and their use is governed by the use of the surrounding soils. Most areas are too small to warrant special erosion control practices. (Capability unit IIe–3)

Prout Series, Deep Variant

Prout series, deep variant, consists of dark-colored, nearly level, somewhat poorly drained soils that formed in lakebed deposits and are underlain by shale at a depth of 40 to 60 inches. The original vegetation consisted of hardwood forest and prairie grass. These soils are extensive, especially in the central part of the county.

A typical profile has an 8-inch plow layer of very dark grayish-brown silt loam. Below this is a 2-inch subsurface layer of pale-brown, mottled, friable loam. The subsoil is yellowish-brown, mottled, firm silty clay loam. The underlying material, which extends to a depth of 40 inches or more, is mottled, firm silty clay loam. At a depth of 44 inches is dark-gray shale. Reaction is slightly acid to strongly acid throughout the profile.

Permeability is moderately slow, and the available moisture capacity is high. Runoff is slow. The water table is high part of the year. The organic-matter content is moderate, and tilth is generally good. Productivity is moderate, if adequate drainage is provided and enough lime and fertilizer are used.

Profile of Prout silt loam, deep variant, along Camp Road; lot 20, sec. 3, Huron Township.

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, fine, granular structure; friable; slightly acid; abrupt, smooth boundary.

A2—8 to 10 inches, pale-brown (10YR 6/3) loam; many, fine, distinct mottles of yellowish brown (10YR 5/8) and brownish yellow (10YR 6/8); weak, thick, platy structure breaking to very weak, fine, subangular blocky; friable; strongly acid; clear, irregular boundary.

B2t—10 to 20 inches, yellowish-brown (10YR 5/4) clay loam; many, medium, prominent mottles of strong brown (7.5YR 5/8); weak, coarse, prismatic structure breaking to moderate, coarse, subangular blocky; firm; thick coatings of grayish-brown (10YR 5/2) clay on prism faces; strongly acid; abrupt, smooth boundary.

C1—20 to 42 inches, mottled reddish-yellow (7.5YR 6/6), light brownish-gray (10YR 6/2), and yellowish-brown (10YR 5/4) silty clay loam; massive; firm; medium acid; abrupt, wavy boundary.

IIC2—42 to 44 inches, mottled strong-brown (7.5YR 5/6), light brownish-gray (10YR 6/2), and yellowish-brown (10YR 5/4) silty clay loam; streaks of gray (5YR 5/1) where shale has weathered out; massive; firm; medium acid; abrupt, wavy boundary.

IIIR—Below 44 inches, dark-gray (10YR 4/1) shale; bedded structure; extremely firm; strongly acid.

In areas that have not been plowed, there is a very dark gray (10YR 3/1) A1 horizon about 6 inches thick. The B horizon ranges from silt loam to light silty clay loam in texture and from 6 to 15 inches in thickness. The solum ranges from strongly acid to slightly acid, and it contains no carbonates. It formed mainly in the lacustrine deposits, but weathering has taken place in the uppermost few inches of the shale. The C horizon is stratified with soil materials that range from fine sand to silty clay loam in texture but are dominantly silt loam and silty clay loam. The depth to shale ranges from 40 to 60 inches.

Prout silt loam, deep variant, 0 to 2 percent slopes (PuA).—This soil is on the lake plain. Some areas are as much as several hundred acres in size. The surface layer is black, very dark gray, or very dark grayish brown. In some areas the soil is directly over hard shale, but in other areas it is underlain by soft or weathered shale. In some areas there are pieces of loose shale in the lower part of the profile.

Included in mapping were areas in which the surface layer is very fine sandy loam, loam, or silty clay loam, numerous small areas of typical Prout soils in which the depth to shale is less than 40 inches, and a few small areas in which the depth to hard shale is at least 60 inches. Also included were small areas of the very poorly drained Colwood soils, acid variant, which are in depressions and minor natural drainageways, and a few small areas that have slopes of slightly more than 2 percent.

Nearly all the acreage is cropland. The principal crops are corn, soybeans, small grain, and hay. (Capability unit IIw–3)

Pyrmont Series

The Pyrmont series consists of nearly level, light-colored, somewhat poorly drained soils that formed in high-lime glacial till. These soils are on Kelleys Island. Pewamo soils generally occupy depressions and drainageways, and Lewisburg soils generally occupy the nearby slopes.

A typical profile in a cultivated area has a 4-inch plow layer of dark grayish-brown, friable silt loam. Below the plow layer is a 1-inch layer of light brownish-gray, friable silt loam. The subsoil consists of 11 inches of brown, mottled, firm silty clay loam. The underlying material consists of reddish-brown, firm, limy silty clay loam over yellowish-brown, mottled, firm, limy clay loam.

Runoff is slow, permeability is moderately slow, and the available moisture capacity is medium to low. The water table is seasonally high. If adequately drained, these soils are productive.

Most of the acreage was once used for grapes but is now idle. Only a small acreage is now used for crops.

Typical profile of Pyrmont silt loam, 0 to 2 percent slopes, 500 feet north of the 4-H camp on Kelleys Island.

Ap—0 to 4 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine, crumb structure; friable; neutral; abrupt, smooth boundary.

A2—4 to 5 inches, light brownish-gray (10YR 6/2) silt loam; many, medium, distinct mottles of yellowish brown (10YR 5/4); moderate, medium, granular structure; friable; neutral; clear, smooth boundary.

B2t—5 to 16 inches, brown (7.5YR 3/1) silty clay loam; many, medium, distinct mottles of yellowish brown (10YR 5/8) and common, medium, prominent mottles of dark red (2.5YR 3/6); moderate, medium, angular blocky structure; firm; medium, continuous, reddish-gray (5YR 5/2) clay films on ped surfaces; mildly alkaline; clear, smooth boundary.

C1—16 to 22 inches, reddish-brown (5Y 5/4) silty clay loam; moderate, thick, platy structure; firm; medium, continuous, reddish-gray clay films on vertical ped faces; calcareous; gradual, smooth boundary.

C2—22 to 60 inches, yellowish-brown (10YR 5/4) clay loam; common, large, distinct mottles of grayish brown (10YR 5/2); massive; firm; calcareous.

In cultivated areas there is either a very thin A2 horizon or none. The B2t horizon is typically heavy silty clay loam (more than 35 percent clay). In this horizon there is extreme variability in the thickness of the clay films and in the proportion of ped surfaces that they cover. The solum is neutral to mildly alkaline, and the depth to carbonates ranges from 12 to 18 inches. The depth to bedrock in the Pyrmont soils in this county ranges from 3½ to 10 feet, and the colors in the B horizon are redder than in most areas outside the county.

Pyrmont soils are shallower to limy material than Bennington soils, and they have a more alkaline subsoil. They are grayer and are mottled at less depth than the moderately well drained Lewisburg soils. Pyrmont soils are less acid and have better structure than Mahoning soils. They have a lighter colored surface layer and a less gray subsoil than the very poorly drained Pewamo soils.

Pyrmont silt loam, 0 to 2 percent slopes (PyA).—This soil is on Kelleys Island.

Included in mapping were small areas of the moderately well drained Lewisburg soils; areas of the dark-colored, very poorly drained Pewamo soils, which occupy some small natural drainageways; and a few small areas of the somewhat poorly drained Haskins soils, which consist of 14 to 36 inches of sandy clay loam over firm till of clay loam texture.

Most of the acreage has been cleared and is now either idle or in housing subdivisions. A small acreage is still farmed. Corn, wheat, rye, grapes, and hay are the crops grown. (Capability unit IIw-2)

Pyrmont Series, Moderately Shallow Variant

The Pyrmont series, moderately shallow variant, consists of nearly level, light-colored, somewhat poorly drained soils that are underlain at a depth of 20 to 40 inches by limestone. These soils are mainly in the southwestern part of the county. Lewisburg soils, moderately shallow variant, occupy nearby higher areas, and Millsdale soils occupy nearby low areas.

A typical profile in a cultivated field has a 10-inch plow layer of dark grayish-brown, friable silt loam. The subsoil consists of 6 inches of dark-brown, mottled, firm clay loam. Beneath this is an 8-inch transitional layer of grayish-brown, mottled, firm, limy silty clay loam. Limestone bedrock is at a depth of 24 inches.

Runoff is slow, permeability is moderately slow, and the available moisture capacity is low to medium. The water table is seasonally high.

Most of the acreage is used for crops or pasture. Artificial drainage benefits most crops.

Typical profile of Pyrmont silt loam, moderately shallow variant, 0 to 2 percent slopes, 600 feet south of the interchange between U.S. Route 6 and State Route 101; lot 4, sec. 2, Margaretta Township.

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine, crumb structure; friable; mildly alkaline; abrupt, smooth boundary.

B2t—10 to 16 inches, dark-brown (10YR 4/3) heavy clay loam; many, fine, distinct mottles of yellowish brown (10YR 5/6); moderate, medium, angular blocky structure; firm; grayish-brown (10YR 5/2) clay films on ped surfaces; moderately alkaline; diffuse, irregular boundary.

BC—16 to 24 inches, grayish-brown (10YR 5/2) heavy silty clay loam; many, coarse, faint mottles of yellowish brown (10YR 5/4) and common, coarse, faint mottles of light brownish gray (10YR 6/2); massive; firm; very strongly calcareous; abrupt, smooth boundary.

IIR—24 inches +, gray (10YR 6/1) solid limestone bedrock.

Between the A1 horizon and the B horizon in many places is a grayish-brown (10YR 5/2), mottled A2 horizon. The B horizon ranges from 6 to 12 inches in thickness and from clay loam to light silty clay in texture. The solum formed either in lacustrine deposits or in glacial till. The lacustrine deposits are somewhat stratified, and the glacial till contains numerous angular pebbles. The limestone is typically flat bedded and solid, but in some areas the uppermost foot or two is fractured.

Pyrmont soils, moderately shallow variant, are mottled at less depth than Lewisburg soils, moderately shallow variant. They have a lighter colored surface layer and a brighter colored subsoil than Millsdale soils.

Pyrmont silt loam, moderately shallow variant, 0 to 2 percent slopes (PzA).—This soil occurs as rather small areas. In some areas the profile is silt loam down to within 2 to 4 inches of the rock. In about one-third of the acreage the surface layer is loam rather than silt loam, and in numerous small areas it is silty clay loam. In numerous spots the surface layer is black or very dark gray. In a few small areas the uppermost foot or two of underlying rock is extensively cracked, and in these areas, roots grow into the cracks. There are a few open sinkholes.

Included in mapping were a few small areas in which the depth to rock is less than 20 inches; numerous areas in which the depth to rock is more than 40 inches; and areas of the dark-colored, very poorly drained Millsdale soils, which occur in shallow depressions and minor natural drainageways. Also included were short slopes of more than 2 percent, where the surface layer is lighter colored than in the surrounding level areas.

Most of the acreage is used for crops or improved pasture. Small grain and hay are the principal crops. (Capability unit IIIw-3)

Quarries

Quarries (Qu) is made up of areas where dolomitic limestone or fine-grained sandstone suitable for construction are being or have been quarried. Some of the limestone is suitable for use on cropland. The limestone quarries, which make up nearly all the acreage, are in the western part of the county and on Kelleys Island. The sandstone quarries, which occupy a total of about 25 acres, are in the southeastern part of the county, particularly near Birmingham. Most pits are between 5 and 20 acres in size.

The soil material in the limestone quarries is commonly calcareous, and that in the sandstone quarries is medium acid. Typically the soil material has poor physical properties. The organic-matter content is low. The available moisture capacity is low. Erosion is a hazard in most areas, and instability results in gullying and siltation.

Areas not now being quarried ought to be resurfaced with soil material in which vegetation can be established. If protected from pollution and siltation, ponded areas in limestone quarries could be developed for wildlife habitat. They would also be appropriate for recreational development, if attention is paid to the hazards of rock cliffs and deep water. (Not placed in a capability unit)

Rawson Series

The Rawson series consists of light-colored, moderately well drained soils in which the upper part of the profile formed in outwash and the lower part in glacial till or lakebed deposits. The original vegetation was a hardwood forest. These soils are on low knolls and ridges in all parts of the county.

A typical profile in a cultivated area has a 10-inch plow layer of dark grayish-brown, friable loam. Below the plow layer is a 4-inch layer of brown, friable loam. The subsoil consists of 22 inches of dark-brown, firm sandy clay loam, mottled in the lower 16 inches, over 6 inches of yellowish-brown, mottled, very firm silty clay loam. The underlying material consists of yellowish-brown, mottled, very firm, limy clay loam.

Runoff is medium, and the available moisture capacity is medium. Permeability is moderate in the upper part of the profile and slow to very slow in the lower part. Tilth is good, and productivity is moderate to high.

These soils are used for various purposes, depending on the use of surrounding soils.

Typical profile of Rawson loam, 0 to 2 percent slopes, in a cultivated field, south of Main Road, east of Wright Road; lot 5, sec. 3, Florence Township.

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) loam; weak, medium, granular structure; friable; medium acid; abrupt, smooth boundary.

A2—10 to 14 inches, brown (10YR 5/3) loam; moderate, medium, platy structure; friable; vesicular; medium acid; clear, smooth boundary.

B1t—14 to 20 inches, dark-brown (7.5YR 4/4) sandy clay loam; moderate, medium, subangular blocky structure; firm; thin, patchy, dark-brown (7.5YR 4/2) clay films on ped surfaces; medium acid; clear, smooth boundary.

B2t—20 to 36 inches, dark-brown (7.5YR 4/4) light sandy clay loam; common, medium, distinct mottles of grayish brown (10YR 5/2); weak, medium, subangular blocky structure; firm; few, discontinuous, thin clay films on peds in uppermost 6 inches; slightly acid; abrupt, smooth boundary.

IIB3—36 to 42 inches, yellowish-brown (10YR 5/4) heavy silty clay loam; many, coarse, faint mottles of yellowish brown (10YR 5/6) and common, coarse, prominent mottles of dark brown (7.5YR 3/2); weak, medium, angular blocky structure; very firm; neutral; clear, smooth boundary.

IIC—42 to 60 inches, yellowish-brown (10YR 5/6) clay loam; many, coarse, faint mottles of yellowish brown (10YR 5/4); common, coarse, prominent mottles of gray (10YR 5/1); and many, medium, distinct mottles of brownish yellow (10YR 6/8); massive; very firm; calcareous.

The A1 horizon in uncultivated areas ranges from 4 to 6 inches in thickness. The A and Bt horizons range from very fine sandy loam to light clay loam, sandy clay loam, or gravelly clay loam in texture. The B horizon ranges from 12 to 36 inches in total thickness, including the IIB3 horizon, which is 2 to 10 inches thick. The B horizon has a color hue of 10YR or 7.5YR, a value of 4 or 5, and a chroma of 4 or 5, and it is mottled with grayer colors. Just above the substratum in many places is a layer of gravelly clay loam. The substratum ranges from heavy clay loam to clay in texture, and the depth to it ranges from 18 to 40 inches. The solum ranges from neutral to medium acid. The Rawson soils in Erie County differ from Rawson soils elsewhere in that the mottles in the B horizon have a chroma of 2 and that they are closer to the surface.

Rawson soils have a brighter colored subsoil and are deeper to mottling than Haskins soils. They are much coarser textured in the lower part of the profile than Bogart and Belmore soils. Rawson soils have a looser, more gravelly subsoil than Cardington, Shinrock, or Ellsworth soils.

Rawson fine sandy loam, 2 to 6 percent slopes (RcB).—This soil occurs as small areas on small knolls and ridges throughout the county. In almost half the areas, the surface layer is loam, and in many areas both the surface layer and the upper part of the subsoil are fine sandy loam. In some areas the soil material between the plow layer and the underlying clayey material contains considerable gravel. The loamy and gravelly material in the upper part of the profile is generally thickest at the top of the knoll or ridge, and it thins out down the slope.

Included in mapping were small areas of the somewhat poorly drained Haskins soils, which are on the lower slopes of some of the knolls and ridges, and a few small areas in which the depth to clayey material is either less than 18 inches or more than 40 inches.

Most areas of this soil are within cropped fields and are managed with areas of the surrounding soils. Erosion is a slight to moderate hazard. (Capability unit IIe-1)

Rawson loam, 0 to 2 percent slopes (RdA).—This soil has the profile described as typical of the series. It occurs as very small areas on low knolls and ridges throughout the county. In a third of the areas, the surface layer and the uppermost part of the subsoil are sandy loam or fine

sandy loam, and in a few spots they are gravelly. The depth to the underlying material is more than 40 inches on the crests of some of the knolls and less than 20 inches on some of the lower slopes.

Included in mapping were areas of the somewhat poorly drained Haskins soils, which occupy shallow depressions.

Use and management of this soil are governed largely by the use and management of surrounding soils. (Capability unit I-1)

Rimer Series

The Rimer series consists of nearly level, somewhat poorly drained sandy soils that formed in outwash of loamy fine sand to fine sandy loam texture and are underlain at a depth of 18 to 40 inches by glacial till or lake sediments. These soils occur throughout the county.

A typical profile in a cultivated area has a 6-inch plow layer of very dark grayish-brown, very friable fine sandy loam. Below the plow layer is an 8-inch layer of brown, mottled, loose loamy fine sand. The subsoil consists of 8 inches of dark yellowish-brown, mottled, very friable fine sandy loam over 4 inches of brown, mottled, firm silty clay loam. The underlying material consists of brown, mottled, very firm, limy silty clay loam over yellowish-brown, mottled, firm, limy, stratified silt loam and silty clay loam.

Runoff is slow, and the available moisture capacity is medium. Permeability is moderately rapid to rapid in the upper part of the profile and moderately slow in the lower part. The water table is seasonally high. These soils are productive.

Most areas of these soils have been cleared and drained and are used for field crops and vegetables. Artificial drainage is beneficial for most crops.

Typical profile of Rimer fine sandy loam, in a cultivated field, east of Remington Avenue, south of the railroad tracks, on the east side of the city of Sandusky.

Ap—0 to 6 inches, very dark grayish-brown (10YR 3/2) fine sandy loam; weak, fine, crumb structure; very friable; neutral; abrupt, smooth boundary.

A2—6 to 14 inches, brown (10YR 4/3) loamy fine sand; common, coarse, prominent mottles of yellowish brown (10YR 5/6) and common, medium, distinct mottles of yellowish brown (10YR 5/4); single grain; loose; common, fine, prominent concretions of very dark grayish-brown iron or manganese; neutral; diffuse, irregular boundary.

B21t—14 to 22 inches, dark yellowish-brown (10YR 4/4) fine sandy loam; common, fine, faint mottles of yellowish brown (10YR 5/4); massive; very friable; clay bridgings evident between sand grains; mildly alkaline; abrupt, wavy boundary.

IIB22t—22 to 26 inches, brown (10YR 5/3) silty clay loam; common, medium, distinct mottles of strong brown (7.5YR 5/6); moderate, medium, angular blocky structure; firm; thin clay coatings on ped surfaces; neutral; clear, smooth boundary.

IIC1—26 to 42 inches, brown (10YR 5/3) silty clay loam; many, medium, faint mottles of light brownish gray (10YR 6/2) and yellowish brown (10YR 5/4); moderate, medium, angular blocky structure; very firm; calcareous; abrupt, wavy boundary.

IIIC2—42 to 60 inches, yellowish-brown (10YR 5/4), stratified heavy silt loam and light silty clay loam; many, coarse, distinct mottles of light brownish gray (10YR 6/2) and common, medium, faint mottles of yellowish brown (10YR 5/6); massive; firm; calcareous.

The Ap horizon is very dark gray (10YR 3/1), very dark grayish brown (10YR 3/2), or very dark brown (10YR 2/2) to a depth of 6 to 9 inches. In the upper part of the profile, the texture ranges from fine sandy loam to loamy fine sand, and in some part of the uppermost 20 inches, the texture is as fine or finer than loamy very fine sand. There is also a horizon of clay accumulation 6 to 12 inches thick. The reaction is slightly acid to neutral. The lower part of the profile is mainly silty clay loam or clay loam, but strata of silt loam, silt, or fine sand occur where the underlying material is of lacustrine origin. Where the underlying material is lacustrine, the siltier strata generally become more numerous with depth. The uppermost 2 to 10 inches of this moderately fine textured material is leached of carbonates and shows evidence of clay accumulation.

The Rimer soils in Erie County differ from the series concept in the following ways: they have a thicker dark-colored surface layer; they have more fine sand and very fine sand and less medium sand and coarse sand in the upper part of the profile; and they have more silt, less clay, and fewer pebbles in the lower part of the profile.

Rimer soils have more fine sand and less clay and gravel in the subsoil than Haskins and Digby soils. They have a less silty subsoil than Kibbie soils. Rimer soils differ from Darroch soils, coarse subsoil variant, in being underlain at a depth of 18 to 40 inches by finer textured deposits.

Rimer loamy fine sand (Rf).—This soil is nearly level. It occurs as small areas on till plains, the lake plain, and deltas throughout the county but mostly in the north-central part. Most areas are less than 20 acres in size. In some areas the surface layer is black or very dark gray. In most areas the sandy soil material is 14 to 40 inches thick, and in some areas the lower part of this material is limy.

Included in mapping were small areas in which the thickness of sandy material is either less than 14 inches or more than 40 inches; small areas of the dark-colored, very poorly drained Gilford soils, which are in shallow depressions and minor natural drainageways; areas of the moderately well drained Metea soils, which occupy some of the higher positions; and small areas in which the surface layer is fine sand or fine sandy loam. Also included were a few small areas that have slopes of slightly more than 2 percent.

Most areas of this soil are cropped with surrounding soils. Wetness is the main limitation. Wind erosion is a slight hazard. (Capability unit IIw-3)

Rimer fine sandy loam (Rg).—This soil has the profile described as typical of the series. It is nearly level. It occurs as small areas on till plains, the lake plain, and deltas throughout the county but mostly in the north-central part. Most areas are less than 20 acres in size. In a few areas the surface layer is very dark gray or black. In most areas the sandy soil material is 14 to 40 inches thick, and in some areas the lower part of the sandy material is limy.

Included in mapping were small areas in which the thickness of sandy soil material is either less than 14 inches or more than 40 inches; small areas of the dark-colored, very poorly drained Gilford soils, which occur in shallow depressions and minor natural drainageways; and areas of Metea soils, which occupy some of the high positions. Also included were small areas in which the surface layer is loamy fine sand; a few areas that are underlain by silty clay rather than silt loam or silty clay loam; and a few small areas that have slopes of slightly more than 2 percent.

Most areas of this soil are used for crops along with surrounding soils. (Capability unit IIw-3)

Ritchey Series

The Ritchey series consists of light-colored, well-drained soils that are underlain at a depth of 10 to 20 inches by solid limestone. These soils have a clayey subsoil. They occur in areas that are shallow over limestone in the western part of the county.

