SOIL SURVEY

Ross County Ohio

Issued November 1967

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
OHIO DEPARTMENT OF NATURAL RESOURCES
Division of Lands and Soil
and
OHIO AGRICULTURAL EXPERIMENT STATION

Major fieldwork for this soil survey was done in the period 1952–1959. Soil names and descriptions were approved in 1965. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1959. This survey was made cooperatively by the Soil Conservation Service