A typical profile in a cultivated area has a 10-inch plow layer of dark grayish-brown, friable loam. The subsoil consists of 6 inches of dark-brown, firm clay loam. Below the subsoil is limestone bedrock.

Runoff is medium to rapid, depending on the slope. Permeability is moderately slow, and the available moisture capacity is low to very low. Natural drainage is adequate. Productivity is generally low to moderate.

The acreage is about half cropland and half permanent pasture. Although most areas are droughty, there are a few in which crops seem to do well even in a dry year.

Typical profile of Ritchey loam, 0 to 6 percent slopes, 1,500 feet north of Strecker Road on the west side of Maple Avenue; lot 32, sec. 2, Groton Township.

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) loam; compound structure—weak, medium, subangular blocky, and moderate, fine, crumb; friable; moderately alkaline; abrupt, wavy boundary.

Bt—10 to 16 inches, dark-brown (7.5YR 4/4) heavy clay loam; moderate, very fine, angular blocky structure; firm; thick, continuous clay films on ped surfaces; moderately alkaline; abrupt, wavy boundary.

IIR—16 inches +, gray (10YR 6/1) limestone bedrock.

Below the A1 horizon in uncultivated areas is a thin brown (7.5YR 5/2) A2 horizon. Where plowing has cut into the B horizon, the surface layer has a reddish hue. The solum ranges from loam to silty clay loam in texture. The Bt horizon is 2 to 10 inches thick and has colors ranging from 10YR to 5YR in hue, from 4 to 5 in value, and from 2 to 4 in chroma. In some places the lower part of this horizon is weakly calcareous. In places where the depth to bedrock is greatest, there is a thin C horizon just above the limestone. The uppermost 1 inch to 10 inches of underlying rock is fractured and mixed with the soil material in some places. The Ritchey soils in Erie County are more clayey than is typical (central concept) for the series.

Ritchey soils are shallower over limestone bedrock than Lewisburg soils, moderately shallow variant. They differ from Casco soils, very flaggy subsoil variant, in being underlain by solid limestone instead of limestone rubble.

Ritchey loam, 0 to 6 percent slopes (RhB).—This soil is on the tops of limestone hills and in low areas drained by sinkholes, in the western part of the county. The slopes are dominantly less than 2 percent, but in a few small areas they are as much as 6 percent. In some areas the surface layer is silt loam rather than loam, and there are a few sandy spots. The surface layer is black or very dark gray in numerous small spots and a few sizable areas. After plowing, the surface layer in some areas is a mixture of red, black, and gray. The depth to bedrock is 18 to 20 inches in most areas, but it is more than 20 inches in small areas where there are pockets in the rock surface. Just above the solid rock in some areas are numerous limestone fragments.

Included in mapping were small areas in which the uppermost foot or two of underlying bedrock is extensively broken and both soil material and plant roots extend into the cracks.

Except in dry years, small grain and hay can be grown with fair success. (Capability unit IIIs-2)

Romeo Series

The Romeo series consists of dark-colored, well-drained soils that are very shallow over limestone bedrock. The original vegetation consisted of prairie grass and scrubby hardwoods. These soils are on the tops and sides of hills in the western part of the county and on Kelleys Island. Ritchey and Castalia soils and Lewisburg soils, moderately shallow variant, all of which are deeper than Romeo soils, occupy nearby areas.

A typical profile has a 6-inch surface layer of very dark grayish-brown, friable silt loam. Directly below the surface layer, at a depth of 6 inches, is limestone bedrock.

Runoff is slow to rapid, depending on the slope. Permeability is moderate, and the available moisture capacity is very low. Productivity is generally very low.

Most of the acreage is permanent pasture. Some areas are too shallow to plow.

Typical profile of Romeo silt loam, 0 to 6 percent slopes, 300 feet west of the Union Hall on State Route 99, just south of State Route 101; lot 20, sec. 2, Margaretta Township.

A1—0 to 6 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, medium, crumb structure; friable; calcareous; abrupt, irregular boundary.

IIR—6 inches +, light brownish-gray (2.5Y 6/2) limestone bedrock.

The A1 horizon ranges from loam to silt loam in texture. The total thickness of soil material is less than 10 inches. The underlying rock is typically flat bedded and solid, but in places the uppermost 3 to 4 feet is fractured. Romeo soils in Erie County differ from the series in that they are calcareous instead of noncalcareous and are well drained instead of wet.

Romeo soils are shallower over rock than Ritchey soils. They are less wet than Joliet soils. They differ from Castalia soils in being underlain by solid limestone rather than broken limestone. Romeo soils are darker colored than Colyer and Berks soils, and they are limy and are underlain by limestone instead of shale or sandstone.

Romeo silt loam, 0 to 6 percent slopes (RsB).—This soil has the profile described as typical of the series. It occurs on the tops of limestone hills in the western part of the county. About two-thirds of the areas have slopes of less than 2 percent, but the rest have slopes of 2 to 6 percent. In numerous very small areas, the depth to rock is more than 10 inches because of irregularities in the surface of the underlying rock. There are a few small areas where limestone bedrock is at the surface.

Included in mapping were areas in which the surface layer is loam and a few areas that have a sandy surface layer. Also included were a few small areas that have slopes of more than 6 percent.

Most areas of this very shallow, droughty soil are idle or are in permanent pasture. (Capability unit VIs-1)

Romeo silt loam, 6 to 18 percent slopes (RsD).—This soil is on the sides of limestone hills in the western part of the county. In a few small areas, the surface layer is lighter colored than is typical. There are a few sandy areas and some very stony areas. The slopes are commonly steplike; the steps correspond to the beds of the rock.

Included in mapping were a few vertical limestone outcrops 3 to 10 feet high and as much as 200 feet long. Also included were numerous narrow ledges that have slopes of less than 6 percent and are separated by very narrow slopes of more than 18 percent.

This shallow, droughty soil is used for permanent pasture. Its use for other farming purposes is uncommon. (Capability unit VIs–1)

Romeo silt loam, 18 to 50 percent slopes (RsF).—This soil occurs on the sides of limestone hills in the western part of the county. Stones and boulders are common on the surface in most areas.

Included in mapping were numerous vertical bedrock outcrops 5 to 25 feet high and as much as 1,000 feet long. Also included were a few small areas that have slopes of less than 18 percent.

Most areas of this soil are used for permanent pasture or woodland. The steep slopes, shallowness, and droughtiness are very severe limitations. (Capability unit VIIs–1)

Sand Pits

Sand pits (Sa) is a land type made up of areas from which sand has been removed, mostly for commercial use as molding sand. Previously these were areas of Arkport and Oakville soils. The pits are 3 to 5 acres in size and 2 to 5 feet deep. The soil material is loose and sandy. Only pits that were open at the time of mapping are included. After the sand has been removed, the surface layer can be replaced and the areas graded and restored. Consequently, some of the pits shown on the soil map will be restored to farming, and new pits will be opened.

The pits now open are commonly close to areas that are farmed. They present no problems of siltation, pollution, or accumulation of undesirable debris. (Not placed in a capability unit)

Shinrock Series

The Shinrock series consists of light-colored, moderately well drained soils that formed in limy, lakebed deposits of silt loam to silty clay loam texture. These soils are in and next to stream valleys on the lake plain.

A typical profile in a wooded area has a 9-inch surface layer of friable silt loam that is dark grayish brown in the upper part and brown in the lower part. The subsoil consists of 8 inches of dark yellowish-brown, mottled, very firm silty clay loam over 10 inches of brown, mottled, firm silty clay loam. The underlying material consists of mottled dark yellowish-brown and yellowish-brown, firm, limy silty clay loam stratified with silt loam and silt, over brown, mottled, friable, limy, stratified layers of silt loam, silt, and very fine sand.

Permeability is moderately slow, and the available moisture capacity is medium.

The use of these soils depends upon the slope. The less sloping areas are used for crops, principally corn, small grain, hay, and vegetables. The steeper areas are used as pasture.

Typical profile of Shinrock silt loam, 2 to 6 percent slopes, in a wooded area, east of Riley Road in the village of Milan.

A1—0 to 5 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, very fine, granular structure; friable; neutral; abrupt, irregular boundary.

A2—5 to 9 inches, brown (10YR 5/3) silt loam; weak, coarse, subangular blocky structure; friable; slightly acid; clear, wavy boundary.

B21t—9 to 17 inches, dark yellowish-brown (10YR 4/4) heavy silty clay loam; common, fine, distinct mottles of grayish brown (10YR 5/2); moderate, medium, angular blocky structure; very firm; moderate, continuous, brown (10YR 5/3) clay films on vertical ped surfaces and thin, patchy films on horizontal ped surfaces; neutral; gradual boundary.

B22t—17 to 27 inches, brown (7.5YR 4/4) heavy silty clay loam; common, fine, distinct mottles of grayish brown (10YR 5/2) and few, medium, distinct mottles of yellowish brown (10YR 5/6); moderate, fine, subangular blocky structure; firm; thin, continuous, brown (10YR 5/3) clay films on vertical ped faces; neutral; clear, wavy boundary.

C1—27 to 42 inches, mottled dark yellowish-brown (10YR 4/4) and yellowish-brown (10YR 5/4) light silty clay loam; numerous fine strata of light brownish-gray (10YR 6/2) silt loam and silt; weak, thick, platy structure, largely the result of stratification; firm; calcareous; clear, wavy boundary.

C2—42 to 60 inches, brown (10YR 5/3), stratified layers of silt loam, silt, and very fine sand; the strata are yellowish brown (10YR 5/6) or light brownish gray (10YR 6/2) and have a few, coarse, distinct mottles of dark brown (7.5YR 4/4); strong, thin, platy structure, mainly the result of stratification; friable; calcareous.

The A horizon ranges from loam to silt loam in texture, and it has colors that range from dark grayish brown (10YR 4/2) in uneroded areas to brown (10YR 5/3) or yellowish brown (10YR 5/4) in severely eroded areas. It is less than 12 inches thick. In cultivated areas there is either a very thin A2 horizon or none. The B horizon ranges from 10 to 30 inches in thickness. It is heavy silty clay loam or light clay in texture, and its dominant colors have a hue of 7.5YR, 10YR, or 2.5YR, a value of 4 or 5, and a chroma of 3 or 4. There are grayish-brown mottles within 10 inches of the top of the B horizon. The C horizon is stratified and has dominant textures of silty clay loam and heavy silt loam. It has a clay content of less than 35 percent. In some places it contains thin strata of silty clay; in others it contains strata of silt and fine sand. The solum ranges from slightly acid to moderately alkaline. The depth to carbonates ranges from 20 to 36 inches but is most commonly between 24 and 32 inches.

Shinrock soils are more clayey in the B horizon than Sisson or Tuscola soils. They lack the pebbles and coarse fragments that are characteristic of Cardington soils. They have a brighter colored subsoil than the somewhat poorly drained Del Rey soils.

Shinrock loam, 0 to 2 percent slopes (ShA).—This soil occurs as small areas, most of which are bordered on one or more sides by steep slopes. These areas are on the lake plain; some are close to steep-sided stream valleys, and some to the escarpment along the shore of Lake Erie.

Included in mapping were numerous areas in which the surface layer is fine sandy loam; areas that are underlain at a depth of 3 to 5 feet by pebbly till of clay loam texture; and areas of the somewhat poorly drained Del Rey soils, which occur in small depressions. Also included were a few small areas that have slopes of slightly more than 2 percent and a few spots of the more silty and less clayey Tuscola soils.

Most areas of this soil are used for crops, principally field crops and special crops. The control of erosion is a minor problem, but gullies that formed on adjacent slopes have cut back into some level areas. (Capability unit I–1)

Shinrock silt loam, 0 to 2 percent slopes (SkA).—This soil occurs as small areas, most of which are bordered on one or more sides by steep slopes. These areas are on the lake plain; some are close to steep-sided stream valleys, and some to the escarpment along the shore of Lake Erie.

Included in mapping were small areas in which the surface layer is loam; areas of the somewhat poorly drained Del Rey soils, which occur in small depressions; and a few small areas that have slopes of slightly more than 2 percent. Also included were a few spots of the more silty and less clayey Tuscola soils.

Most areas of this soil are used for crops, principally field crops and special crops. The control of erosion is a minor problem, but gullies that formed on adjacent slopes have cut back into some areas. (Capability unit I–1)

Shinrock silt loam, 2 to 6 percent slopes (SkB).—This soil has the profile described as typical of the series. It occurs as small areas on the side slopes of minor natural drainageways on the lake plain. Most areas are long and narrow.

Included in mapping were numerous areas in which the surface layer is loam, fine sandy loam, or silty clay loam; a few small eroded areas that have a light brownish-gray or yellowish-brown surface layer; and numerous small areas that have slopes of less than 2 percent. Also included were a few areas that have slopes of more than 6 percent; areas of the somewhat poorly drained Del Rey soils and the very poorly drained Lenawee soils, which occupy small depressions and minor natural drainageways; and a few spots of the more silty and less clayey Tuscola soils.

Areas of this soil are farmed with surrounding level soils. Vegetables, some fruit, and the main field crops are grown. The control of erosion is a moderate problem in some areas. (Capability unit IIe–1)

Shinrock silt loam, 6 to 12 percent slopes, moderately eroded (SkC2).—This soil occurs as small areas on the side slopes of stream valleys on the lake plain. Most areas are long and narrow. There are seep spots on some hillsides. Part of the original surface layer has been lost through erosion. The degree of erosion varies considerably within small areas. In the most eroded areas, the present surface layer is yellowish-brown silty clay loam, but in the least eroded areas, it is dark grayish-brown silt loam. The variations in color can be seen in freshly plowed fields. Below the plow layer in a few areas west of Sandusky, the texture is silty clay rather than silty clay loam. In some areas there are no mottles in the profile.

Included in mapping were very narrow areas of the very poorly drained Lenawee soils, which are in narrow valleys, small areas that have slopes of either less than 6 percent or more than 12 percent, and small areas of the more silty and less clayey Tuscola and Sisson soils.

Most areas are within cultivated fields, but some are in permanent pasture or woodland. All the common field crops are grown. Wetness caused by the seep spots interferes with cultivation. Erosion is a severe hazard. Further erosion will result in poorer tilth, because more of the silty clay loam subsoil will be incorporated in the plow layer. (Capability unit IIIe–2)

Shinrock silt loam, 12 to 18 percent slopes, moderately eroded (SkD2).—This soil is on the side slopes of stream valleys on the lake plain. It occurs as long narrow areas parallel to the valleys. Seeps and springs on hillsides create local wet spots. About half the original surface layer has been removed through erosion. In cultivated areas the plow layer contains chunks of yellowish-brown silty clay loam brought up from the subsoil. The present surface layer is loam in some areas, mainly wooded areas, and sandy in a few spots.

Included in mapping were numerous small areas, mostly wooded, that are only slightly eroded; small areas of the more silty, less clayey, pebbly Sisson soils; and small areas that have slopes of either less than 12 percent or more than 18 percent.

Most small areas are within fields of more gently sloping soils. Most larger areas are now used as woodland or pasture. Erosion is a very severe hazard and can be expected to continue unless a protective cover of vegetation is maintained. Some houses have been built on this soil. (Capability unit IVe–1)

Shinrock soils, 18 to 25 percent slopes (SlE).—These soils occur as long narrow areas on the sides of stream valleys on the lake plain. There are seep spots and springs on some of the slopes. The surface layer is very fine sandy loam, loam, or silt loam. Within most areas are variations in slope, in texture of the surface layer, and in degree of erosion. Wooded areas are slightly eroded to moderately eroded, and cleared areas are moderately eroded to severely eroded. The more eroded areas have a yellowish-brown, finer textured surface layer. There are also a few gullies. Below the plow layer in a few areas near Venice is silty clay.

Included in mapping were a few small areas that have slopes of either less than 18 percent or more than 25 percent.

Most areas of these soils are in woodland or permanent pasture, because they are too steep to be worked conveniently with machinery. Erosion is a very severe hazard. (Capability unit VIe–1)

Shinrock soils, 25 to 40 percent slopes (SlF).—These soils occur as long narrow areas on the sides of stream valleys on the lake plain. There are seep spots and springs on some of the slopes. The surface layer is very fine sandy loam, loam, or silt loam. Within most areas are variations in slope, in texture of the surface layer, and in degree of erosion. Wooded areas are slightly eroded to moderately eroded, and cleared areas are moderately eroded to severely eroded. The more eroded areas have a yellowish-brown, finer textured surface layer. There are a few gullies.

Most areas of these soils are in woodland or permanent pasture, because they are too steep to be worked conveniently with machinery. Erosion is a very severe hazard. (Capability unit VIIe–1)

Shoals Series

The Shoals series consists of nearly level, light-colored, somewhat poorly drained soils that formed in sediments deposited along streams. The original vegetation was a hardwood forest. These soils are occasionally flooded. They occur in the western and central parts of the county.

A typical profile in a cultivated field has an 8-inch plow layer of dark grayish-brown, friable silt loam. The

subsoil consists of 12 inches of dark grayish-brown, mottled, friable silt loam. The underlying material consists of brown, mottled, very friable very fine sandy loam over dark grayish-brown, friable silt loam. Below this is very dark gray, mottled, friable silt loam that contains thin strata of loam and fine sandy loam.

Runoff is slow, permeability is slow to moderate, and the available moisture capacity is high. The water table is seasonally high. If adequately drained, these soils are productive.

Most areas of these soils are used for permanent pasture, but some of the larger areas are used for crops.

Profile of Shoals silt loam, on the south side of the Huron River, about 2 miles southwest of Milan.

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

B21g—8 to 20 inches, dark grayish-brown (10YR 4/2) silt loam; common, faint, coarse mottles of dark gray (10YR 4/1) and common, fine, distinct mottles of yellowish brown (10YR 5/6); weak, fine, subangular blocky structure; friable; neutral; clear, wavy boundary.

C1—20 to 29 inches, brown (10YR 4/3) very fine sandy loam; few, fine, distinct mottles of dark yellowish brown (10YR 3/4); very weak, very fine, subangular blocky structure; very friable; neutral; clear, wavy boundary.

C2—29 to 36 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, subangular blocky structure; friable; neutral; gradual boundary.

C3—36 to 60 inches, very dark gray (10YR 3/1) silt loam and thin strata of loam and fine sandy loam; many, medium, distinct mottles of yellowish brown (10YR 5/8) and dark yellowish brown (10YR 4/4); massive; friable; neutral.

These soils are highly stratified, and within short distances there are variations in texture, thickness, and sequence of strata. The texture of the A and B horizons ranges from loam to silty clay loam. In the C horizon, thin strata of gravelly and sandy loam are common. Deep in the profile in some places are the dark-colored surface layers of buried soils. These soils are limy below a depth of 4 feet in some places. The reaction ranges from slightly acid to moderately alkaline. In some profiles the B and C horizons are dull gray and unmottled.

Shoals silt loam (Sm).—This soil occurs as long narrow areas on the bottoms of stream valleys in the western and central parts of the county. It is flooded occasionally. The slope is less than 2 percent in most areas. On the surface in some areas are stones or freshly deposited soil materials.

Included in mapping were numerous areas, some of considerable size, in which the surface layer is fine sandy loam, loam, or silty clay loam; numerous areas of the very poorly drained Sloan soils, which occur in abandoned stream channels; and areas of the moderately well drained Eel soils, which occupy some knolls and ridges.

The use of this soil depends upon the width of the area and the degree to which it is cut up by old stream channels. (Capability unit IIw–1)

Sisson Series

The Sisson series consists of gently sloping to steep, light-colored, well-drained soils that formed in water-laid silt and fine sand. These soils occur on undulating hills along the valleys of the Huron River and its tributaries. They are on the highest or steepest parts of the landscape. Tuscola, Kibbie, Colwood, and Washtenaw soils occupy nearby lower areas.

A typical profile of a severely eroded Sisson soil has a 10-inch plow layer of yellowish-brown, friable silt loam. The subsoil consists of 4 inches of yellowish-brown, firm silt loam. The underlying material consists of yellowish-brown, very friable silt loam over a layer of yellowish-brown, loose, limy, stratified very fine sand and fine sand that contains bands of silt. Below this is yellowish-brown, very friable, limy, stratified silt loam and very fine sandy loam.

Runoff is slow to medium, depending on the slope and the texture of the surface layer. Permeability is moderate, and the available moisture capacity is high.

Most areas that have slopes of less than 25 percent are cultivated. Corn, small grain, hay, and vegetables are grown.

Typical profile of Sisson silt loam, 12 to 18 percent slopes, severely eroded, in a cultivated field, on the north side of Scheid Road, between the Huron-Avery Road and State Route 13; lot 3, sec. 2, Huron Township.

Ap—0 to 10 inches, yellowish-brown (10YR 5/4) silt loam; very weak, fine, subangular blocky structure; friable; neutral; abrupt, smooth boundary.

Bt—10 to 24 inches, yellowish-brown (10YR 5/4) heavy silt loam; moderate, medium, subangular blocky structure; firm; discontinuous thin films of clay on all ped faces; neutral; gradual boundary.

C1—24 to 40 inches, yellowish-brown (10YR 5/4) silt loam; very weak, medium, subangular blocky structure; very friable; neutral; gradual boundary.

C2–40 to 54 inches, yellowish-brown (10YR 5/6), stratified very fine sand and fine sand; numerous bands of dark yellowish-brown (10YR 4/4) silt; massive or single grain; sand is loose, silt bands are firm; calcareous; gradual boundary.

C3—54 to 60 inches, yellowish-brown (10YR 5/4), stratified silt loam and very fine sandy loam; numerous thin strata of yellowish brown (10YR 5/8); laminar structure due to stratification; very friable; calcareous.

In severely eroded areas, the present Ap horizon consists mainly of soil material from the original B horizon. In slightly eroded areas, the A1 or Ap horizon is dark grayish-brown (10YR 4/2) silt loam, fine sandy loam, or loamy fine sand, and below this is an A2 horizon of yellowish-brown fine sandy loam or loamy fine sand. The color of the surface layer ranges from dark grayish brown (10YR 4/2) in the least eroded areas to yellowish brown (10YR 5/4) in the most eroded areas. The amount of soil material remaining from the original A horizon varies within short distances. The B horizon ranges from loam to light silty clay loam in texture and from 10 to 20 inches in thickness. In few profiles does the C horizon have the full range in texture. In some it is fine sand or very fine sand, but in others it is dominantly silt loam stratified with silt and fine sand. The solum ranges from slightly acid to neutral. The depth to carbonates ranges from 24 to 48 inches and is least in eroded areas.

Sisson soils are less clayey in the B horizon than Shinrock soils. They are more clayey than Arkport soils, which are sandy throughout most of the profile. They are free of mottles to a greater depth than the moderately well drained Tuscola soils. Sisson soils are less gravelly and more silty than Oshtemo or Chili soils.

Sisson loamy fine sand, 2 to 6 percent slopes (SnB).—This soil is on the lake plain and on deltas. It occurs as small areas on the side slopes of minor natural drainageways and on the top and sides of low knolls. The surface layer is dark grayish brown. In a few small eroded areas, the surface layer is yellowish brown. In some areas loamy fine sand extends only to the base of the plow layer, but

in others extends to a depth of 2 or 3 feet. On most of the lower slopes and in some entire areas, this soil is mottled at a depth of 15 to 24 inches.

Included in mapping were small areas of Arkport soils, which consist mainly of loamy fine sand and have a few bands of reddish sandy loam; numerous small areas that have slopes of less than 2 percent; and a few spots that have slopes of more than 6 percent.

Most areas are cropped with surrounding soils. Vegetables and the common field crops are grown. In a few areas vegetables are irrigated. Wind erosion is a hazard if the soil is bare. Water erosion is less of a hazard than on the finer textured Sisson soils. (Capability unit IIe–2)

Sisson fine sandy loam, 2 to 6 percent slopes (SoB).—This soil occurs as small areas on the sides of small valleys on the lake plain, on deltas, and on gently undulating uplands. The surface layer is dark grayish brown. In a few small eroded areas it has contrasting brownish colors.

Included in mapping were areas of the moderately well drained Tuscola soils, which are on some of the lower slopes, and narrow strips, most numerous in the gently undulating areas, of the very poorly drained Colwood soils and the somewhat poorly drained Washtenaw soils, which occur in minor natural drainageways. Also included were numerous small areas that have slopes of less than 2 percent and a few areas that have slopes of more than 6 percent.

Most areas of this soil are cropland. Vegetables, corn, and small grain are the principal crops. The vegetable crops are irrigated. Some areas adjacent to the city of Huron have been used for residential purposes. (Capability unit IIe–1)

Sisson fine sandy loam, 6 to 12 percent slopes, moderately eroded (SoC2).—This soil occurs as small areas on the sides of valleys on the lake plain, on deltas, and on undulating uplands along the Huron River. The surface layer is grayish-brown fine sandy loam. In some areas, especially on the lower part of slopes, there are mottles at a depth of 15 to 24 inches.

Included in mapping were narrow strips, mostly in the undulating areas, of the very poorly drained Colwood soils and the somewhat poorly drained Washtenaw soils, which occur in minor natural drainageways; small areas in which the surface layer is loamy fine sand or loam; numerous small areas that have slopes of less than 6 percent; and a few areas that have slopes of more than 12 percent. Also included were a few small severely eroded areas in which the surface layer is yellowish brown and a few small slightly eroded areas in which the surface layer is darker colored.

Most areas of this soil are used for crops, principally corn, small grain, and hay. Some areas adjacent to Huron have been used for residential developments. (Capability unit IIIe–1)

Sisson silt loam, 2 to 6 percent slopes (SsB).—This soil is on the lake plain and on deltas. It occurs on the side slopes of minor natural drainageways and low knolls. The surface layer is dark grayish brown or, in some moderately eroded areas, yellowish brown. In a few small areas the surface layer is loam.

Included in mapping were numerous small areas of Tuscola soils, which occur on the lower slopes, are slightly darker colored, and are mottled at a depth of 15 to 24 inches; areas of the very poorly drained Colwood soils and the somewhat poorly drained Washtenaw soils, which occupy the bottoms of narrow drainageways; and small areas that have slopes of either less than 2 percent or more than 6 percent.

Most areas of this soil are used for crops, principally corn, small grain, hay, and vegetables. A few areas have been used successfully for residential developments. Erosion is a moderate hazard, unless a cover of vegetation is maintained. (Capability unit IIe–1)

Sisson silt loam, 6 to 12 percent slopes, moderately eroded (SsC2).—This soil is on side slopes of stream valleys on the lake plain and on deltas. Narrow strips extend back along tributary valleys for a mile or more from the Huron River valley. The areas are of various sizes, and they commonly have complex slopes and are irregularly shaped. Part of the original dark-colored surface layer has been lost through erosion, and the present plow layer is generally grayish brown. In some uneroded spots, the surface layer is loam or fine sandy loam; in some of the severely eroded spots, it is heavy silt loam.

Included in mapping were slightly eroded areas in which the surface layer is dark grayish brown and severely eroded areas in which the surface layer is yellowish brown. Also included were areas of the somewhat poorly drained Washtenaw soils, which occupy the bottoms of narrow drainageways, and small areas that have slopes of either less than 6 percent or more than 12 percent.

Most areas are used with other soils for corn, small grain, and hay. Erosion is a severe hazard. (Capability unit IIIe–1)

Sisson silt loam, 12 to 18 percent slopes, moderately eroded (SsD2).—This soil is on the side slopes of stream valleys on the lake plain and on deltas. Narrow strips extend back along tributary valleys for a mile or more from the Huron River valley. The areas are of various sizes and commonly have complex slopes and are irregularly shaped. Part of the original dark-colored surface layer has been lost through erosion, and the present plow layer is generally grayish brown. In some uneroded spots, the surface layer is loam or fine sandy loam; in some severely eroded spots, it is heavy silt loam.

Included in mapping were slightly eroded areas in which the surface layer is dark grayish brown and severely eroded areas in which the surface layer is yellowish brown. Also included were areas of the somewhat poorly drained Washtenaw soils, which occupy the bottoms of narrow drainageways. Other inclusions were small areas that have slopes of either less than 12 percent or more than 18 percent.

Some areas are used with other soils for corn, small grain, and hay. Other areas are in pasture. Homesites on this soil are generally suitable for scenic landscaping. Erosion is a very severe hazard. (Capability unit IVe–2)

Sisson silt loam, 12 to 18 percent slopes, severely eroded (SsD3).—This soil has the profile described as typical of the series. It is on the side slopes of stream valleys and in dissected upland areas on the lake plain and on deltas. It is extensive in areas adjacent to the valleys of the Huron River and its tributaries. Smaller areas occur along other streams in the northern part of the county.

In the major valleys, on the uppermost two-thirds or three-fourths of the side slopes, are severely eroded areas; below these are slightly eroded or uneroded areas that have a dark-gray surface layer and, in some places, deposits of material washed from higher areas. Included in these areas in mapping were a few small gullies that are cutting back into adjacent level soils; a few areas in which the slope is either less than 12 percent or more than 18 percent; and small areas, mostly on the lower part of the slopes, of the more clayey, less silty Shinrock soils.

In the uplands are areas that were once nearly level but now are dissected by numerous drainageways. These areas have complex slopes. On some of the slopes are protected areas that are only slightly eroded and have a gray or grayish-brown surface layer. In some of these areas, the surface layer is loam or fine sandy loam. In some of the most severely eroded spots, the surface layer is heavy silt loam. Plowed fields range from dark gray to grayish brown in color.

Most areas are used with other soils for corn, small grain, and hay. Erosion has reduced the organic-matter content, and consequently, tilth has deteriorated. Further erosion is a very severe hazard. (Capability unit IVe–2)

Sisson silt loam, 18 to 25 percent slopes, moderately eroded (SsE2).—This soil occurs as long narrow areas on the sides of stream valleys on the lake plain and on deltas. These areas have complex slopes. The degree of erosion varies considerably. In the slightly eroded areas, the surface layer is dark grayish brown, and in the severely eroded areas, it is yellowish brown. The plow layer in cultivated fields generally shows various colors.

Included in mapping were small areas that have slopes of either less than 18 percent or more than 25 percent; and small areas, especially on the lower slopes, of the more clayey, less silty Shinrock soils.

Most areas are in woodland or pasture. Erosion is a very severe hazard. (Capability unit VIe–1)

Sisson soils 25 to 50 percent slopes (StF).—These soils occur as long, very narrow areas on the side slopes of valleys along the Huron River and other large streams. The slopes are complex. The degree of erosion and the color and the texture of the surface layer vary. Most areas are moderately eroded, and the texture of the surface layer is mainly silt loam, fine sandy loam, or loam.

Included in mapping were areas that have been protected from erosion by forest vegetation and have a surface layer of dark grayish-brown silt loam, loam, or fine sandy loam. Also included were severely eroded areas that have a surface layer of yellowish-brown silt loam; areas of the more clayey, less silty Shinrock soils, which are on the lower third of slopes; and some vertical banks as much as 30 feet high and 500 feet long.

These soils are too steep to be farmed and are commonly in woodland or pasture. Erosion is a very severe hazard. (Capability unit VIIe–1)

Sloan Series

The Sloan series consists of dark-colored, very poorly drained soils that formed in recent stream deposits and are flooded occasionally. The original vegetation consisted of lowland hardwoods and swamp grass. These soils are in stream valleys in the western and central parts of the county. In the larger valleys, they occupy the lowest areas and Shoals or Eel soils occupy adjacent higher areas. In the smaller valleys, they occupy the whole bottom and Alexandria, Shinrock, and other upland soils are in surrounding areas.

A typical profile in a pastured area has a 22-inch surface layer that consists, in the uppermost few inches, of very dark gray, friable silt loam and, below this, of very dark grayish-brown, mottled, very friable fine sandy loam. The subsoil consists of 10 inches of dark grayish-brown, mottled, friable loam. The underlying material consists of dark grayish-brown, mottled, friable silt loam over dark yellowish-brown, mottled, friable silt loam.

Runoff is slow to ponded, permeability is moderate to slow, and the available moisture capacity is high. The water table is high.

Most areas of these soils are in permanent pasture. Artificial drainage is necessary for the successful production of most crops.

Typical profile of Sloan silt loam, along Pipe Creek, 300 feet west of Patten Tract Road, Perkins Township.

A11—0 to 14 inches, very dark gray (10YR 3/1) silt loam; weak, fine, crumb structure; friable; moderately alkaline; clear, wavy boundary.

A12g—14 to 22 inches, very dark grayish-brown (10YR 3/2) fine sandy loam; many, coarse, prominent mottles of brown (7.5YR 4/4); massive; very friable; moderately alkaline; clear, smooth boundary.

B2g—22 to 32 inches, dark grayish-brown (10YR 4/2) loam; many, coarse, prominent mottles of strong brown (7.5YR 5/6); massive; friable; moderately alkaline; clear, smooth boundary.

C1—32 to 38 inches, dark grayish-brown (10YR 4/2) silt loam; many, coarse, distinct mottles of yellowish brown (10YR 5/4); massive; friable; moderately alkaline; clear, smooth boundary.

C2—38 to 60 inches, dark yellowish-brown (10YR 4/4) silt loam; common, coarse, distinct mottles of yellowish brown (10YR 5/6); massive; friable; moderately alkaline.

These soils are highly stratified; the texture, thickness, and sequence of horizons change from place to place. The A horizon ranges from 10 to 24 inches in thickness and is black (10YR 2/1), very dark gray (10YR 3/1), very dark brown (10YR 2/2), or very dark grayish brown (10YR 3/2) in color. In areas along the smaller, swifter streams, the dominant textures are loam, fine sandy loam, and silt loam, but in areas along the slower, larger streams, they are silt loam and silty clay loam. Thin strata of sand and gravel are common in all areas. The B horizon generally has a matrix color hue of 10YR or 2.5Y, a value of 4 or 5, and a chroma of 1 or 2. There are buried A horizons in some profiles. There are extreme variations from place to place in the number of stones and pebbles. The Sloan soils in Erie County are neutral to calcareous, but typically they are slightly acid to neutral. The B and C horizons are dull gray and unmottled in places.

Sloan soils have a darker colored surface layer and generally grayer colors than Shoals soils. They are less acid and have a darker colored surface layer than Wayland soils.

Sloan silt loam (Sv).—This soil occurs mostly as long narrow areas on the bottoms of stream valleys in the western and central parts of the county. The slope is mostly less than 2 percent. There are stones on the surface in a few areas. In some areas along Mills Creek and Pipe Creek, limestone bedrock is within 5 feet of the surface.

Included in mapping were areas of loam, fine sandy loam, and silty clay loam, numerous small areas that have fresh deposits of light-colored soil material, and small areas in which the surface layer is limy. Also in-

cluded were areas of the somewhat poorly drained Shoals soils and the moderately well drained Eel soils, which occupy small knolls and ridges.

This soil is used mostly for pasture, but it is also used for crops. All the main field crops are grown. The use of this soil is governed by the degree to which it is dissected by old stream channels and by the width of the valley in which it occurs. (Capability unit IIIw–1)

Tawas Series

The Tawas series consists of dark-colored, very poorly drained soils that formed in 20 to 40 inches of muck over sandy or gravelly mineral soil material. The original vegetation consisted of swamp hardwoods and swamp grass. This soil occupies small closed depressions. Oshtemo, Belmore, Chili, and other better drained sandy or gravelly soils occur in surrounding areas.

A typical profile has a 27-inch organic layer of black, friable muck at the surface. The underlying material consists of very dark grayish-brown, very friable loamy sand over grayish-brown, loose sand.

Most areas of these soils are idle because they are too wet to be farmed with surrounding soils and too small to be farmed separately.

Typical profile of Tawas muck, 0.1 mile north of the Ohio Turnpike and 600 feet east of Humm Road, Berlin Township.

O1—0 to 10 inches, black (N 2/0) muck; moderate, fine, granular structure; friable; medium acid; clear, smooth boundary.

O2—10 to 27 inches, black (10YR 2/1) muck; moderate, fine, subangular blocky structure; friable; medium acid; abrupt, wavy boundary.

IIC1—27 to 35 inches, very dark grayish-brown (10YR 3/2) loamy sand; massive; very friable; slightly acid; gradual boundary.

IIC2—35 to 60 inches, grayish-brown (10YR 5/2) sand; single grain; loose; slightly acid.

The organic material ranges from 18 to 40 inches in thickness. Most of it has decomposed enough that plant parts cannot be recognized. The reaction ranges from medium acid to neutral. The underlying material is sand, loamy sand, or sandy loam that is extremely variable in color. In some areas it is strongly mottled; in others it is gleyed. This material is medium acid to calcareous. Between the muck and the mineral soil material in some areas is a thin layer consisting of a mixture of muck and sand.

Tawas soils differ from Gilford soils in having a thick layer of muck at the surface. They differ from Warners soils in being underlain by sand and gravel instead of marl.

Tawas muck (Ta).—This soil occupies closed depressions within the sandy beach ridge areas of the county. The areas are less than 5 acres in size. The muck is generally thickest in the center of the depression.

Included in mapping were small areas in which the muck is either less than 18 inches thick or more than 40 inches.

Most areas are in their natural swampy state. A few areas are used for crops with other adjacent soils. (Capability unit IVw–3)

Toledo Series

The Toledo series consists of dark-colored, very poorly drained soils that formed in clayey lakebed deposits. The original vegetation consisted of lowland hardwoods and swamp grass. The soils are on the lake plain in the northwestern part of the county. They occupy broad level areas. Fulton soils occupy adjacent knolls.

A typical profile in a cultivated area has a 9-inch plow layer of very dark gray, firm silty clay. The subsoil consists of 41 inches of mottled, very firm clay that, in the uppermost 6 inches, has a matrix color of grayish brown and, below this, a matrix color of gray. The underlying material consists of yellowish-brown, mottled, very firm, limy silty clay.

Runoff is slow to ponded, permeability is slow, and the available moisture capacity is high. The water table is high for extended periods, and in some areas there is excess surface water. The organic-matter content is high, and tilth is generally good. The supply of lime and plant nutrients is moderately high. If adequately drained, these soils are very productive.

Most areas of these soils have been drained and are used for field crops and special crops. Artificial drainage is necessary for the successful production of most crops.

Typical profile of Toledo silty clay, at the North Central Substation of the Ohio Agricultural Research and Development Center.

Ap—0 to 9 inches, very dark gray (10YR 3/1) silty clay; weak, medium, granular structure; firm; neutral; abrupt, smooth boundary.

B21g—9 to 15 inches, grayish-brown (10YR 5/2) clay; common, medium, distinct mottles of yellowish brown (10YR 5/8), reddish yellow (7.5YR 6/6), and dark brown (10YR 4/3); strong, fine, angular blocky structure; very firm; very dark brown (10YR 2/2) organic coatings on ped faces; neutral; gradual, wavy boundary.

B22g—15 to 50 inches, gray (10YR 5/1) clay; common, coarse, distinct mottles of dark brown (10YR 4/3), yellowish brown (10YR 5/6), and light olive brown (2.5Y 5/4); moderate, coarse, prismatic structure breaking to strong, fine and medium, angular blocky; very firm; thin, very patchy, gray (10YR 5/1) clay films on ped faces; mildly alkaline; abrupt, irregular boundary.

C—50 to 60 inches, yellowish-brown (10YR 5/4) silty clay; many, coarse, prominent mottles of gray (10YR 5/1), grayish brown (2.5Y 5/2), and light olive brown (2.5Y 5/4); massive; very firm; calcareous.

The A horizon ranges from 7 to 10 inches in thickness. In some areas it is black (10YR 2/1), and in sizable areas it is silty clay loam. In the lower part of the B and C horizons, strata of silty clay loam are common, and in areas where Toledo soils grade to Lenawee soils, they are numerous. In some areas the B and C horizons have faint mottles and dominantly a dull-gray matrix. The solum is slightly acid to mildly alkaline. The depth to free carbonates ranges from 40 to 60 inches.

Toledo soils are more clayey than Lenawee soils, especially in the lower part of the profile, and they have a thinner dark-colored surface layer. They are less acid and contain fewer pebbles than Miner soils. They have a darker colored surface layer and a grayer subsoil than Fulton soils.

Toledo silty clay loam (Tc).—This soil occurs as large uniform areas on the lake plain in the northwestern part of the county. It is nearly level.

Included in mapping were areas, as much as 10 acres in size, of Toledo silty clay, which is underlain at a depth of 42 to 60 inches by silty clay loam in many areas. Also included were small areas of the more silty, less clayey Lenawee soils and a few small areas that are limy at or near the surface.

Nearly all the acreage has been drained and is used for crops. Corn, small grain, sugar beets, fruits, and vege-

tables are the principal crops. Numerous homes have been built on this soil. (Capability unit IIIw–5)

Toledo silty clay (To).—This soil has the profile described as typical of the series. It is level. It occurs as large uniform areas on the lake plain in the northwestern part of the county. In some areas, especially those farthest east, the silty clay or clay is underlain at a depth of 40 to 60 inches by silty clay loam.

Included in mapping were spots in which the surface layer is black and some spots in which it is black to a depth of 1 foot or 2 feet; areas in which the depth to limy material is only 20 to 30 inches; and areas in which the uppermost 6 to 15 inches is silty clay loam. Also included were a few small areas of the somewhat poorly drained Fulton soils, which are generally on low knolls.

Almost the entire acreage is used for crops. Corn, small grain, sugar beets, tomatoes, and cabbage are the principal crops. A small acreage is used for other vegetables and for orchard and vineyard crops. The included areas of silty clay loam are a little easier to work than those of silty clay. The areas underlain by silty clay loam are a little easier to drain than those underlain by silty clay. (Capability unit IIIw–5)

Toledo Series, Calcareous Variant

The Toledo series, calcareous variant, consists of nearly level, dark-colored, very poorly drained soils that formed in clayey lakebed deposits. The original vegetation consisted of lowland hardwoods and swamp grass. These soils are on the lake plain in the northwestern part of the county.

A typical profile in a cultivated field has an 8-inch plow layer of very dark grayish-brown, firm, limy silty clay. The subsoil consists of 16 inches of gray, mottled, very firm, limy silty clay. The underlying material is grayish-brown, mottled, very firm, limy silty clay that contains strata of silty clay loam.

Runoff is very slow, permeability is slow, and the available moisture capacity is high. The water table is high. The organic-matter content is high, and tilth is good. If drained, these soils are productive.

Most areas of these soils have been drained and are used for field crops and vegetables. Artificial drainage is necessary for the successful production of most crops.

Typical profile of Toledo silty clay, calcareous variant, 400 feet north and 50 feet west of the corner of McCartney Road and U.S. Route 6, Margaretta Annex.

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) silty clay; moderate, medium, granular structure; firm; calcareous; abrupt, smooth boundary.

B2g—8 to 24 inches, gray (10YR 5/1) silty clay; common, coarse, distinct mottles of dark brown (10YR 4/3) and light olive brown (2.5YR 5/4); weak, medium, prismatic structure breaking to strong, fine, angular blocky; very firm; calcareous; gradual boundary.

Cg—24 to 60 inches, grayish-brown (10YR 5/2) silty clay; many, coarse, distinct mottles of light olive brown (2.5YR 5/4); massive; very firm; thin strata of silty clay loam.

The Ap horizon ranges from very dark grayish brown (10YR 3/2) to black (10YR 2/1). In a few places it is mucky, and in some places it contains small white shells. Below the Ap horizon, the soil consists of strongly gleyed silty clay. Below a depth of 40 inches are a few lenses of silty clay loam.

Toledo soils, calcareous variant, differ from the typical Toledo soils in being calcareous throughout the profile instead of noncalcareous to a depth of 40 to 60 inches.

Toledo silty clay, calcareous variant (Tp).—This soil is nearly level. It occurs as areas 20 to 200 acres in size on low parts of the lake plain in the northwestern part of the county. About half the acreage has a surface layer of silty clay loam rather than silty clay. The surface layer is grayer than that in surrounding areas of typical Toledo soils.

Included in mapping were small areas in which, just below plow depth, there is a thin layer of marl, which is underlain at a depth of 10 or 12 inches by clay. In small areas the clay is underlain at a depth of 3 to 5 feet by silty clay loam.

Most areas have been drained and are used for corn, small grain, fruit, and vegetables. (Capability unit IIIw–5)

Trumbull Series

The Trumbull series consists of light-colored, poorly drained soils that formed in low-lime glacial till. The original vegetation was swamp hardwoods. These soils occupy shallow depressions and natural drainageways in the southeastern part of the county. Generally, they occupy the lowest parts of uplands. Mahoning and Ellsworth soils occupy surrounding higher areas.

A typical profile in a cultivated field has a 7-inch plow layer of dark grayish-brown, friable silt loam. Below the plow layer is an 8-inch layer of gray, mottled, friable silt loam. The subsoil consists of 15 inches of gray, mottled, firm silty clay over 12 inches of mottled light brownish-gray and strong-brown, very firm clay loam. Below this is 10 inches of mottled light brownish-gray and strong-brown, firm silty clay loam. The underlying material consists of grayish-brown, mottled, firm, limy silty clay loam.

Runoff is slow to ponded, permeability is slow, and the available moisture capacity is medium. The water table is high. Productivity is low to moderate.

Most of the acreage is used for crops or permanent pasture. Artificial drainage is necessary for the successful production of most crops.

Typical profile of Trumbull silt loam, in a cultivated field, 0.5 mile east of Cable Road, 0.9 mile north of the Huron County line; lot 9, sec. 4, Florence Township.

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, crumb structure; friable; strongly acid; abrupt, smooth boundary.

A2g—7 to 15 inches, gray (10YR 5/1) silt loam; many, medium, prominent mottles of strong brown (7.5YR 5/6); weak, very thick, platy structure breaking to weak, fine, subangular blocky; friable; medium acid; abrupt, wavy boundary.

B1tg—15 to 30 inches, gray (10YR 6/1) silty clay; many, medium, prominent mottles of strong brown (7.5YR 5/6) and yellowish brown (10YR 5/6); moderate, medium, angular blocky structure; dark grayish-brown (10YR 4/2) clay films on ped surfaces; firm; medium acid; clear, wavy boundary.

B2tg—30 to 42 inches, mottled light brownish-gray (10YR 6/2) and strong-brown (7.5YR 5/6) clay loam; weak, coarse, angular blocky structure; very firm; thin, grayish-brown (10YR 5/2) clay films on ped surfaces; medium acid; clear, wavy boundary.

B3g—42 to 52 inches, mottled light brownish-gray (10YR 6/2) and strong-brown (7.5YR 5/6) silty clay loam; massive; firm; slightly acid; clear, smooth boundary.
C—52 to 60 inches, grayish-brown (10YR 5/2) silty clay loam; many, coarse, prominent mottles of strong brown (7.5YR 5/6); massive; firm; weakly calcareous.

The B and C horizons range from clay loam to clay in texture. The A horizon and the upper part of the B horizon range from medium acid to strongly acid. The depth to carbonates ranges from 36 to more than 60 inches. Throughout the profile are sharp pebbles and a few stones.

Trumbull soils have a grayer subsoil than Mahoning soils. They have a lighter colored surface layer than Miner soils. They contain more clay in the upper part of the B horizon and more stones and pebbles throughout the profile than Colwood soils, acid variant. Trumbull soils differ from Allis soils in not having shale within 40 inches of the surface.

Trumbull silt loam (Tr).—This soil occurs as 2- to 100-acre areas in level and depressional areas and in minor natural drainageways on till plains. It has slopes of less than 2 percent. Some areas along the natural drainageways have an overwash, as much as 18 inches thick, of loam or sandy loam washed from the nearby slopes. The overwash is lighter colored than the original surface layer. Some areas in Vermilion Township contain layers of lake-laid silt and clay.

Included in mapping were sizable areas in which the surface layer is silty clay loam; areas of the somewhat poorly drained Mahoning soils, which occur in high spots on the edges of the depressions occupied by Trumbull soils, and a few areas in which shale or sandstone is at a depth of 3 to 5 feet. Also included were a few areas, at the edges of some depressions and natural drainageways, that have slopes of slightly more than 2 percent.

Most of the smaller areas are used for crops with surrounding soils. Some of the larger areas are used for pasture or woodland, and others are idle. (Capability unit IIIw–7)

Tuscola Series

The Tuscola series consists of nearly level to gently sloping, light-colored, moderately well drained soils that formed in water-laid silt and fine sand. The original vegetation was a hardwood forest. These soils are on the lake plain and on deltas, mainly in the central part of the county.

A typical profile in a cultivated field has a 6-inch plow layer of dark grayish-brown, very friable fine sandy loam. Below the plow layer is a 4-inch layer of light yellowish-brown, friable loam. The subsoil consists of 22 inches of yellowish-brown, mottled, firm silty clay loam. The underlying material consists of yellowish-brown, mottled, friable, limy, stratified silt loam, very fine sandy loam, and silty clay loam over mottled, friable, limy, stratified yellowish-brown silt loam and very fine sandy loam and light yellowish-brown loamy fine sand.

Permeability is moderate, and the available moisture capacity is medium to high. The supplies of lime and of plant nutrients are generally high. Tilth is generally good. These soils are productive.

Most areas of these soils have been cleared and are used for crops. Vegetables and all the main crops are grown successfully. Natural drainage is usually adequate.

Typical profile of Tuscola fine sandy loam, 0 to 2 percent slopes, 200 feet north of Mason Road, 1,700 feet east of U.S. Route 250; lot 14, sec. 3, Milan Township.

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) fine sandy loam; weak, fine, granular structure; very friable; slightly acid; abrupt, smooth boundary.
A2—6 to 10 inches, light yellowish-brown (10YR 6/4) loam; moderate, medium, platy structure; friable; slightly acid; clear, irregular boundary.
B21t—10 to 22 inches, yellowish-brown (10YR 5/4) light silty clay loam; few, fine, faint mottles of grayish brown (10YR 5/2) and few, medium, faint mottles of yellowish brown (10YR 5/6); strong, medium, angular blocky structure; firm; continuous clay films on ped surfaces; slightly acid; gradual boundary.
B22t—22 to 32 inches, yellowish-brown (10YR 5/4) light silty clay loam; common, medium, faint mottles of grayish brown (10YR 5/2) and common, medium, distinct mottles of yellowish brown (10YR 5/8); moderate, coarse, angular blocky structure; firm; discontinuous clay films on ped surfaces; firm; neutral; gradual boundary.
C1—32 to 42 inches, yellowish-brown (10YR 5/4), stratified silt loam (70 percent), very fine sandy loam (20 percent), and silty clay loam (10 percent); common, coarse, distinct mottles of yellowish brown (10YR 5/8) and common, coarse, faint mottles of grayish brown (10YR 5/2); laminar structure resulting from stratification; friable; weakly calcareous; gradual boundary.
C2—42 to 60 inches, stratified yellowish-brown (10YR 5/4) silt loam (50 percent), very fine sandy loam (30 percent), and light yellowish-brown (10YR 6/4) loamy very fine sand (20 percent); common, coarse, faint mottles of grayish brown (10YR 5/2) and common, coarse, distinct mottles of yellowish brown (10YR 5/8); few, coarse, distinct concentrations of light-gray (10YR 7/2) lime; laminar structure resulting from stratification; friable; very friable in strata of loamy very fine sand; calcareous.

Within short distances, the thickness and texture of strata vary considerably. The A1 horizon is thinner and the A2 horizon is thicker in uncultivated areas than in cultivated areas, and there is no A2 horizon in some cultivated areas. The Bt horizon is at least 10 inches thick, and it has a clay content of 18 to 35 percent. The solum ranges from slightly acid to neutral. The depth to carbonates ranges from 24 to 54 inches, but it is most commonly between 36 and 48 inches. There are few stones or pebbles. In the Tuscola soils in this county, the upper part of the B horizon has 2-chroma mottles, which are not characteristic of Tuscola soils elsewhere.

Tuscola soils differ from Sisson soils in having grayish-brown mottles in the subsoil. They have less gray mottles and coatings in the subsoil than those in the subsoil of Kibbie soils. Tuscola soils contain more clay than Galen soils. They contain less clay than Shinrock soils. They are more silty in the B horizon and less gravelly than Belmore or Oshtemo soils. Tuscola soils contain more silt and less clay in the B horizon than Cardington soils, and they have fewer pebbles.

Tuscola loamy fine sand, 0 to 2 percent slopes (TsA).—This soil occurs on deltas and on the lake plain, mostly in Huron and Berlin Townships. It is dissected by streams and gullies. The loamy fine sand is thinnest at the edge of the stream valleys and gullies and becomes thicker with distance away from the edge. In some areas only the plow layer is loamy fine sand, but in other areas loamy fine sand is 2 to 3 feet thick. The layer of silty clay loam is less than 5 inches thick. In many places the upper part of the profile consists of loamy fine sand, fine sand, and fine sandy loam and the lower part of silt and silt loam. A few areas in the western part of the county are underlain at a depth of 40 to 60 inches by limestone.

Included in mapping were small areas in which the surface layer is fine sand or fine sandy loam; areas of Galen soils, which consist of loamy fine sand that contains thin bands of fine sandy loam; and areas of the

somewhat poorly drained Kibbie soils, which occupy some small depressions and natural drainageways. Also included were a few small areas that have slopes of more than 2 percent and some areas, mostly near Milan, in which there are numerous thin layers of medium sand and coarse sand below a depth of 30 inches.

Most areas of this soil are used as cropland. Corn, small grain, soybeans, hay, and vegetables are grown. Wind erosion is a hazard in some areas, and blowing soil can damage crops, especially vegetable crops. The control of water erosion is not much of a problem, but gullies can form in areas adjacent to steep slopes. Sprinkler irrigation is well suited, and vegetables are irrigated in some areas. (Capability unit I–1)

Tuscola fine sandy loam, 0 to 2 percent slopes (TuA).—This soil has the profile described as typical of the series. It occurs on the lake plain and on deltas, mostly as areas less than 100 acres in size and bordered on one or more sides by steep slopes. Some areas are underlain by silt, some by sand, and others by alternate layers of silt and sand.

Included in mapping were small areas in which the surface layer is loamy fine sand or very fine sandy loam; areas of Shinrock soils, which contain thicker layers of silty clay loam than Tuscola soils; and areas of the well-drained Sisson soils, which occupy small knolls and areas next to steep banks. Also included were areas of the somewhat poorly drained Kibbie soils, which occupy closed depressions and minor natural drainageways; a few small areas in which the depth to limestone bedrock is 40 to 60 inches; a few small areas that have a slope of more than 2 percent; and a few areas in which the surface layer is black or very dark gray.

Nearly all areas have been cleared and are used for crops. Corn, soybeans, small grain, hay, and vegetables are grown. A few areas are irrigated. (Capability unit I–1)

Tuscola fine sandy loam, 2 to 6 percent slopes (TuB).—This soil occurs as small areas on low knolls and on the sides of minor natural drainageways on the lake plain and on deltas.

Included in mapping were small areas in which the surface layer is loamy fine sand or very fine sandy loam; a few small moderately eroded areas in which the surface layer is light grayish brown; and small areas of the well-drained Sisson soils, which are on the higher knolls adjacent to steeper slopes. Also included were areas of somewhat poorly drained Kibbie soils, which occupy a few depressions and minor natural drainageways.

Most areas are within fields of level soils. Corn, small grain, hay, and vegetables are grown. The control of erosion is a slight problem, but most of the eroded areas are too small to warrant special erosion control practices. (Capability unit IIe–1)

Tuscola silt loam, 0 to 2 percent slopes (TwA).—This soil occurs as small areas on the lake plain. The areas are scattered, and most of them are bordered by steep slopes on one or more sides. The silt loam extends down to the layer of silty clay loam, and below this is mostly silt loam that contains thin layers of silt and fine sand. In about half the areas the surface layer is loam rather than silt loam. Areas of loam are most extensive in the western part of Perkins Township and in the eastern part of Margaretta Township. In these areas the soil contains thin layers of coarse sand and a few pebbles.

Included in mapping were a few small areas in which the surface layer is fine sandy loam, small areas of Shinrock soils, in which the silty clay loam is about 2 feet thick, and areas of the somewhat poorly drained Kibbie soils, which occupy some depressions and minor natural drainageways. Also included were a few small areas that have slopes of slightly more than 2 percent.

Most areas are used for corn, small grain, and vegetables. The gullies that form in adjacent steep areas may cut back into areas of this soil. (Capability unit I–1)

Tuscola silt loam, 2 to 6 percent slopes (TwB).—This soil occurs on the lake plain and on deltas. In some areas, mostly southwest of Sandusky, the surface layer is loam instead of silt loam and the soil contains thin layers of coarse sand and a few pebbles. The surface is pebbly in some areas.

Included in mapping were a few areas in which the loamy material is underlain at a depth of 4 to 5 feet by firm glacial till of clay loam texture; numerous small areas that have slopes of less than 2 percent; a few areas that have slopes of more than 6 percent; and areas of the somewhat poorly drained Kibbie soils, which are in narrow drainageways. Also included were a few eroded areas, in which the surface layer is lighter colored.

Most areas of this soil are used for crops, principally corn, small grain, and hay. Erosion is a moderate hazard. (Capability unit IIe–1)

Vaughnsville Series

The Vaughnsville series consists of reddish-brown, moderately well drained to somewhat poorly drained soils that formed in sandy to gravelly beach ridge deposits. The original vegetation was a hardwood forest. These soils occur on the lower slopes of some of the larger beach ridges.

A typical profile in a cultivated area has a 6-inch plow layer of dark reddish-brown, very friable loam. The subsoil consists of 18 inches of reddish-brown, mottled, firm sandy clay loam over 14 inches of strong-brown, mottled, friable sandy loam. The underlying material is brown, loose gravelly sandy loam.

These soils are periodically wet because of seepage. Runoff is slow to medium, permeability is moderately rapid, and the available moisture capacity is medium. Productivity is moderate.

These soils are used for crops, pasture, and orchards.

Typical profile of Vaughnsville loam, in a cultivated field, 400 feet north of Mason Road, about one-half mile east of Axtel; lot 5, sec. 2, Vermilion Township.

Ap—0 to 8 inches, dark reddish-brown (2.5YR 3/4) loam; moderate, fine to medium, crumb structure; very friable; slightly acid; abrupt, smooth boundary.

B2t—8 to 26 inches, reddish-brown (5YR 5/4) sandy clay loam; many, fine, faint mottles of strong brown (7.5YR 5/8) and few, fine, distinct mottles of grayish brown (10YR 5/2); moderate, medium, subangular blocky structure; firm; clay films on ped surfaces; slightly acid; gradual, smooth boundary.

B3—26 to 40 inches, strong-brown (7.5YR 5/6) sandy loam; common, medium, distinct mottles of grayish brown 10YR 5/2); weak, medium, subangular blocky structure; friable; neutral; clear, wavy boundary.

IIC—40 to 60 inches +, brown (7.5YR 5/4) stratified gravelly sandy loam and fine gravel; single grain; loose; neutral.

The solum ranges from dark red (2.5YR 3/6) to strong brown (7.5YR 5/6) in color. The B horizon ranges from gravelly sandy clay loam to sandy clay loam in texture. It has an overall clay content of 18 to 35 percent. The C horizon consists of stratified layers of fine gravel and sandy loam. The A and B horizons range from slightly acid to neutral, and the C horizon, where not calcareous, is neutral to moderately alkaline. The depth to carbonates ranges from 36 to 60 inches.

Vaughnsville soils are redder than Bogart, Jimtown, and Digby soils. They differ from Castalia soils, which also plow up red in some areas, in that they are not shallow to limestone rubble.

Vaughnsville loam (Va).—This soil occurs as small areas on the lower slopes of beach ridges. The slope range is 1 to 6 percent. The surface is gravelly in some areas. Till of clay loam texture occurs at a depth of more than 48 inches in some areas.

Included in mapping were a few small areas of the moderately well drained Bogart soils.

The use and management of this soil are governed by the use and management of adjacent more extensive soils. Corn, oats, wheat, soybeans, and hay are the main crops. In the eastern part of the county there are some apple and peach orchards. (Capability unit IIw–3)

Warners Series

The Warners series consists of dark-colored, very poorly drained soils that formed in muck and mineral soil material underlain by marl. These soils occupy a broad basin in the northwestern part of the county, and are especially extensive in the Resthaven Wildlife Area. The depth to marl is greatest in the center of the basin and becomes thinner toward the edges. Areas of these soils are surrounded by Warners soils, clayey subsoil variant, Toledo soils, and Toledo soils, calcareous variant.

A typical profile has a 7-inch layer of black, very friable muck at the surface. Below this is 4 inches of very dark gray, very friable muck. The underlying material is light-gray, very friable marl. Below the marl is lake-laid clay at a depth of 40 inches to more than 5 feet.

Runoff is very slow, permeability is moderate, and the available moisture capacity is high. The water table is very high. Productivity is moderate, if drainage is adequate.

Most areas of these soils either are idle or are used as a wildlife preserve. Small areas are used for field crops and potatoes.

Typical profile of Warners muck, in Resthaven Wildlife Area; lot 25, sec. 3, Margaretta Township.

1—0 to 7 inches, black (10YR 2/1) muck; moderate, medium, crumb structure; very friable; calcareous; abrupt, smooth boundary.

2—7 to 11 inches, very dark gray (10YR 3/1) muck; strong, very fine, granular structure; very friable; very strongly calcareous; abrupt, wavy boundary.

IIC—11 to 60 inches +, light-gray (10YR 7/2) marl; few, medium, prominent mottles of yellowish brown (10YR 5/4 and 5/6); very weak, very coarse, subangular blocky structure; very friable; very strongly calcareous.

Above the marl is organic material, mineral material, or a mixture of both. The depth to clay ranges from 40 inches to more than 5 feet and does not depend upon the nature of the overlying material. The layer of marl is at least 12 inches thick. There are varying amounts of travertine on the surface and throughout the profile, and some of the fragments are large enough to interfere with cultivation. In some places there is a 1- to 2-inch layer of solid travertine. Some of the Warners soils in Erie County have a surface layer that is muckier and higher in organic-matter content than is typical of the Warners series.

Warners soils differ from Tawas soils in being underlain by marl rather than sand. They are deeper over clay than Warners soils, clayey subsoil variant.

Warners soils (Wa).—These soils are nearly level to depressional. They occur in the western part of Margaretta Township. In some areas the layer at the surface is black, limy muck; in others, it is very dark gray, limy loam. The depth to clay is more than 40 inches in most areas. In a few places along the Sandusky County line, the marl is underlain by sand rather than clay.

Included in mapping were a few spots in which the depth to clay is less than 40 inches.

Most of the acreage is part of the wildlife preserve. Corn, wheat, soybeans, potatoes, and hay are grown in the areas farmed. Marl, used in manufacturing portland cement, has been mined extensively. (Capability unit IVw–3)

Warners Series, Clayey Subsoil Variant

The Warners series, clayey subsoil variant, consists of dark-colored, very poorly drained soils that formed in a mixture of marl, muck, and mineral soil material and are underlain at a depth of less than 30 inches by clay. These soils occur in the northwestern part of the county. They generally occur as rims around the basins occupied by the deeper typical Warners soils. Toledo soils are in surrounding areas.

A typical profile has a 10-inch plow layer of very dark gray, friable, limy loam. Below the plow layer is 15 inches of white marl. The underlying material is gray, mottled, very firm, limy silty clay.

Runoff is very slow, permeability is slow, and the available moisture capacity is high. The water table is very high. Productivity is moderate, if adequate drainage is provided.

Most areas of these soils are used for crops.

Typical profile of a Warners loam, clayey subsoil variant, in a cultivated field, south of Crystal Cave Road; lot 15, Margaretta Annex.

Apca—0 to 10 inches, very dark gray (10YR 3/1) loam; moderate, fine, crumb structure; friable; calcareous; abrupt, smooth boundary.

IIC1—10 to 25 inches, white (5Y 8/1) marl; massive; friable; calcareous; abrupt, wavy boundary.

IIIC2—25 to 60 inches +, gray (10YR 5/1) silty clay; common, medium, distinct mottles of yellowish brown (10YR 5/8); massive; very firm; calcareous.

Overlying the marl is organic material, mineral material, or a mixture of both. The marl ranges from 8 to 20 inches in thickness. The depth to clayey material ranges from 20 to 30 inches. Just above the clay in some areas is a thin layer of sedimentary peat. There are varying amounts of travertine on the surface and in all horizons above the clay.

Warners soils, clayey subsoil variant, are shallower over clay than the typical Warners soils. They differ from Toledo soils, calcareous variant, in that they contain a layer of marl.

Warners soils, clayey subsoil variant (Wc).—These soils occur in the northwestern part of Margaretta Town-

ship. They are nearly level. They have a surface layer of either black muck or very dark gray loam.

Included in mapping were small areas in which the depth to clay is either less than 20 inches or more than 30 inches.

Most areas of this unit are used for field crops or potatoes. The smaller areas are within the wildlife preserve. (Capability unit IVw–3)

Washtenaw Series

The Washtenaw series consists of light-colored, generally somewhat poorly drained soils that formed in 24 to 40 inches of soil material washed in from nearby hillsides that are occupied mainly by Sisson soils. Washtenaw soils occupy narrow valleys, mostly draws in rolling areas along the Huron River.

A typical profile in a cultivated area has a 6-inch plow layer of dark grayish-brown, friable silt loam. The subsoil consists of grayish-brown, mottled, friable silt loam. Below this is an 18-inch layer of friable silt loam that is very dark grayish brown in the uppermost few inches and very dark gray in the lower part. This layer is mottled in the uppermost 8 inches. The underlying material is grayish-brown, mottled, friable, stratified silt loam and very fine sandy loam.

Runoff is very slow, permeability is moderate, and the available moisture capacity is high. The content of organic matter is high, and tilth is good. Productivity is moderate.

Most areas of these soils are used for crops. Seedlings are likely to be washed out or buried during heavy rains, because these soils are in natural drainageways.

Typical profile of a Washtenaw silt loam, in a grass meadow, 600 feet west of State Route 13 and 550 feet north of Scheid Road; lot 2, sec. 2, Huron Township.

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) silt loam; strong, medium, granular structure; friable; neutral; clear, smooth boundary.

B2g—6 to 30 inches, grayish-brown (10YR 5/2) silt loam; many, fine, faint mottles of yellowish brown (10YR 5/4); weak, fine, subangular blocky structure; friable; slightly acid; abrupt, smooth boundary.

IIA1b—30 to 34 inches, very dark grayish-brown (10YR 3/2) silt loam; common, fine, faint mottles of dark brown (10YR 4/3); very weak, fine, subangular blocky structure; friable; neutral; abrupt, irregular boundary.

IIA2gb—34 to 38 inches, very dark gray (10YR 3/1) silt loam; many, medium, distinct mottles of dark brown (10YR 3/3); massive; friable; neutral; clear, irregular boundary.

IIBgb—38 to 48 inches, very dark gray (10YR 3/1) heavy silt loam; massive; friable; neutral; gradual boundary.

IICgb—48 to 60 inches, grayish-brown (10YR 5/2), stratified silt loam and very fine sandy loam; many, coarse, distinct mottles of yellowish brown (10YR 5/6); massive; friable; mildly alkaline.

In the A and B horizons, which formed in local alluvium, the texture ranges from fine sandy loam to silt loam. The color ranges from dark gray (10YR 4/1) in the poorly drained areas to dark grayish brown (10YR 4/2) in the somewhat poorly drained areas. Nearly all of this soil was once poorly drained, but the deposition of local alluvium has raised the surface far enough above the water table that most areas are now somewhat poorly drained. Below the local alluvium is a buried soil much like the Colwood soils; it ranges from fine sandy loam to light silty clay loam in texture. The buried A1 horizon is lighter colored than is typical of Colwood soils. The overwash is slightly acid to mildly alkaline. The depth to carbonates ranges from 48 to more than 60 inches.

Washtenaw soils differ from Colwood and Kibbie soils in that they contain a buried surface layer. They differ from Sloan and Shoals soils in that they formed in local alluvium washed from hillsides rather than in stream deposits and in that they contain a thick buried surface layer.

Washtenaw soils (Wh).—These soils occur as long narrow areas on the bottoms of narrow natural drainageways between eroded hillsides. They are predominantly level, but the slope ranges up to as much as 3 percent. The surface layer is dominantly silt loam, but in sizable areas it is fine sandy loam. The texture of the surface layer depends upon the kind of soil material washed in at a given point, and it varies considerably within short distances. Whether the drainage is poor or somewhat poor depends on the thickness of soil material above the water table.

Included in mapping were areas of Colwood soils that have not been covered with washed-in soil material.

Most areas are farmed with the nearby hillsides. Corn, small grain, soybeans, and hay are the principal crops. Some areas are used as permanent pasture. (Capability unit IIw–3)

Wayland Series

The Wayland series consists of light-colored, poorly drained soils that formed in material deposited by flowing streams. These soils are flooded occasionally. The original vegetation consisted of lowland hardwoods. These soils occur in the eastern part of the county. They occupy the lowest positions in the wider streams valleys, and Orrville and Lobdell soils occupy the higher areas. In some of the smaller valleys, they occupy the entire width of the valley and are surrounded by Ellsworth, Chili, or other upland soils.

A typical profile has a 4-inch surface layer of very dark gray, friable silt loam. The subsoil consists of 10 inches of very dark grayish-brown, mottled, friable loam over 13 inches of dark-gray, mottled, friable silt loam. The underlying material consists of dark grayish-brown and yellowish-brown, friable, stratified silt loam, fine sandy loam, and loam.

Runoff is very slow, and the available moisture capacity is high. Permeability ranges from moderately rapid to slow, but it is moderately slow in most places. Productivity is generally low, even when adequate drainage has been provided.

Most areas of these soils are in woodland or permanent pasture.

Typical profile of Wayland silt loam, 300 feet east of Florence-Wakeman Road, south of Chappel Creek; lot 39, sec. 4, Florence Township.

A1—0 to 4 inches, very dark gray (10YR 3/1) silt loam; weak, fine, crumb structure; friable; slightly acid; clear, smooth boundary.

Bg1—4 to 14 inches, very dark grayish-brown (10YR 4/2) loam; many, fine, distinct mottles of yellowish brown 10YR 5/4); massive; friable; medium acid; diffuse, wavy boundary.

Bg2—14 to 27 inches, dark-gray (10YR 4/1) silt loam; many, fine, distinct mottles of yellowish brown (10YR 4/4); massive; friable; medium acid; clear, smooth boundary.

C—27 to 60 inches +, dark grayish-brown (10YR 4/2) and yellowish-brown (10YR 5/4), stratified silt loam, fine sandy loam, and loam; massive; friable; slightly acid.

These soils are highly stratified, and within short distances there are differences in texture, thickness, and sequence of strata. The A1 horizon ranges from 2 to 6 inches in thickness and is black (10YR 2/1), very dark gray (10YR 3/1), or very dark brown (10YR 2/2) in color. In the uppermost 2 feet, the textures are dominantly loam, silt loam, and silty clay loam. In some areas there are thin layers of sand and gravel in the profile, and in some areas there is a buried A horizon. The B and C horizons are dull gray and unmottled in some places. The Wayland soils in Erie County are more acid than Wayland soils in some other areas, and their strata of sandy or gravelly soil material are more common than is typical of the Wayland series.

Wayland soils are grayer than Orrville soils. They are more acid than Sloan soils and have a thinner A1 horizon.

Wayland silt loam (Wn).—This soil occurs mostly as long narrow areas on the bottoms of the larger stream valleys in the eastern part of the county. Smaller areas occur along the Huron River in Oxford Township. On the surface in some areas are numerous stones and boulders. Except where light-colored soil material has been recently washed onto the surface, the surface layer is black, very dark gray, or very dark brown. In a few places it is as much as 12 inches thick. The slope range is dominantly 0 to 2 percent.

Included in mapping were numerous areas in which the surface layer is loam, fine sandy loam, or silty clay loam; areas in which shale is within 5 feet of the surface; and areas of the somewhat poorly drained Orrville soils, which occupy some knolls and ridges. Also included were the short steep slopes and vertical banks on the sides of present and former stream channels.

Most areas of this soil are pasture or woodland, but a few of the wider areas are cropland. Corn, small grain, soybeans, and hay are the crops grown. (Capability unit IIIw–1)

Wilmer Series

The Wilmer series consists of nearly level, dark-colored, somewhat poorly drained soils that formed in outwash. The original vegetation consisted of a hardwood forest and a ground cover of prairie grass. These soils occur on outwash plains in the eastern and central parts of the county. Digby and Jimtown soils are commonly in the same general areas; Millgrove soils occupy nearby depressions; and Oshtemo, Belmore, Chili, and Bogart soils occupy nearby beach ridges.

A typical profile has a 12-inch plow layer of very dark grayish-brown, friable loam. The subsoil consists of 20 inches of yellowish-brown, mottled, firm sandy clay loam over 8 inches of yellowish-brown, mottled, friable loam. The underlying material consists of a layer of yellowish-brown, mottled, friable, stratified sandy loam, gravelly loam, and gravelly sandy loam that contains lenses of loose sand and gravel.

Runoff is slow, permeability is moderate, and the available moisture capacity is medium. The organic-matter content is high, and tilth is good. If adequately drained, these soils are productive.

Most of the acreage is used for corn, small grain, sugar beets, soybeans, and vegetables.

Typical profile of Wilmer loam, in a cultivated field, ½ mile north of Bryan Road and ⅛ mile east of Kelley Road.

Ap—0 to 12 inches, very dark grayish-brown (10YR 3/2) loam; moderate, fine, crumb structure; friable; neutral; abrupt, smooth boundary.

B21t—12 to 18 inches, yellowish-brown (10YR 5/4) sandy clay loam; common, medium, distinct mottles of yellowish brown (10YR 5/8) and few, coarse, faint mottles of grayish brown (10YR 5/2); moderate, medium, subangular blocky structure; firm; peds have patchy, thin, brown (10YR 5/3) clay films; root fillings of very dark gray (10YR 3/1) fine sandy loam; neutral; gradual boundary.

B22t—18 to 32 inches, yellowish-brown (10YR 5/4) sandy clay loam; common, medium, distinct mottles of yellowish brown (10YR 5/8); weak, coarse, subangular blocky structure; firm; brown (10YR 4/3), medium, discontinuous clay films on both vertical and horizontal surfaces of peds; slightly acid; gradual, wavy boundary.

B3—32 to 40 inches, yellowish-brown (10YR 5/4) loam; common, medium, faint mottles of yellowish brown (10YR 5/8); massive; friable; neutral; abrupt, smooth boundary.

C—40 to 60 inches, yellowish-brown (10YR 5/4), stratified sandy loam, gravelly loam, and gravelly sandy loam; common, medium, distinct mottles of yellowish brown (10YR 5/8); massive; friable; lenses of loose sand and gravel; neutral.

The A horizon ranges from 10 to 16 inches in thickness, and in places it is fine sandy loam instead of loam. The Ap horizon is very dark grayish brown (10YR 3/2) or black (10YR 2/1) in color. Although typically sandy clay loam, the B horizon is gravelly clay loam and fine gravelly loam in places. This is a horizon of clay accumulation, and it has an overall clay content of 20 to 35 percent. The C horizon is stratified with medium sand and fine sand and their gravelly equivalents. The A and B horizons range from neutral to slightly acid, and the C horizon, if not calcareous, ranges from neutral to mildly alkaline. The content of gravel ranges from almost none to 40 percent.

Wilmer soils are similar in texture and drainage to the light-colored Jimtown and Digby soils. They have a brighter colored subsoil than the very poorly drained Millgrove soils. They contain more gravel and less silt than Darroch soils. Wilmer soils contain more gravel and less clay than Elliott soils. They differ from Haskins soils, dark surface variant, in that they lack clayey layers in the lower part of the profile. They have less clay in the B horizon than Miner soils, and they have gravel in the C horizon.

Wilmer loam (Wo).—This soil is on outwash plains and between beach ridges. The surface is gravelly in a few spots. In some areas, the surface layer is fine sandy loam. In some areas in Berlin Township, numerous sandstone fragments 2 to 4 inches in diameter occur in the upper part of the profile. In a few areas in the eastern part of the county, the soil is acid. The slopes are dominantly less than 2 percent.

Included in mapping were areas of the dark-colored, very poorly drained Millgrove soils, which occupy some depressional areas; areas west of Milan that are underlain at a depth of 40 to 60 inches by silt and fine sand; and a few small areas that have slopes of slightly more than 2 percent.

Most areas of this soil have been drained and are used for crops. All the common field crops are grown successfully. Sweet corn, peas, cabbage, melons, pumpkins, and other vegetables are important crops in the areas of fine sandy loam around Milan. Some of the acid areas in the eastern part of the county are used for permanent pasture. (Capability unit IIw–4)

Formation and Classification of the Soils

This section discusses the factors of soil formation, the processes of soil formation, and the classification of the soils in Erie County by higher categories. The last part shows laboratory data for selected soils.

Factors of Soil Formation

The factors that determine the kind of soil that forms at any given point are the composition of the parent material, the plants and animals on and in the soil, the relief, the climate under which the soil material accumulated or weathered, and the length of time that the forces of soil development have acted on the soil material (*5*). The variations among soils result from variations in one or more of these factors.

Climate and vegetation are the active factors of soil formation. They alter the accumulated soil material and bring about the development of genetically related horizons. Relief, mainly by its effect on temperature and runoff, modifies the effects of climate and vegetation. The parent material also affects the kind of profile that can be formed and, in extreme cases, determines it almost entirely. Finally, time is needed to change the parent material into a soil. Usually, a long time is required for the development of distinct horizons.

Parent materials

Most of the soils in Erie County formed either in glacial till or in melt-water deposits, but some formed in relatively recent deposits of alluvium and others in residuum weathered in place from the underlying rock. Some soils formed in more than one kind of parent material. For example, the upper part of the Allis soils formed in glacial till or melt-water deposits, but the lower part formed in material weathered from shale.

MELT-WATER DEPOSITS.—This material consists partly of lacustrine deposits and outwash. The lacustrine deposits settled in the still water of a glacial lake, and the outwash was laid down by the moving water of streams flowing from the melting glacier. The pebbles and gravel in these deposits have been rounded by the action of water.

In Erie County there is no clear boundary between the soils that formed in lacustrine deposits and those that formed in outwash. The size of particles ranges from fine, in material that was carried far into the glacial lake and deposited in still water, to coarse, in material that was deposited at the edge of the lake or in flowing streams. Toledo and Fulton soils formed in the clay and silty clay deposited in still water. The parent material of Fulton soils was strongly calcareous. Del Rey and Lenawee soils formed in clay loam and silty clay loam deposited slightly closer to the edge of the lake. Sisson, Tuscola, and Kibbie soils formed in deposits of silt and fine sand that settled still closer to the edge of the glacial lake. Such deposits are most extensive where the Huron River enters the lake and were probably deposited at the delta of the river when the lake was higher. Arkport soils formed in the sandy material deposited at the edge of the glacial lake. Belmore and Chili soils formed in gravelly material deposited along the rim of the lake.

At many points the water did not flow at a constant rate throughout the period of deposition. Changes in the rate of flow resulted in stratification of the outwash deposits. In many areas of Kibbie soils and Colwood soils, for instance, the deposits consist of alternate thin layers of silt and fine sand. Even more pronounced differences in the composition of different layers is indicated by the formation of two-story soils, of which the Metea, Rimer, Haskins, and Rawson soils are examples. The upper part of these soils formed in sandy or loamy deposits, and the lower part in silty to clayey deposits.

GLACIAL TILL.—Glacial till is the material that was left behind when the glacier melted. Typically, it contains particles of different sizes, including some rather large stones. The smaller stones and pebbles have sharp angles because they have not been rounded by the action of water. Some of the boulders have been carried for long distances, but most of the material is of local origin.

Bennington, Cardington, and Pewamo soils formed in glacial till that contains a high proportion of limestone. Ellsworth and Mahoning soils formed in till that is partly limestone but predominantly sandstone and shale.

ALLUVIUM.—Alluvium is deposited by flowing streams. Most of it is derived from the surface layer of soils farther upstream. Alluvium has extreme variations in texture within small areas, depending upon variations in the rate of streamflow and the duration of flooding. Soils that formed from alluvium have weakly expressed horizons because the soil-forming processes start over again each time new material is deposited. Such soils are highly stratified, and many have buried surface layers that are dark colored.

Eel, Shoals, and Sloan soils formed in alluvium derived from soils that were high in content of lime. Lobdell, Orrville, and Wayland soils formed in alluvium that was low in content of lime. Washtenaw soils formed in local alluvium derived from Sisson soils, which are on adjacent slopes. This material was removed by erosion and deposited in the drainageways at the foot of the slopes.

RESIDUUM.—Limestone, shale, and sandstone are the three kinds of bedrock in this county. A few soils developed entirely in residuum weathered from bedrock, but only the lower part of some developed in this kind of parent material. Soils that formed wholly or partly in material weathered from limestone are high in content of lime, and most of them are calcareous at least in the lower part of the profile.

When limestone weathers, the calcium carbonate dissolves and is carried away in the ground water, and other mineral compounds remain. Among these impurities are several iron compounds. Ritchey soils formed in this kind of parent material. Because of the iron, they have a brown B horizon.

Some shale weathers to material high in clay content. The lower part of the profile of Allis soils developed in material weathered from shale. These soils have a "soapy" layer just above the shale. The shale in the central part of the county is more silty than clayey. The Colyer soils in the Kimball area formed in this kind of material.

The sandstone in Erie County typically weathers to yellowish-brown fine sand. Part of the profile of Berks

and Loudonville soils developed in material weathered from sandstone. These soils have pockets of the yellowish-brown fine sand.

Plants and animals

Plants, micro-organisms, earthworms, burrowing insects, small animals, and other forms of life are active in the soil-forming process.

The vegetation under which a soil forms influences color, structure, and organic-matter content. Soils that form under grass generally are darker colored than those that form under forest, because they accumulate organic matter more rapidly and organic matter imparts a dark color. Grass also promotes the development of a granular structure in the surface layer.

Bacteria and fungi help to break down organic residue and incorporate it into the soil. Generally, fungi are more active in acid soils and bacteria in alkaline soils. Earthworms, burrowing insects, and small animals mix the soil. Their burrows make the soil porous and permeable. The activities of earthworms help to incorporate organic matter. If a soil is well populated with earthworms, fallen leaves or vegetation are usually incorporated into the soil quite rapidly.

Most of the soils in Erie County formed under hardwood forests. Sisson, Shinrock, and Ellsworth soils, among others, formed under forests of red oak, white oak, black oak, and other hardwood trees. Most of the poorly drained and very poorly drained soils formed under swamp forest. Among these are Trumbull, Miner, Pewamo, and Toledo soils.

In one area, 1 mile to 2 miles wide, extending in a northeast-southwest direction from north of Union Corners to about 2 miles east of North Monroeville on the Huron County line, the native forest was thin enough to permit the growth of a dense stand of prairie grass. The dominant soils in this area are Elliott, Darroch, and Wilmer soils. All of these soils have a thick, dark-colored surface layer, an indication of the effect of grass on their formation.

Relatively recently, soil formation has been affected by the activities of man. Accelerated erosion has resulted from clearing and cultivation. Soil structure has been altered and the content of organic matter diminished as a result of cultivation. The nature of the vegetation has been changed. The natural condition of the soils has been changed by artificial drainage and by the application of lime and fertilizer.

Climate

Erie County has a humid, temperate climate that is conducive to the growth of hardwood trees. There is no evidence of climatic differences between the prairie area and the rest of the county, but there may have been differences in the past. The amount of effective precipitation is less on steep slopes, from which water runs off, than in depressions, where water accumulates. The climate is essentially uniform throughout the county and does not directly account for differences among the soils.

Relief

Relief affects the formation of soils in Erie County mainly through its effect on drainage. In general, sloping soils have better drainage than level soils. Soils that have quite different characteristics can form in the same kind of parent material, depending on their position on the landscape, or relief. For example, Chili and Millgrove soils both formed in porous gravelly outwash. The Chili soils are well drained because they are on ridges high above the water table, but the Millgrove soils are very poorly drained because they are in low areas where the water table is close to the surface.

The most extensive landforms in Erie County are lake plains, till plains, and outwash plains. Because these landforms have low relief, the soils have predominantly very poor to somewhat poor drainage. Soils that have good drainage occur on the steep side slopes along the valleys of the Huron River and the Vermilion River, on the moderately steep side slopes of the sandstone and limestone hills that rise above the lake plain and the till plains, and in the northern part of the county, on the beach ridges.

A group of soils that formed in one kind of parent material but that have different characteristics because of differences in relief and drainage is called a soil catena. One example of a catena in Erie County is made up of the Ellsworth, Mahoning, and Miner soils, which formed in glacial till. The Ellsworth soils are moderately well drained, the Mahoning soils are somewhat poorly drained, and the Miner soils are very poorly drained.

Time

The length of time that parent material has been exposed to the processes of soil formation affects the nature of the soil that forms. More time is necessary for the formation of soil in some kinds of parent materials than in others. More of the observed differences among the soils in Erie County result from differences in parent material than from variations in length of time. For example, Arkport and Pyrmont soils have been forming about the same length of time, but Arkport soils are leached of lime to a considerably greater depth than Pyrmont soils. More rapid leaching takes places in the Arkport soils because their parent material is sandy outwash that permits more rapid movement of water through the soil than does the dense glacial till that is the parent material of Pyrmont soils.

Compared with soils in unglaciated areas, all the soils in Erie County are relatively young. Except for the soils that formed in recent alluvium, most of them are about the same age, in years. The soils that formed in recent alluvium lack well-defined horizons.

Processes of Soil Formation

The soils in Erie County have horizons that developed through one or more of the following processes: addition, removal, transfer, and transformation. The intensity with which these processes operate varies widely in different soils.

The best example of addition is the accumulation of organic matter that has produced the dark colors of the surface layer. Before the addition took place, the surface layer was no darker colored than the rest of the profile. This process has been dominant in the formation of Millgrove and Gilford soils.

In most soils of the county, removal of lime from the uppermost 1 foot to 5 feet has taken place. The lime, as well as other materials, is leached out of the soil by water moving downward through the profile. Removal of carbonates has been one of the dominant processes in the formation of Cardington and Shinrock soils.

Water is the carrier for most transfers that take place during the development of a soil profile. In many soils, clay has been transferred from the A to the B horizon. In Cardington, Shinrock, and Sisson soils, for example, the A horizon contains less clay than it once did, and the B horizon contains more clay. In some B horizons, there are thin films of clay in the pores and on the ped surfaces. This clay has moved downward from the A horizon. Clay films are an important feature in the classification of soils.

An example of transformation is the weathering of shale into clay. The sequence in the weathering of clay is as follows: hard shale, soft shale, clay that has platy, shalelike structure, and clay. All stages of this sequence can be observed in some profiles of Allis soils.

Classification of the Soils

Soils are classified so that we can more easily remember their significant characteristics, assemble knowledge about them, see their relationships to one another, and understand their behavior and their response to the whole environment. Through classification and the use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

Two systems of classifying soils above the series level have been used in the United States in recent years. The older system was adopted in 1938 (*2*) and revised later (*12*). The system currently used by the National Cooperative Soil Survey was adopted in 1965 and is under continual study. Readers interested in the development of the system should refer to the latest literature available (*10, 14*).

The current system consists of six categories. Beginning with the most inclusive, these categories are the order, the suborder, the great group, the subgroup, the family, and the series. The criteria for classification are soil properties that are measurable or observable, but the properties are selected so that soils of similar genesis are grouped together. Placement of some series in the current system of classification, particularly in families, may change as more precise information becomes available.

Table 8 shows the classification of the soil series in Erie County according to the current system, in 1969, and the great soil group according to the 1938 system. The categories of the current system are defined briefly in the following paragraphs.

ORDER.—Soils are grouped into orders according to properties that seem to have resulted from the same processes acting to about the same degree on the parent material. Ten soil orders are recognized in the current system: Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. The Entisols, Inceptisols, Mollisols, Alfisols, Ultisols, and Histosols are represented in Erie County.

Entisols are recent soils in which there has been little, if any, horizon development. Inceptisols occur mostly on young, but not recent, land surfaces. Mollisols have a thick dark-colored surface layer, moderate to strong structure, and base saturation of more than 50 percent. Alfisols contain accumulated aluminum and iron, have argillic or natric horizons, and have a base saturation of more than 35 percent. Ultisols have an argillic horizon or a fragipan and a base saturation of less than 35 percent. Histosols are organic. They are not classified at the subgroup and family levels, because classification at these levels was provisional at the time this survey went to the printer.

SUBORDER.—Each order is divided into suborders, primarily on the basis of soil characteristics that indicate genetic similarity. The suborders have a narrower climatic range than the order. The criteria for suborders reflect either the presence or absence of waterlogging, or soil differences resulting from climate or vegetation.

GREAT GROUP.—Each suborder is divided into great groups, on the basis of uniformity in kind and sequence of genetic horizons. The great group is not shown in table 8 because the name of the great group is the same as the last word in the name of the subgroup.

SUBGROUP.—Each great group is divided into subgroups, one representing the central (typic) concept of the group, and others, called intergrades, made up of soils that have mostly the properties of one great group but also one or more properties of another great group.

FAMILIES.—Families are established within subgroups, primarily on the basis of properties important to plant growth. Some of these properties are texture, mineralogy, reaction, soil temperature, permeability, consistence, and thickness of horizons.

SERIES.—The series has the narrowest range of characteristics of the categories in the classification system. It is described fully in the section "How This Survey Was Made."

Laboratory Data

The results of laboratory analysis of eight soils in Erie County are given in table 9. Samples taken from representative profiles were analyzed at the Ohio Agricultural Research and Development Center, Columbus, Ohio. Data for soils of the Cardington and Pewamo series appear in the published Soil Survey of Delaware County, Ohio (*17*). Unpublished data on mechanical analysis of Ellsworth, Toledo, Tuscola, and Miner soils are on file at the Soil Department, Ohio State University, at the Ohio Department of Natural Resources, Division of Lands and Soil, and at the State office of the Soil Conservation Service, Columbus, Ohio.

The data on particle size distribution shown in table 9 were obtained by the pipette method outlined by Steele and Bradfield (*11*), but using sodium hexametaphosphate as the dispersion agent and a 10-gram soil sample. The percentage of organic matter was determined by a dry combustion method (*8*) for all soils free of carbonates and by wet oxidation procedures for soils containing carbonates (*7*). Exchangeable calcium and magnesium were determined by the EDTA method outlined by Barrows and Simpson (*3*). Potassium was determined by flame photometry. Exchangeable hydrogen, which includes ti-

TABLE 8.—*Soil series classified into higher categories*

Series	Current classification			Great soil group 1938 classification
	Family	Subgroup	Order	
Alexandria	Fine, illitic, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Allis	Fine, illitic, acid, mesic	Aeric Haplaquepts	Inceptisols	Low-Humic Gley soils.
Arkport	Coarse-loamy, mixed, mesic	Psammentic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Arkport, moderately shallow variant.	Coarse-loamy, mixed, mesic	Psammentic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Beaches	Sandy, siliceous, mesic	Typic Udipsamments	Entisols	Regosols.
Beaches, wet	Sandy, siliceous, mesic	Aquic Udipsamments	Entisols	Regosols.
Belmore	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Bennington	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Berks	Loamy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols	Sols Bruns Acides.
Bogart	Fine-loamy, mixed, mesic	Aquic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Cardington	Fine, mixed, mesic	Aquic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Casco, very flaggy subsoil variant.	Loamy-skeletal, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Castalia	Loamy-skeletal, carbonatic, mesic	Typic Rendolls	Mollisols	Rendzinas.
Chili	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Colwood	Fine-loamy, mixed, noncalcareous, mesic.	Typic Haplaquolls	Mollisols	Humic Gley soils.
Colwood, acid variant	Fine-silty, mixed, acid, mesic	Typic Humaquepts	Inceptisols	Humic Gley soils.
Colyer	Clayey-skeletal, mixed, mesic	Lithic Dystrochrepts	Inceptisols	Sols Bruns Acides.
Darroch	Fine-loamy, mixed, mesic	Aquic Argiudolls	Mollisols	Brunizems.
Darroch, coarse subsoil variant.	Coarse-loamy, mixed, mesic	Aquic Hapludolls	Mollisols	Brunizems.
Dekalb	Loamy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols	Sols Bruns Acides.
Del Rey	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Digby	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Eel	Fine-loamy, mixed, mesic	Aquic Fluventic Eutrochrepts.	Inceptisols	Alluvial soils.
Elliott	Fine, illitic, mesic	Aquic Argiudolls	Mollisols	Brunizems.
Ellsworth	Fine, illitic, mesic	Aquic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Fries	Clayey, illitic, mesic	Typic Umbraquults	Ultisols	Humic Gley soils.
Fulton	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Galen	Coarse-loamy, mixed, mesic	Psammentic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Gilford	Coarse-loamy, mixed, noncalcareous, mesic.	Typic Haplaquolls	Mollisols	Humic Gley soils.
Haskins	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Haskins, dark surface variant.	Fine-loamy, mixed, mesic	Aquic Argiudolls	Mollisols	Gray-Brown Podzolic soils.
Jimtown	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Joliet	Loamy, mixed, noncalcareous, mesic	Lithic Haplaquolls	Mollisols	Humic Gley soils.
Kibbie	Fine-loamy, mixed, mesic	Udollic Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Kibbie, moderately shallow variant.	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Kibbie, acid variant	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Lenawee	Fine, illitic, nonacid, mesic	Mollic Haplaquepts	Inceptisols	Humic Gley soils.
Lewisburg	Fine, illitic, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Lewisburg, moderately shallow variant.	Fine, illitic, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Lobdell	Fine-loamy, mixed, mesic	Aquic Fluventic Eutrochrepts.	Inceptisols	Gray-Brown Podzolic soils.

See footnote at end of table.

TABLE 8.—*Soil series classified into higher categories*—Continued

Series	Current classification			Great soil group 1938 classification
	Family	Subgroup	Order	
Loudonville	Fine-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Mahoning	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Mermill	Fine-loamy, mixed, mesic	Mollic Ochraqualfs	Alfisols	Humic Gley soils.
Metea	Fine-loamy, mixed, mesic	Arenic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Millgrove	Fine-loamy, mixed, noncalcareous, mesic.	Typic Argiaquolls	Mollisols	Humic Gley soils.
Millsdale	Fine, mixed, noncalcareous, mesic	Typic Argiaquolls	Mollisols	Humic Gley soils.
Miner	Fine, illitic, mesic	Mollic Ochraqualfs	Alfisols	Humic Gley soils.
Mitiwanga	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Oakville	Mixed, mesic	Typic Udipsamments	Entisols	Regosols.
Orrville	Fine-loamy, mixed, nonacid, mesic	Aeric Fluventic Haplaquepts.	Inceptisols	Alluvial soils.
Oshtemo	Coarse-loamy, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Pewamo	Fine, mixed, noncalcareous, mesic	Typic Argiaquolls	Mollisols	Humic Gley soils.
Prout	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Ultisols	Gray-Brown Podzolic soils.
Prout, brown subsoil variant.	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols	Gray-Brown Podzolic soils.
Prout, deep variant	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Ultisols	Gray-Brown Podzolic soils.
Pyrmont	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Pyrmont, moderately shallow variant.	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Rawson	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Rimer	Coarse-loamy over clayey, mixed, mesic.	Aeric Arenic Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Ritchey	Loamy, mixed, mesic	Lithic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Romeo	Loamy, mixed, noncalcareous mesic	Lithic Haplaquolls	Mollisols	Rendzinas.
Shinrock	Fine, illitic, mesic	Aquic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Shoals	Fine-loamy, mixed, nonacid, mesic	Aeric Fluventic Haplaquepts.	Inceptisols	Alluvial soils.
Sisson	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Sloan	Fine-loamy, mixed, noncalcareous, mesic.	Fluventic Haplaquolls	Mollisols	Alluvial soils.
Tawas	[1]	[1]	Histosols	Organic soils.
Toledo	Fine, illitic, nonacid, mesic	Mollic Haplaquepts	Inceptisols	Humic Gley soils.
Toledo, calcareous variant	Fine, illitic, calcareous, mesic	Mollic Haplaquepts	Inceptisols	Humic Gley soils.
Trumbull	Fine, illitic, mesic	Typic Ochraqualfs	Alfisols	Low-Humic Gley soils.
Tuscola	Fine-loamy, mixed, mesic	Aquic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Vaughnsville	Fine-loamy, mixed, mesic	Aquic Hapluadalfs	Alfisols	Gray-Brown Podzolic soils.
Warners	Fine-silty, mixed, calcareous, mesic	Typic Haplaquolls	Inceptisols	Organic soils.
Warners, clayey subsoil variant.	[1]	[1]	Histosols	Organic soils.
Washtenaw	Fine-loamy, mixed, nonacid, mesic	Typic Haplaquents	Entisols	Alluvial soils.
Wayland	Fine-loamy, mixed, nonacid, mesic	Fluventic Haplaquepts	Inceptisols	Alluvial soils.
Wilmer	Fine-loamy, mixed, mesic	Aquic Argiudolls	Mollisols	Brunizems.

[1] Histosols not classified at the subgroup and family levels because classification at these levels was provisional at the time the survey went to the printer.

TABLE 9.—*Physical and chemical*

[Analyses made by the Ohio Agricultural Research and Development Center,

Series and sample number	Horizon	Depth from surface	Particle-size distribution—											
			Very coarse sand (1 to 2 mm.)	Coarse sand (0.5 to 1.0 mm.)	Medium sand (0.25 to 0.5 mm.)	Fine sand (0.1 to 0.25 mm.)	Very fine sand (0.05 to 0.1 mm.)	Total sand (0.05 to 2 mm.)	Fine silt (0.002 to 0.02 mm.)	Coarse silt (0.02 to 0.05 mm.)	Total silt (0.002 to 0.05 mm.)	Fine clay (0.0002 mm.)	Coarse clay (0.0002 to 0.002 mm.)	Total clay (<0.002 mm.)
		In.	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
Arkport: Er–20.	Ap	0–9	0.1	0.3	0.6	47.2	37.5	85.7	5.4	3.4	8.8	1.5	4.0	5.5
	A3	9–21	.1	.3	.6	52.4	34.8	88.2	5.5	1.6	7.1	.8	3.9	4.7
	A&B1	21–27	.2	.5	.7	51.2	39.8	92.4	------	-------	4.6	.9	2.1	3.0
	A&B2	27–48	.1	.5	.9	27.2	59.4	88.1	4.4	3.9	8.3	1.3	2.3	3.6
	C	48–60	-------	.8	1.8	40.9	52.1	95.6	------	-------	1.7	1.2	1.5	2.7
Bennington: Er–31.	Ap	0–8	3.1	5.1	4.3	10.0	8.9	31.4	38.0	12.4	50.4	3.0	15.2	18.2
	A&B	8–10	1.8	3.4	3.2	8.1	7.7	24.2	23.4	23.4	46.8	9.3	19.7	29.0
	B21t	10–20	1.6	2.7	2.5	6.2	6.0	19.0	27.9	12.0	39.9	16.2	24.9	41.1
	B22t	20–27	1.5	3.3	3.1	7.7	7.7	23.3	27.9	13.1	41.0	13.9	21.8	35.7
	C1	27–38	2.1	3.9	3.5	8.2	7.3	25.0	23.6	22.0	45.6	10.0	19.4	29.4
	C2	38–48	2.9	6.0	5.3	11.8	11.1	37.1	25.1	16.0	41.1	7.9	13.9	21.8
	C3	48–60	2.5	5.4	4.5	11.4	11.4	35.2	26.7	17.7	44.4	6.7	13.7	20.4
Colwood, acid variant: Er–37.	Ap	0–8	.6	1.7	2.3	9.5	4.3	18.4	35.5	11.0	46.5	10.0	25.1	35.1
	A1	8–11	.2	1.4	2.2	9.3	4.1	17.2	34.8	13.4	48.2	9.9	24.7	34.6
	B1g	11–16	.2	1.1	1.9	8.1	3.5	14.8	37.7	13.4	51.1	9.6	24.5	34.1
	B21g	16–26	.2	.8	1.3	6.8	3.5	12.6	34.6	10.5	45.1	14.9	27.4	42.3
	B22g	26–36	.2	.9	1.5	7.3	3.5	13.4	33.3	9.9	43.2	16.1	27.3	43.4
	B3	36–50	.7	1.5	1.7	5.3	3.7	12.9	40.1	7.8	47.9	21.7	27.5	39.2
	IIC	50–52	.1	.8	.6	2.6	3.4	7.5	36.3	27.7	64.0	6.1	22.4	28.5
Elliott: Er–38. This profile is very close to a silty clay loam type.	Ap	0–8	.6	1.8	2.4	7.4	8.2	20.4	32.9	9.7	42.6	14.9	22.1	37.0
	A1	8–12	.5	1.8	2.1	6.6	7.6	18.6	33.3	10.2	43.5	15.5	22.4	37.9
	B21t	12–22	.7	1.8	2.3	5.5	5.7	16.0	35.8	8.9	44.7	15.0	24.3	39.3
	B22t	22–30	.4	.9	1.0	3.0	5.3	10.6	39.9	9.5	49.4	14.3	25.7	40.0
	B3	30–41	1.1	2.0	2.0	5.1	5.7	15.9	39.1	12.4	51.5	10.4	22.2	32.6
	C1	41–48	2.8	6.6	5.8	12.5	7.2	34.9	30.7	8.1	38.8	6.8	19.5	26.3
	C2	48–60	2.9	4.2	3.2	7.3	6.0	23.6	38.2	10.0	48.2	6.9	21.3	28.2
Fulton: Er–5. This profile is very close to a silty clay loam type.	Ap	0–9	1.6	2.7	1.2	2.1	1.4	9.0	------	-------	50.3	12.1	-------	40.7
	B21tg	9–17	.2	.5	.3	.5	.5	2.0	------	-------	37.8	29.5	-------	60.2
	B22tg	17–30	.1	.2	.2	.6	.6	1.7	------	-------	49.7	22.2	-------	48.6
	B3g	30–36	.3	.3	.2	.9	1.5	3.2	------	-------	41.3	20.1	-------	55.5
	C1	36–47	.1	.2	.2	.7	.8	2.0	------	-------	48.0	17.1	-------	50.0
	C2	47–68	.1	.1	.1	.5	.8	1.6	------	-------	49.6	15.8	-------	48.8
	C3	68–78	-------	.1	.1	.4	.9	1.5	------	-------	48.6	16.3	-------	49.9
Mahoning: Er–29.	Ap	0–8	2.6	2.9	3.3	9.0	8.7	26.5	43.8	12.0	55.8	3.4	14.3	17.7
	A2	8–11	1.1	2.9	4.1	12.1	12.0	32.1	29.2	18.9	48.1	7.4	12.4	19.8
	A&B	11–14	1.3	3.1	4.2	12.6	11.8	33.0	31.2	14.6	45.8	8.7	12.5	21.2
	B2t	14–23	1.2	2.6	2.8	8.6	8.5	23.7	30.0	9.6	39.6	14.7	22.0	36.7
	B3t	23–35	2.1	2.8	2.7	7.6	7.4	22.6	33.9	9.5	43.4	13.2	20.8	34.0
	C1	35–48	1.9	2.7	2.2	6.3	6.3	19.4	37.3	9.3	46.6	11.0	23.0	34.0
	C2	48–60	2.6	3.7	2.8	6.8	6.5	22.4	38.6	8.4	47.0	8.1	22.5	30.6
	IIC3	60–78	1.7	2.9	2.3	5.6	5.9	18.4	33.9	13.7	47.6	9.1	24.9	34.0
Sisson: Er–21. This very fine sandy loam type is a common inclusion in the fine sandy loam type.	Ap	0–10	.9	.7	.6	4.1	55.3	61.6	13.1	15.7	28.8	1.9	7.7	9.6
	B&A	10–14	.1	.3	.3	1.4	41.7	43.8	15.4	18.2	33.6	8.1	14.5	22.6
	Bt	14–22	-------	.2	.3	1.1	38.2	39.8	19.9	16.3	36.2	11.0	13.0	24.0
	B3	22–27	-------	.1	.1	.8	33.3	34.3	18.2	21.1	39.3	10.7	15.7	26.4
	C1	27–36	-------	.1	.1	.8	35.7	36.7	24.3	19.4	43.7	8.2	11.4	19.6
	C2	36–52	.1	.3	.3	1.2	41.0	42.9	21.2	23.5	44.7	3.7	8.7	12.4
	C3	52–60	.1	.3	.3	1.4	57.4	59.5	11.9	23.7	35.6	2.0	2.9	4.9

data for selected soils

Columbus, Ohio. Dashes indicate that no determination was made]

USDA texture	pH, 1:1 (H_2O)	Organic matter	Calcite	Dolomite	$CaCO_3$ equivalent	Extractable cations (milliequivalents per 100 grams of soil)						Base saturation
						H	Ca	Mg	K	Sum of extractable cations	Sum of bases	
		Pct.	*Pct.*	*Pct.*	*Pct.*							*Pct.*
Loamy fine sand	6.4	1.4				3.9	3.5	0.4	0.23	8.0	4.1	51
Fine sand	5.4	.6				4.2	1.0	.2	.20	5.6	1.4	25
Fine sand	5.5	.3				3.4	.7	.2	.09	4.4	1.0	23
Fine sand	5.6	.3				3.0	1.9	.5	.08	5.5	2.5	45
Fine sand	6.5					1.7	2.0	.5	.05	4.3	2.6	60
Silt loam	6.1	2.6				5.3	8.3	1.4	.22	15.2	9.9	65
Clay loam	4.9	.9				9.1	5.6	1.0	.19	15.9	6.8	43
Silty clay	4.7	.7				12.0	8.5	1.5	.24	22.2	10.2	46
Clay loam	6.4	.9				6.0	14.2	2.2	.36	22.8	16.8	74
Clay loam	7.8	.8	4.1	1.4	6							
Loam	7.9		2.5	2.4	5							
Loam	7.9		7.4	2.5	10							
Silty clay loam	6.0	3.2				13.6	13.0	3.5	.46	30.6	17.0	55
Silty clay loam	6.2	3.1				13.3	13.0	3.4	.51	30.2	16.9	56
Silty clay loam	4.5	1.2				19.4	3.2	1.1	.21	23.9	4.5	19
Silty clay	4.4	.6				17.9	2.6	.9	.24	21.6	3.7	17
Silty clay	4.3	.6				17.0	2.7	1.1	.24	21.0	4.0	19
Silty clay loam	4.4	.6				12.5	1.8	1.1	.24	15.6	3.1	20
Silty clay loam	4.5	.5				13.2	2.0	1.2	.25	16.6	3.4	21
Clay loam	6.1	2.6				7.7	16.2	3.0	.31	27.2	19.5	72
Silty clay loam	6.3	2.6				7.2	17.7	3.0	.31	28.2	21.0	74
Silty clay loam	6.6	.5				4.9	14.2	3.8	.18	23.1	18.2	79
Silty clay	6.8	.4				3.5	13.8	3.6	.18	21.1	17.6	83
Silty clay loam	7.1					2.7	10.5	2.7	.15	16.0	13.3	83
Loam	7.3		.6	.7	1							
Clay loam	7.7		5.0	3.1	8							
Silty clay loam	6.0	4.3				9.6	10.3	5.5	.35	25.8	16.2	63
Clay	5.5	2.7				9.7	10.5	9.8	.44	30.4	20.7	68
Silty clay	7.5	1.7				5.2	14.6	10.3	.35	30.5	25.3	83
Silty clay	7.7	1.2			13							
Silty clay	7.9	1.2			21							
Silty clay	8.1	1.5			18							
Silty clay	8.1	1.7			17							
Silt loam	5.4	2.9				7.1	6.1	1.0	.20	14.4	7.3	51
Loam	5.0	.8				6.0	3.6	.8	.12	10.5	4.5	43
Loam	4.7	.6				8.5	3.2	1.0	.10	12.8	4.3	34
Clay loam	5.3	.7				7.1	7.8	4.1	.24	19.2	12.1	63
Clay loam	7.5		.4	.4	1							
Silty clay loam	8.0		6.7	2.3	9							
Clay loam	8.0		10.7	3.7	15							
Silty clay loam	7.9		10.7	4.1	15							
Very fine sandy loam	6.5	1.6				2.9	5.1	.7	.18	8.9	6.0	67
Loam	5.4	.6				5.0	5.0	1.2	.19	11.4	6.4	56
Loam	4.9	.4				8.2	6.1	1.6	.19	16.1	7.9	49
Loam	5.3	.4				5.5	8.4	2.3	.18	16.4	10.9	66
Loam	6.1					3.0	7.9	2.1	.13	13.1	10.1	77
Loam	8.0		6.8	10.0	18							
Very fine sandy loam	8.0		9.3	13.3	24							

TABLE 9.—*Physical and chemical*

Series and sample number	Horizon	Depth from surface	Particle-size distribution—											
			Very coarse sand (1 to 2 mm.)	Coarse sand (0.5 to 1.0 mm.)	Medium sand (0.25 to 0.5 mm.)	Fine sand (0.1 to 0.25 mm.)	Very fine sand (0.05 to 0.1 mm.)	Total sand (0.05 to 2 mm.)	Fine silt (0. 002 to 0.02 mm.)	Coarse silt (0.02 to 0.05 mm.)	Total silt (0. 002 to 0.05 mm.)	Fine clay (0. 0002 mm.)	Coarse clay (0. 0002 to 0.002 mm.)	Total clay (<0.002 mm.)
		In.	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
Toledo: Er–4.	Ap	0–8	.2	.4	.2	.7	.8	2.3			43.7	18.4		54.0
	B1g	8–13½	.3	.4	.3	.8	.8	2.6			41.4	23.3		56.0
	B2g	13½–27	.1	.4	.3	1.0	.9	2.7			37.3	27.4		60.0
	B3g	27–39	.1	.3	.2	.6	.8	2.0			34.1	29.8		63.9
	B3g–C1	39–54	.1	.3	.2	.9	.9	2.4			34.1	27.6		63.5
	C1	54–66	.1	.3	.2	.5	.5	1.6			57.2	17.5		41.2
	C2	66–96	.1	.1	.2	.6	.8	1.8			44.2	18.9		54.0
	C3	96–100		.1	.1	.4	.6	1.2			46.9	17.8		51.9

tratable aluminum, was determined by the triethanolamine method (*7*) and cation exchange capacity by the summation of exchangeable cations. Calcium carbonate equivalent was determined titrimetrically by the procedure of Hutchison and MacLennan (*8*). All pH measurements were made by using a 1:1 soil-water ratio.

The Arkport, Bennington, Colwood, and Fulton profiles from which samples were taken are described in the section "Descriptions of the Soils." The Elliott, Mahoning, Sisson, and Toledo profiles from which samples were taken are described in the following paragraphs.

ELLIOTT SERIES

Typical profile of Elliott silty clay loam (Er–38), 1,950 feet south and 950 feet west of corner of Livengood and Higbee Roads; Oxford Township.

Ap—0 to 8 inches, black (10YR 2/1) light silty clay loam; very dark grayish-brown (10YR 3/2) when crushed; moderate, medium, granular structure; friable; neutral; abrupt, smooth boundary.

A1—8 to 12 inches, very dark brown (10YR 2/2) silty clay loam; very dark grayish-brown (10YR 3/2) when crushed; moderate, medium, subangular blocky structure; firm; slightly acid; clear, very irregular boundary.

B21t—12 to 22 inches, yellowish-brown (10YR 5/4) clay, many, coarse, faint mottles of grayish brown (10YR 5/2) and common, medium, faint mottles of yellowish brown (10YR 5/6); strong, very coarse (2- to 4-inch) prismatic structure that breaks to weak, medium, prismatic, which in turn breaks to moderate, medium, subangular blocky; very firm; continuous, very dark gray (10YR 3/1), clay-organic coatings 0.1 to 0.5 millimeter thick on very coarse prisms, and dark-gray (10YR 4.1), clay-organic coatings 0.1 millimeter thick on medium prisms; no coatings on blocks; roots concentrated between prisms; 5 percent tongues of A1 material at top of horizon; slightly acid; gradual, smooth boundary.

B22t—22 to 30 inches, yellowish-brown (10YR 5/4) clay; many, coarse, faint mottles of grayish brown (10YR 5/2) and yellowish brown (10YR 5/6 and 5/8); moderate, medium (1 inch to 2 inches) prismatic structure breaking to moderate, medium, angular blocky; firm; gray (10YR 5/1) and dark-gray (10YR 4/1) clay-organic coatings, on 60 percent of prism faces and 30 percent of block faces; few isolated masses, 1 inch to 3 inches in diameter, of very sticky, very dark gray (10 YR 3/1) silty clay; neutral; gradual boundary.

B3—30 to 41 inches, grayish-brown (10YR 5/2) clay loam; many, coarse, faint to distinct mottles of yellowish brown (10YR 5/4 and 5/6); moderate, medium, subangular blocky structure; firm; gray (10YR 5/1) and dark-gray (10YR 4/1) clay-organic coatings on 50 percent of prisms; mildly alkaline; clear, smooth boundary.

C1—41 to 48 inches, yellowish-brown (10YR 5/4) light clay loam; many, coarse, faint mottles of grayish brown (10YR 5/2) and yellowish brown (10YR 5/6); massive but breaks to weak, thin, platy structure; friable; some vertical faces 50 percent of which are coated with gray (10YR 5/1); many fine shale fragments; moderately alkaline; clear, smooth boundary.

C2—48 to 60 inches, yellowish-brown (10YR 5/4) clay loam; many, coarse, distinct mottles of gray (10YR 5/1) and brownish yellowish (10YR 6/6); massive but breaks to weak, thin, platy structure; firm; calcareous.

MAHONING SERIES

Typical profile of Mahoning silt loam (ER–29), along Vermilion-Florence Township line, 0.4 mile east of State Highway 60 at southwest corner of woodlot. (Cores taken 9/9 and 9/10/64, at depths of 3 to 6 inches, 11 to 14 inches, 17 to 20 inches, 28 to 31 inches, and 40 to 43 inches.)

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; weak, very fine, crumb structure; friable; medium acid; abrupt, smooth boundary.

A2—8 to 11 inches, pale-brown (10YR 6/3) silt loam; many, coarse, distinct mottles of yellowish brown (10YR 5/6); moderate, medium, platy structure breaking to blocky; friable; medium acid; gradual irregular boundary.

A&B—11 to 14 inches, pale-brown (10YR 6/3) silt loam in which are imbedded chunks of yellowish-brown (10YR 5/4) silty clay loam; few, fine, distinct mottles of strong brown (7.5YR 5/8); moderate, medium, subangular blocky structure; firm; strongly acid; 60 percent is A horizon, and 40 percent B horizon; gradual boundary.

B2t—14 to 23 inches, dark yellowish-brown (10YR 4/4) light silty clay; many, coarse, faint mottles of dark brown (10YR 4/3); moderate, medium, prismatic structure breaking to strong, medium, angular blocky; continuous light brownish-gray (10YR 6/2) coatings on prism faces and half the block faces; discontinuous, medium and thick, clay films on vertical and hori-

data for selected soil—Continued

USDA texture	pH, 1:1 (H_2O)	Organic matter	Calcite	Dolomite	$CaCO_3$ equivalent	Extractable cations (milliequivalents per 100 grams of soil)						Base saturation
						H	Ca	Mg	K	Sum of extractable cations	Sum of bases	
		Pct.	*Pct.*	*Pct.*	*Pct.*							*Pct.*
Silty clay	6. 2	4. 3				8. 3	18. 6	7. 5	. 58	35. 0	26. 7	76
Silty clay	6. 6	1. 8				5. 8	16. 5	8. 6	. 44	31. 3	25. 5	82
Clay	7. 0	1. 0				3. 7	16. 1	10. 4	. 44	30. 6	26. 9	88
Clay	7. 4					2. 4	19. 2	11. 0	. 38	33. 0	30. 6	93
Clay	7. 8				6							
Silty clay	8. 1				20							
Silty clay	7. 8				18							
Silty clay	7. 7				19							

zontal ped faces; very firm; medium acid; clear, wavy boundary.

B3t—23 to 35 inches, grayish-brown (10YR 5/2) and yellowish-brown (10YR 5/4) heavy silty clay loam; many, medium, distinct mottles of weak red (2.5YR 4/2); weak, coarse, prismatic structure breaking to weak, fine, angular blocky; thick coatings of gray (10YR 5/1) around larger sandstone fragments; continuous thin clay films and patches of thick clay films on vertical and horizontal ped faces; very firm; neutral; numerous flat sandstone fragments 2 to 6 inches in diameter; abrupt, wavy boundary.

C1—35 to 48 inches, yellowish-brown (10YR 5/4) heavy silty clay loam; many, coarse, distinct mottles of grayish brown (10YR 5/2) and common, coarse, distinct mottles of pale brown (10YR 6/3); weak, medium, platy structure breaking to blocky; dark-gray (10YR 4/1) coatings on 50 percent of ped surfaces; very firm; strongly calcareous; gradual boundary.

C2—48 to 60 inches, dark yellowish-brown (10YR 4/4) heavy silty clay loam; many, coarse, prominent mottles of brown (10YR 5/3) and common, coarse, prominent mottles of very pale brown (10YR 7/4); moderate, thin, platy structure; few very coarse prisms; dark-gray (10YR 4/1) coatings on the prisms; very firm; calcareous; pebble line at 60 inches; abrupt, smooth boundary.

IIC3—60 to 78 inches, yellowish-brown (10YR 5/4) clay loam; common, fine, prominent mottles of yellowish brown (10YR 5/8); few, coarse, faint mottles of brown (10YR 5/3), and common, medium, distinct mottles of grayish brown (10YR 5/2); laminar structure; firm; calcareous.

SISSON SERIES

Typical profile of Sisson very fine sandy loam (Er–21), 100 feet west of Hoover Road, 0.3 mile south of Huron-Avery Road; Milan Township. (Sampled for Bureau of Public Roads. No cores taken.)

Ap—0 to 10 inches, brown (10YR 5/3) very fine sandy loam; weak, very fine, crumb structure; very friable; pH 7.5; abrupt, smooth boundary.

B&A—10 to 14 inches, 40 percent light yellowish-brown (10YR 6/4) loam and 60 percent yellowish-brown (10YR 5/6) loam; moderate, medium, subangular blocky structure; friable; pH 6.0; clear, irregular boundary.

Bt—14 to 22 inches, strong-brown (7.5YR 5/8) light silty clay loam; strong, medium, angular blocky structure; firm; thin discontinuous clay films on all ped surfaces; pH 6.0; clear, wavy boundary.

B3—22 to 27 inches, dark yellowish-brown (10YR 4/4) light clay loam; compound structure—weak, very coarse, subangular blocky and weak, thick, platy; friable; dark-brown (7.5YR 3/2) coatings on vertical ped faces; pH 7.5; clear, wavy boundary.

C1—27 to 36 inches, yellowish-brown (10YR 5/4) very fine sandy loam; moderate, thick, platy structure; very friable; very thin bands of brownish-yellow (10YR 6/8) silt loam and a few isolated chunks of brown (7.5YR 5/4) silt loam; pH 7.8; gradual boundary.

C2—36 to 52 inches, grayish-brown (10YR 5/2) loamy very fine sand; moderate, medium, platy structure; very friable; about 0.01 inch of yellow-brown (10YR 5/6) silt between plates; strongly calcareous; gradual boundary.

C3—52 to 60 inches, stratified; 50 percent yellowish-brown (10YR 5/6) fine sand, 40 percent grayish-brown (10YR 5/2) silt, and 10 percent strong-brown (7.5YR 5/6) silty clay loam; strata are 0.1 to 0.25 inch thick; no other structure; very friable; strongly calcareous.

TOLEDO SERIES

Typical profile of Toledo silty clay (Er–4), North Central Substation of Ohio Agricultural Research and Development Center, 150 feet west and 336 feet south of lane to new barn. (Cores taken at 1 inch to 4 inches, 9 to 12 inches, 21 to 24 inches, 34 to 37 inches, 46 to 49 inches.)

Ap1—0 to 5 inches, very dark grayish-brown (10YR 3/2) silty clay; moderate, medium, granular structure; clear lower boundary.

Ap2—5 to 8 inches, very dark grayish-brown (10YR 3/2) silty clay; moderate to strong, medium to coarse, angular blocky structure; abrupt lower boundary.

B1g—8 to 13 inches, dark grayish-brown (2.5Y 4/2) silty clay; many, fine, distinct mottles of yellowish brown (10YR 5/8), and reddish yellow (7.5YR 6/6 to 6/8); massive in place but breaks to weak, very fine, subangular blocky structure; very firm in place; appears to be a somewhat dense plowsole.

B2g—13 to 27 inches, gray (10YR 5/1) to dark-gray (10YR 4/1) clay; medium, distinct mottles of yellowish brown (10YR 5/8) and some distinct mottles of dark yellowish brown (10YR 4/4); weak to moderate, fine to medium, angular blocky structure; shiny clay surfaces on some blocks; moderately sticky; few roots; diffuse lower boundary.

B3g—27 to 39 inches, light olive brown (2.5Y 5/4) clay; distinct mottles of grayish brown (10YR 5/2); weak, fine to medium, subangular blocky structure; clear, wavy (0 to 2-inch) lower boundary.

B3g-C1—39 to 54 inches, distinctly mottled, grayish-brown (2.5Y 5/2) and yellowish-brown (10YR 5/4) clay; some fine black concretions and coatings; splotches and soft concretions of light-gray or white carbonate material; moderate, fine to medium, angular blocky structure.

C1—54 to 66 inches, mottled grayish-brown and light olive-brown silty clay loam; grayish brown (2.5Y 5/2) is more prominent on surfaces and light olive brown (2.5Y 5/4) in interiors; gray (2.5Y 7/0) clayey or calcareous coatings along some laminæ and along the few vertical cracks; laminæ, ⅛ to ½ inch thick, have coatings of very fine sand; splotches of gray or white carbonate.

C2—66 to 96 inches, light olive-brown (2.5Y 5/4) silty clay; few, large, gray mottles or coatings along laminæ surfaces (2.5Y 5/0) few, small, soft, black concretions; calcareous.

C3—96 to 109 inches, brown (10YR 5/3) light silty clay; few yellowish-brown (10YR 5/8) and gray or white calcareous coatings; laminated; calcareous.

General Nature of the County

French traders were the first white settlers in the area that is now Erie County. Indians of the Ottawa, Wyandot, and Seneca tribes had been the earlier inhabitants. In 1792 the State of Connecticut set aside the part of its Western Reserve known as the Firelands for people whose property in the East had been destroyed during the Revolutionary War. The Firelands were settled between 1808 and 1812. Huron County, which at that time included the whole of the Firelands, was organized in 1809. Erie County was formed from the northern part of Huron County in 1838, and the county seat was established at Sandusky.

Numerous gristmills and sawmills were built along the streams by the early settlers. The flour mills established at Venice in 1831 provided the first cash market for wheat in the Firelands. Winemaking was an important industry from 1850 until prohibition. The paper industry established in 1881 provided a market for straw.

The first railroad in Erie County was completed in 1851. In the 1850's, Sandusky was the only port on the southern shore of Lake Erie that had a railroad connection to the Ohio River. The Columbus-Sandusky turnpike, completed in 1834, was the first major highway in the county. Milan was an important port and shipbuilding center in the 1840's, after the Milan Canal was built.

At present, the county has a complete network of all-weather highways of Federal, State, county, and township systems. Three railroads serve the area, and inland waterways provide transportation to all parts of the Great Lakes region. Iron ore and grain are shipped through the port of Huron. Trucking firms offer freight service, and local charter air service is available at two airports.

An important present-day industry is commercial canning of fruits and vegetables at processing plants in Sandusky. Sandusky is also a shipping point for coal, as well as a leading resort area.

Boating, camping, swimming, fishing, and water skiing are among the recreational activities available. Sandusky, Huron, and Vermilion maintain parks and picnic areas. The Ohio Division of Wildlife manages three public hunting areas in the county.

Physiography, Relief, and Drainage

Erie County is within the broad, diversified Eastern lake section of the Central Lowland Province (*4*). It has the lake plain, till plains, outwash plains, and hills that are typical of glaciated areas. About two-thirds of the county was once covered by a glacial lake, and many features of the landscape, such as the beach ridges and wave-cut cliffs, are results of wave action. There are also many outcrops of limestone, sandstone, and shale bedrock.

The elevation ranges from 576 to 870 feet. The highest elevation is on a sandstone hill in southeastern Berlin Township, and the lowest elevation is in the marshy area along Lake Erie. There is a general rise in elevation from north to south. Local relief commonly varies less than 40 feet.

Most of the county is drained by small streams that flow directly into Lake Erie. Only a small part of the county is drained by the two rivers that flow through it.

Farming

In 1959, according to the U.S. Bureau of the Census, there were 832 farms in the county and the total area in farms was 114,018 acres. Of this acreage, 77,720 acres was cropped, 12,110 acres was pastured, 8,968 was wooded, and the rest was used for other purposes. The average size of farm was 137 acres. Of the 832 farms, 718 were operated by owners or part owners and the rest by tenants. There were 256 cash-grain farms, 75 dairy farms, 15 poultry farms, 80 livestock farms other than dairy and poultry farms, 60 fruit farms, 35 vegetable farms, and 309 general and miscellaneous farms.

In 1959, corn was harvested from 26,498 acres, soybeans from 13,794 acres, orchard crops and other special crops from 7,019 acres, wheat from 13,790 acres, and oats from 7,473 acres. Alfalfa was grown for hay on only 4,682 acres, and clover on 2,203 acres.

Climate [5]

The climate of Erie County is continental. Wide variations in temperature from day to day and from year to year are characteristic. Rainfall is abundant and well distributed throughout the year but varies widely from year to year. Summers are moderately warm and humid and have occasional days when the temperature exceeds 90°F. Winters are rather cold and cloudy and have 1 day to 5 days when the temperature is below zero. The prevailing winds are southwesterly. Heavy fog occurs about eight times a year and is most frequent during the colder half of the year. Eight tornadoes have been reported since 1900; one of the most damaging occurred in Sandusky on June 28, 1924.

Lake Erie has a modifying effect on the weather in the northern part of the county. Winds off the lake tend to lower the temperature on summer days and to raise

[5] By MARVIN E. MILLER, climatologist for Ohio, Weather Bureau, ESSA.

the temperature on winter days. The growing season is longer in the northern part of the county than in the southern part. The daily variation in temperature becomes greater with increasing distance from the lake, and the average annual precipitation increases somewhat.

Temperature and precipitation data based on records from Sandusky are shown in table 10. These data are fairly representative of Erie County, except for the following differences: Compared with the northernmost part of the county, the southernmost part has an average daily minimum temperature about 1.5°F. higher, an average daily minimum about 4° lower, and average yearly precipitation that is greater by slightly more than 1 inch. The probability of and the occurrence of specified temperatures of 32° and lower are shown in table 11. As the table shows, the interval between freezing temperatures decreases as distance from the lake increases. Normally, the interval between freezing temperatures is 198 days at Sandusky, 168 days at Castalia, and 155 days at Norwalk, which is in Huron County, a few miles south of the boundary with Erie County. Frosts damage crops more late in spring than early in fall and are particularly harmful to fruit.

The highest yearly temperature normally occurs soon after June 21, and the lowest yearly temperature soon after December 22. The highest and lowest temperatures recorded are about the same throughout the county: 105° to 109° for the highest and 12° below zero to 20° below for the lowest. The normal daily variation in temperature is greatest late in summer and least in winter. Temperatures exceeding 89° have been recorded as early as April, but such temperatures are recorded more commonly in the period June through August. Low temperatures ranging from 9° below zero in the northern part of the county to 18° below zero in the southern part can be expected 3 years in 10. Low temperatures ranging from 3° above in the northern part to 1° below zero in the southern part can be expected 3 years in 10. Low temperatures ranging from 17° below zero in the northern part to 27° below zero in the southern part can be expected 1 year in 100.

The average yearly precipitation is slightly more than 34 inches. Most of the rainfall during the growing season comes in showers and thunderstorms. Thunderstorms occur on about 37 days each year, mostly during the period May through August. Most of the precipitation in winter is rain.

The planting of crops, except for small grain and hay, is generally done between the latter part of April and the middle of June. During a 10-year period, rainfall of more than 1.2 inches per week can be expected in 9 weeks that occur in April, in 10 weeks that occur in May, and in 11 weeks that occur in June. Rains of this magnitude delay field operations, and because they occur in a season when there is little or no plant cover, they may cause soil losses. Flash floods caused by thunderstorms occasionally damage crops along many of the tributaries of the Huron River and the Vermilion River. These floods usually occur late in the afternoon or early in the evening. On July 12, 1967, in slightly more than 19 hours, 10.5 inches of rain fell in Sandusky.

During the cold season, the moisture content of the soil is gradually replenished because the amount of moisture received as precipitation is greater than the amount lost through evaporation. By the end of March, not only is the moisture content at or above field capacity, but groundwater reserves have also been built up. From then on through the growing season, the level of soil moisture depends upon the balance between precipitation and evaporation. In July and August the moisture needs of all crops reach a maximum, but there is a progressive drying

TABLE 10.—*Temperature and precipitation data*

[All data from Sandusky; elevation 606 feet, based on records for the period 1936-65]

Month	Temperature				Precipitation				
	Average daily maximum	Average daily minimum	Two years in 10 will have at least 4 days with—		Average total	One year in 10 will have—		Average snowfall	Average number of days with 1 inch or more of snow
			Maximum temperature equal to or higher than—	Minimum temperature equal to or lower than—		Less than—	More than—		
	°F.	°F.	°F.	°F.	In.	In.	In.	In.	
January	34	21	54	4	2.40	0.73	4.51	7.2	3
February	36	22	55	7	2.19	.95	3.65	6.3	2
March	45	30	69	14	2.88	1.31	4.74	5.8	2
April	57	40	78	28	3.23	1.56	5.15	1.1	(1)
May	70	51	87	39	3.41	1.50	5.68	0	0
June	79	61	92	51	4.11	1.59	7.15	0	0
July	83	65	96	56	3.62	1.56	6.05	0	0
August	82	64	95	55	3.23	1.58	5.14	0	0
September	75	57	90	45	2.80	1.14	4.79	0	0
October	65	47	82	35	2.02	.56	3.87	0	0
November	50	35	68	21	2.22	1.01	3.65	2.5	1
December	38	25	57	9	2.04	.96	3.28	6.1	2
Year	59	43	[2] 98	[3] 0	34.15	26.49	42.37	29.0	10

[1] Less than 0.5 day. [2] Average annual maximum. [3] Average annual minimum.

TABLE 11.—*Probability of freezing temperatures in spring and fall*

Areas along Lake Erie south to 3 miles inland

Probability	Dates for given probability and temperature				
	20° F. or lower	24° F. or lower	28° F. or lower	32° F. or lower	36° F. or lower
Spring:					
1 year in 10 later than	March 28	April 9	April 12	April 24	May 7
3 years in 10 later than	March 19	March 30	April 4	April 18	April 30
5 years in 10 later than	March 13	March 23	March 30	April 14	April 25
Fall:					
1 year in 10 earlier than	November 16	November 11	October 23	October 18	October 3
3 years in 10 earlier than	November 24	November 18	November 1	October 25	October 12
5 years in 10 earlier than	November 30	November 23	November 8	October 29	October 18
Areas 3 miles inland south to Ohio Turnpike					
Spring:					
1 year in 10 later than	April 9	April 23	May 4	May 18	June 2
3 years in 10 later than	March 31	April 15	April 29	May 6	May 22
5 years in 10 later than	March 25	April 8	April 19	April 27	May 14
Fall:					
1 year in 10 earlier than	November 16	October 27	October 7	September 29	September 20
3 years in 10 earlier than	November 24	November 7	October 19	October 7	September 29
5 years in 10 earlier than	November 28	November 15	October 28	October 13	October 5
Areas south of Ohio Turnpike					
Spring:					
1 year in 10 later than	April 12	April 23	May 4	May 21	June 4
3 years in 10 later than	April 1	April 15	April 27	May 12	May 26
5 years in 10 later than	March 25	April 9	April 22	May 6	May 20
Fall:					
1 year in 10 earlier than	----------	October 16	October 5	September 23	September 5
3 years in 10 earlier than	----------	October 27	October 14	October 2	September 16
5 years in 10 earlier than	November 13	November 3	October 21	October 8	September 24

of all soils because rainfall is almost always insufficient to meet the moisture needs. By the end of the growing season, the supply of moisture available to plants is at a minimum.

Relative humidity is an important factor in the growth of plants. Generally, humidity is lowest in summer and highest in winter. On hot summer days, relative humidity in the afternoon is in the 35- to 45-percent range. The average annual relative humidity is 77 percent at 1 a.m., 80 percent at 7 a.m., 72 percent at 1 p.m., and 69 percent at 7 p.m.

The percentage of possible sunshine is 75 in July and 32 in December. For the year, the average number of clear days (0 to 30 percent cloudiness) is 99, of partly cloudy days (30 to 70 percent cloudiness), 122; and of cloudy days (more than 70 percent cloudiness), 144.

The strongest winds are recorded in winter. The average daily windspeed at the earth's surface is slightly more than 10 miles per hour in winter and about 7 miles per hour in summer. Damaging winds of 35 to 80 miles per hour are usually associated with thunderstorms and occur most frequently in spring and summer.

Literature Cited

(1) AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS.
1961. STANDARD SPECIFICATIONS FOR HIGHWAY MATERIALS AND METHODS OF SAMPLING AND TESTING. Ed. 8, 2 v., illus.

(2) BALDWIN, MARK, KELLOGG, CHARLES E., and THORP, JAMES.
1938. SOIL CLASSIFICATION. U.S. Dept. Agr. Ybk. 978–1001, illus.

(3) BARROWS, H. L., and SIMPSON, E. C.
1962. AN EDTA METHOD FOR DIRECT ROUTINE DETERMINATION OF CALCIUM AND MAGNESIUM IN SOILS AND PLANT TISSUES. Soil Sci. Soc. Amer. Proc., v. 26, pp. 443–445.

(4) FENNEMAN, N. M.
1938. PHYSIOGRAPHY OF EASTERN UNITED STATES. 714 pp., illus. New York and London.

(5) JENNY, H.
1941. FACTORS OF SOIL FORMATION. 281 pp., illus. New York and London.

(6) O'NEIL, A. M.
1952. A KEY FOR EVALUATING SOIL PERMEABILITY BY MEANS OF CERTAIN FIELD CLUES. Soil Sci. Soc. Amer. Proc., v. 16, No. 3, pp. 312–315.

(7) PEECH, M., ALEXANDER, L. T., DEAN, L. A., and REED, J. F.
1947. METHODS OF SOIL ANALYSIS FOR SOIL-FERTILITY INVESTIGATIONS. U.S. Dept. Agr. Cir. 757, 25 pp.

(8) PIPER, C. S.
1947. SOIL AND PLANT ANALYSIS. 368 pp. New York.
(9) SCHNUR, G. LUTHER.
1937. YIELD, STAND, AND VOLUME TABLES FOR EVEN-AGED UPLAND OAK FORESTS. U.S. Dept. Agr. Tech. Bul. 560, 87 pp., illus.
(10) SIMONSON, ROY W.
1962. SOIL CLASSIFICATION IN THE UNITED STATES. Science 137: 1027–1034, illus.
(11) STEELE, J. G., and BRADFIELD, R.
1934. SIGNIFICANCE OF SIZE DISTRIBUTION IN THE CLAY FRACTION. Amer. Soil Survey Assoc. Bull. 15: 88–93.
(12) THORP, JAMES, and SMITH, GUY D.
1949. HIGHER CATEGORIES OF SOIL CLASSIFICATION: ORDER, SUBORDER, AND GREAT SOIL GROUPS. Soil Sci. 67: 117–122.
(13) UNITED STATES DEPARTMENT OF AGRICULTURE.
1951. SOIL SURVEY MANUAL. U.S. Dept. Agr. Handbook 18, 503 pp., illus.
(14) ———
1960. SOIL CLASSIFICATION, A COMPREHENSIVE SYSTEM, 7TH APPROXIMATION. 265 pp., illus. [Supplements issued in March 1967 and in September 1968]
(15) ———
1960. SOIL SURVEY OF PAULDING COUNTY, OHIO. 95 pp., illus.
(16) ———
1965. SOIL SURVEY OF ALLEN COUNTY, OHIO. 99 pp., illus.
(17) ———
1969. SOIL SURVEY OF DELAWARE COUNTY, OHIO. 71 pp., illus.
(18) WATERWAYS EXPERIMENT STATION, CORPS OF ENGINEERS.
1953. THE UNIFIED CLASSIFICATION SYSTEM. Tech. Memo. 3–357, 48 pp., illus.

Glossary

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as crumbs, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Available moisture capacity. The capacity of a soil to hold water in a form available to plants. Amount of moisture held in soil between field capacity, or about one-third atmosphere of tension, and the wilting coefficient, or about 15 atmospheres of tension.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Channery soil. A soil that contains thin, flat fragments of sandstone, limestone, or schist, as much as 6 inches in length along the longer axis. A single piece is called a fragment.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrations of compounds or of soil grains cemented together. The composition of some concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are examples of material commonly found in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Contour farming. Plowing, cultivating, planting, and harvesting in rows that are at right angles to the natural direction of the slope or parallel to the terrace grade.

Cover crop. A close-growing crop grown primarily to improve and to protect the soil between periods of regular crop production; or a crop grown between trees and vines in orchards and vineyards.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, and covered by grass for protection against erosion; used to conduct surface water away from cropland.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs along after rains. The distinction between gully and rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by normal tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage. V-shaped gullies result if the material is more difficult to erode with depth; whereas U-shaped gullies result if the lower material is more easily eroded than that above it.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If the soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Illuviation. The accumulation of material in a soil horizon through the deposition of suspended material and organic matter removed from horizons above. Since part of the fine clay in the B horizon (or subsoil) of many soils has moved into the B horizon from the A horizon above, the B horizon is called an illuvial horizon.

Mapping unit. Areas of soil of the same kind outlined on the soil map and identified by a symbol.

Mottled. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: Abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are these: *fine,* less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Munsell notation. A system for designating color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with a hue of 10YR, a value of 6, and a chroma of 4.

Natural drainage. Drainage that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural soil drainage are recognized, but only five are recognized in Erie County.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and have mottling in the lower B and the C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time. They commonly have mottling below a depth of 6 to 16 inches in the lower part of the A horizon and in the B and C horizons.

Poorly drained soils are wet for long periods; they are light gray and generally mottled from the surface downward, but some have few or no mottles.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Parent material (soil). The disintegrated and partly weathered rock from which a soil has formed.

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod.

Permeability. The quality that enables a soil horizon to transmit water or air. Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Phase, soil. A subdivision of a soil type, series, or other unit in the soil classification system, made because of differences that affect management but do not affect classification. A soil type, for example, may be divided into phases because of differences in slope, stoniness, thickness, or some other characteristic that affects its management but not its behavior in the natural landscape.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Mildly alkaline	7.4 to 7.8
Very strongly acid	4.5 to 5.0	Moderately alkaline	7.9 to 8.4
Strongly acid	5.1 to 5.5	Strongly alkaline	8.5 to 9.0
Medium acid	5.6 to 6.0	Very strongly alkaline	9.1 and higher
Slightly acid	6.1 to 6.5		
Neutral	6.6 to 7.3		

Relief. The elevations or inequalities of a land surface, considered collectively.

Residual material. Unconsolidated, partly weathered mineral material that accumulates over disintegrating solid rock. Residual material is not soil but is frequently the material in which a soil has formed.

Sand. As a soil separate, individual rock or mineral fragments ranging from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz, but sand may be of any mineral composition. As a textural class, soil that is 85 percent or more sand and not more than 10 percent clay.

Series, soil. A group of soils developed from a particular type of parent material and having genetic horizons that, except for texture of the surface layer, are similar in differentiating characteristics and in arrangement in the profile.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil variant. A soil having properties sufficiently different from those of other known soils to suggest establishing a new soil series, but a soil of such limited known area that creation of a new series is not believed to be justified.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Stripcropping. Growing crops in a systematic arrangement of strips, or bands, to serve as vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are (1) *single grain* (each grain by itself, as in dune sand) or (2) *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically the part of the soil below the solum.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surplus runoff so that it may soak into the soil or flow slowly to a prepared outlet without harm. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

Weathering. All physical and chemical changes produced in rocks at or near the earth's surface by atmospheric agents. These changes result in more or less complete disintegration and decomposition of the rock.

GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs. Dashes indicate that the soil was not placed in that particular grouping. Other information is given in tables as follows:

Estimated yields, table 1, page 22.
Engineering uses of the soils, tables 3, 4, and 5, pages 30 through 65.
Soil and land use planning, table 6, page 66.
Acreage and extent, table 7, page 90.

Map symbol	Mapping unit	Described on page	Capability unit Symbol	Capability unit Page
AdD	Alexandria silt loam, 6 to 18 percent slopes	92	IIIe-2	16
AdF2	Alexandria silt loam, 18 to 40 percent slopes, moderately eroded	92	VIIe-1	22
AlA	Allis silty clay loam, 0 to 2 percent slopes	92	IVw-1	20
AlB	Allis silty clay loam, 2 to 6 percent slopes	93	IVw-1	20
AoA	Allis stony silt loam, 0 to 2 percent slopes	93	IVw-1	20
ArA	Arkport loamy fine sand, 0 to 2 percent slopes	94	IIs-1	14
ArB	Arkport loamy fine sand, 2 to 6 percent slopes	94	IIs-1	14
ArC	Arkport loamy fine sand, 6 to 12 percent slopes	94	IIIe-1	16
ArD	Arkport loamy fine sand, 12 to 18 percent slopes	94	IVe-2	19
AtA	Arkport loamy fine sand, moderately shallow variant, 0 to 2 percent slopes	94	IIs-1	14
AtB	Arkport loamy fine sand, moderately shallow variant, 2 to 6 percent slopes	95	IIs-1	14
Bc	Beaches	95	-----	--
Be	Beaches, wet	95	-----	--
BlB	Belmore sandy loam, 2 to 6 percent slopes	96	IIe-2	11
BlC	Belmore sandy loam, 6 to 12 percent slopes	96	IIIe-1	16
BmA	Belmore loam, 0 to 2 percent slopes	96	IIs-2	15
BmB	Belmore loam, 2 to 6 percent slopes	96	IIe-2	11
BnA	Bennington loam, 0 to 2 percent slopes	97	IIw-2	12
BoA	Bennington silt loam, 0 to 2 percent slopes	97	IIw-2	12
BoB	Bennington silt loam, 2 to 6 percent slopes	97	IIw-6	14
BpA	Bennington-Pyrmont silt loams, limestone substratum, 0 to 2 percent slopes	97	IIw-2	12
BrB	Berks channery silt loam, 0 to 6 percent slopes	98	IVs-2	21
BrD	Berks channery silt loam, 6 to 18 percent slopes	98	IVs-2	21
BsF	Berks channery soils, 18 to 60 percent slopes	98	VIIs-1	22
BtA	Bogart loam, 0 to 2 percent slopes	99	IIs-2	15
BtB	Bogart loam, 2 to 6 percent slopes	99	IIe-2	11
Bw	Borrow pits	99	-----	--
CaA	Cardington silt loam, 0 to 2 percent slopes	100	I-1	10
CaB	Cardington silt loam, 2 to 6 percent slopes	100	IIe-1	11
CfA	Casco loam, very flaggy subsoil variant, 0 to 2 percent slopes	101	IIIs-2	19
CfB	Casco loam, very flaggy subsoil variant, 2 to 6 percent slopes	101	IIIs-2	19
CfD	Casco loam, very flaggy subsoil variant, 6 to 18 percent slopes	101	IVs-2	21
ChA	Castalia very channery silt loam, 0 to 2 percent slopes	102	IIIs-2	19
ChB	Castalia very channery silt loam, 2 to 6 percent slopes	102	IIIs-2	19
ClA	Chili loam, 0 to 2 percent slopes	103	IIs-2	15
ClB	Chili loam, 2 to 6 percent slopes	103	IIe-2	11
ClC	Chili loam, 6 to 12 percent slopes	103	IIIe-1	16
ClD	Chili loam, 12 to 18 percent slopes	103	IVe-2	19
Cm	Colwood fine sandy loam	104	IIw-5	14
Co	Colwood silt loam	104	IIw-5	14
Cp	Colwood silt loam, limestone substratum	104	IIw-5	14
Cr	Colwood silt loam, acid variant	105	IIIw-7	18
Cs	Colwood silty clay loam, acid variant	105	IIIw-7	18
CtA	Colyer shaly loam, 0 to 2 percent slopes	106	IVs-2	21
CtC	Colyer shaly loam, 2 to 12 percent slopes	106	IVs-2	21
CyE	Colyer soils, 12 to 50 percent slopes	106	VIIs-1	22
Da	Darroch silt loam	106	IIw-4	13
Dc	Darroch fine sandy loam, coarse subsoil variant	107	IIw-4	13
DkA	Dekalb fine sandy loam, 0 to 2 percent slopes	108	IIs-3	15
DkB	Dekalb fine sandy loam, 2 to 6 percent slopes	108	IIe-3	12
DrA	Del Rey loam, 0 to 2 percent slopes	108	IIw-2	12

Map symbol	Mapping unit	Described on page	Capability unit Symbol	Capability unit Page
DsA	Del Rey silt loam, 0 to 2 percent slopes	109	IIw-2	12
DsB	Del Rey silt loam, 2 to 6 percent slopes	109	IIw-6	14
DtA	Digby sandy loam, 0 to 2 percent slopes	109	IIw-3	13
DyA	Digby loam, 0 to 2 percent slopes	109	IIw-3	13
Ee	Eel silt loam	110	IIw-7	14
EhA	Elliott silt loam, 0 to 2 percent slopes	111	IIw-4	13
EkA	Elliott silty clay loam, 0 to 2 percent slopes	111	IIw-4	13
ElA	Ellsworth silt loam, 0 to 2 percent slopes	111	IIw-2	12
ElB	Ellsworth silt loam, 2 to 6 percent slopes	111	IIIe-2	16
ElC2	Ellsworth silt loam, 6 to 12 percent slopes, moderately eroded	112	IVe-1	19
ElD2	Ellsworth silt loam, 12 to 18 percent slopes, moderately eroded	112	VIe-1	21
EwF	Ellsworth and Chili soils, 18 to 50 percent slopes	112	VIIe-1	22
Fr	Fries silt loam	112	IIIw-7	18
Fs	Fries silty clay loam	112	IIIw-7	18
FuA	Fulton silty clay loam, 0 to 2 percent slopes	113	IIIw-2	17
FuB	Fulton silty clay loam, 2 to 6 percent slopes	113	IIIw-2	17
GaA	Galen loamy fine sand, 0 to 2 percent slopes	114	IIs-1	14
GaB	Galen loamy fine sand, 2 to 6 percent slopes	114	IIs-1	14
GfB	Galen loamy fine sand, limestone substratum, 0 to 6 percent slopes	114	IIs-1	14
GlB	Galen loamy fine sand, shale substratum, 0 to 6 percent slopes	114	IIs-1	14
Go	Gilford fine sandy loam	115	IIw-5	14
Gp	Gravel pits	115	-----	--
HsA	Haskins loam, 0 to 2 percent slopes	116	IIw-3	13
HsB	Haskins loam, 2 to 6 percent slopes	116	IIw-6	14
HtA	Haskins loam, dark surface variant, 0 to 2 percent slopes	117	IIw-4	13
JtA	Jimtown loam, 0 to 2 percent slopes	117	IIw-3	13
Ju	Joliet silt loam	118	IVw-2	20
KbA	Kibbie fine sandy loam, 0 to 2 percent slopes	119	IIw-3	13
KbB	Kibbie fine sandy loam, 2 to 6 percent slopes	119	IIw-6	14
KeA	Kibbie silt loam, 0 to 2 percent slopes	119	IIw-3	13
KfA	Kibbie fine sandy loam, moderately shallow variant, 0 to 2 percent slopes	120	IIw-3	13
KhA	Kibbie silt loam, acid variant, 0 to 2 percent slopes	120	IIw-3	13
La	Lenawee silt loam	121	IIw-5	14
Lc	Lenawee silty clay loam	121	IIw-5	14
LeA	Lewisburg silt loam, 0 to 2 percent slopes	122	I-1	10
LeB	Lewisburg silt loam, 2 to 6 percent slopes	122	IIe-1	11
LgA	Lewisburg silt loam, moderately shallow variant, 0 to 2 percent slopes	122	IIs-3	15
LgB	Lewisburg silt loam, moderately shallow variant, 2 to 6 percent slopes	123	IIe-3	12
LgC	Lewisburg silt loam, moderately shallow variant, 6 to 12 percent slopes	123	IIIe-3	16
Lm	Lobdell silt loam	123	IIw-7	14
LoA	Loudonville loam, 0 to 2 percent slopes	124	IIs-3	15
LoB	Loudonville loam, 2 to 6 percent slopes	124	IIe-3	12
LoC	Loudonville loam, 6 to 12 percent slopes	124	IIIe-3	16
Ma	Made land	124	-----	--
MfA	Mahoning loam, 0 to 2 percent slopes	125	IIIw-3	17
MgA	Mahoning silt loam, 0 to 2 percent slopes	125	IIIw-3	17
MgB	Mahoning silt loam, 2 to 6 percent slopes	125	IIIw-3	17
MhA	Mahoning stony silt loam, 0 to 2 percent slopes	126	IIIw-3	17
MkA	Mahoning loam, sandstone substratum, 0 to 2 percent slopes	126	IIIw-3	17
MlA	Mahoning silt loam, shale substratum, 0 to 2 percent slopes	126	IIIw-3	17
Mm	Marsh	126	-----	--
Mn	Mermill silt loam	127	IIw-5	14
Mo	Mermill silty clay loam	127	IIw-5	14
MrA	Metea loamy fine sand, 0 to 2 percent slopes	128	IIs-1	14
MrB	Metea loamy fine sand, 2 to 6 percent slopes	128	IIs-1	14
MrC	Metea loamy fine sand, 6 to 12 percent slopes	128	IIIe-1	16
Ms	Millgrove loam	129	IIw-5	14
Mt	Millgrove silty clay loam	129	IIw-5	14
Mu	Millsdale silt loam	129	IIIw-6	18
Mv	Millsdale silty clay loam	129	IIIw-6	18
Mw	Miner silty clay loam	130	IIIw-7	18

GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Described on page	Capability unit Symbol	Capability unit Page
MxA	Mitiwanga loam, 0 to 2 percent slopes	131	IIw-2	12
OaB	Oakville loamy fine sand, 2 to 6 percent slopes	131	IVs-1	21
OaC	Oakville loamy fine sand, 6 to 12 percent slopes	131	IVs-1	21
OaE	Oakville loamy fine sand, 12 to 25 percent slopes	131	IVs-1	21
Or	Orrville silt loam	132	IIw-1	12
OsA	Oshtemo loamy sand, 0 to 2 percent slopes	133	IIIs-1	19
OsB	Oshtemo loamy sand, 2 to 6 percent slopes	133	IIIs-1	19
OtA	Oshtemo sandy loam, 0 to 2 percent slopes	133	IIIs-1	19
OtB	Oshtemo sandy loam, 2 to 6 percent slopes	133	IIIs-1	19
Pc	Pewamo silty clay loam	134	IIw-5	14
Pe	Pewamo silty clay	134	IIIw-5	18
Ph	Pewamo silty clay loam, limestone substratum	134	IIw-5	14
PmA	Prout loam, 0 to 2 percent slopes	135	IIIw-4	17
PrA	Prout channery loam, 0 to 2 percent slopes	135	IIIw-4	17
PsA	Prout loam, brown subsoil variant, 0 to 2 percent slopes	136	IIs-3	15
PsB	Prout loam, brown subsoil variant, 2 to 6 percent slopes	136	IIe-3	12
PuA	Prout silt loam, deep variant, 0 to 2 percent slopes	136	IIw-3	13
PyA	Pyrmont silt loam, 0 to 2 percent slopes	137	IIw-2	12
PzA	Pyrmont silt loam, moderately shallow variant, 0 to 2 percent slopes	137	IIIw-3	17
Qu	Quarries	138	-----	--
RcB	Rawson fine sandy loam, 2 to 6 percent slopes	138	IIe-1	11
RdA	Rawson loam, 0 to 2 percent slopes	138	I-1	10
Rf	Rimer loamy fine sand	139	IIw-3	13
Rg	Rimer fine sandy loam	139	IIw-3	13
RhB	Ritchey loam, 0 to 6 percent slopes	140	IIIs-2	19
RsB	Romeo silt loam, 0 to 6 percent slopes	140	VIs-1	21
RsD	Romeo silt loam, 6 to 18 percent slopes	140	VIs-1	21
RsF	Romeo silt loam, 18 to 50 percent slopes	141	VIIs-1	22
Sa	Sand pits	141	-----	--
ShA	Shinrock loam, 0 to 2 percent slopes	141	I-1	10
SkA	Shinrock silt loam, 0 to 2 percent slopes	142	I-1	10
SkB	Shinrock silt loam, 2 to 6 percent slopes	142	IIe-1	11
SkC2	Shinrock silt loam, 6 to 12 percent slopes, moderately eroded	142	IIIe-2	16
SkD2	Shinrock silt loam, 12 to 18 percent slopes, moderately eroded	142	IVe-1	19
SlE	Shinrock soils, 18 to 25 percent slopes	142	VIe-1	21
SlF	Shinrock soils, 25 to 40 percent slopes	142	VIIe-1	22
Sm	Shoals silt loam	143	IIw-1	12
SnB	Sisson loamy fine sand, 2 to 6 percent slopes	143	IIe-2	11
SoB	Sisson fine sandy loam, 2 to 6 percent slopes	144	IIe-1	11
SoC2	Sisson fine sandy loam, 6 to 12 percent slopes, moderately eroded	144	IIIe-1	16
SsB	Sisson silt loam, 2 to 6 percent slopes	144	IIe-1	11
SsC2	Sisson silt loam, 6 to 12 percent slopes, moderately eroded	144	IIIe-1	16
SsD2	Sisson silt loam, 12 to 18 percent slopes, moderately eroded	144	IVe-2	19
SsD3	Sisson silt loam, 12 to 18 percent slopes, severely eroded	144	IVe-2	19
SsE2	Sisson silt loam, 18 to 25 percent slopes, moderately eroded	145	VIe-1	21
StF	Sisson soils, 25 to 50 percent slopes	145	VIIe-1	22
Sv	Sloan silt loam	145	IIIw-1	17
Ta	Tawas muck	146	IVw-3	20
Tc	Toledo silty clay loam	146	IIIw-5	18
To	Toledo silty clay	147	IIIw-5	18
Tp	Toledo silty clay, calcareous variant	147	IIIw-5	18
Tr	Trumbull silt loam	148	IIIw-7	18
TsA	Tuscola loamy fine sand, 0 to 2 percent slopes	148	I-1	10
TuA	Tuscola fine sandy loam, 0 to 2 percent slopes	149	I-1	10
TuB	Tuscola fine sandy loam, 2 to 6 percent slopes	149	IIe-1	11
TwA	Tuscola silt loam, 0 to 2 percent slopes	149	I-1	10
TwB	Tuscola silt loam, 2 to 6 percent slopes	149	IIe-1	11
Va	Vaughnsville loam	150	IIw-3	13
Wa	Warners soils	150	IVw-3	20
Wc	Warners soils, clayey subsoil variant	150	IVw-3	20
Wh	Washtenaw soils	151	IIw-3	13
Wn	Wayland silt loam	152	IIIw-1	17
Wo	Wilmer loam	152	IIw-4	13

Accessibility Statement

This document is not accessible by screen-reader software. The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at (800) 457-3642 or by e-mail at ServiceDesk-FTC@ftc.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at http://offices.sc.egov.usda.gov/locator/app.

Nondiscrimination Statement

Nondiscrimination Policy

The U.S. Department of Agriculture (USDA) prohibits discrimination against its customers, employees, and applicants for employment on the basis of race, color, national origin, age, disability, sex, gender identity, religion, reprisal, and where applicable, political beliefs, marital status, familial or parental status, sexual orientation, whether all or part of an individual's income is derived from any public assistance program, or protected genetic information. The Department prohibits discrimination in employment or in any program or activity conducted or funded by the Department. (Not all prohibited bases apply to all programs and/or employment activities.)

To File an Employment Complaint

If you wish to file an employment complaint, you must contact your agency's EEO Counselor (http://directives.sc.egov.usda.gov/33081.wba) within 45 days of the date of the alleged discriminatory act, event, or personnel action. Additional information can be found online at http://www.ascr.usda.gov/complaint_filing_file.html.

To File a Program Complaint

If you wish to file a Civil Rights program complaint of discrimination, complete the USDA Program Discrimination Complaint Form, found online at http://www.ascr.usda.gov/complaint_filing_cust.html or at any USDA office, or call (866) 632-9992 to request the form. You may also write a letter containing all of the information requested in the form. Send your completed complaint form or letter by mail to U.S. Department of Agriculture; Director, Office of Adjudication; 1400 Independence Avenue, S.W.; Washington, D.C. 20250-9419; by fax to (202) 690-7442; or by email to program.intake@usda.gov.

Persons with Disabilities

If you are deaf, are hard of hearing, or have speech disabilities and you wish to file either an EEO or program complaint, please contact USDA through the Federal Relay Service at (800) 877-8339 or (800) 845-6136 (in Spanish).

If you have other disabilities and wish to file a program complaint, please see the contact information above. If you require alternative means of communication for

program information (e.g., Braille, large print, audiotape, etc.), please contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

Supplemental Nutrition Assistance Program

For additional information dealing with Supplemental Nutrition Assistance Program (SNAP) issues, call either the USDA SNAP Hotline Number at (800) 221-5689, which is also in Spanish, or the State Information/Hotline Numbers (http://directives.sc.egov.usda.gov/33085.wba).

All Other Inquiries

For information not pertaining to civil rights, please refer to the listing of the USDA Agencies and Offices (http://directives.sc.egov.usda.gov/33086.wba).

program information (e.g., Braille, large print, audiotape, etc.), please contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

Supplemental Nutrition Assistance Program

For additional information dealing with Supplemental Nutrition Assistance Program (SNAP) issues, call either the USDA SNAP Hotline Number at (800) 221-5689, which is also in Spanish, or the State Information/Hotline Numbers (http://directives.sc.egov.usda.gov/33085.wba).

All Other Inquiries

For information not pertaining to civil rights, please refer to the listing of the USDA Agencies and Offices (http://directives.sc.egov.usda.gov/33086.wba).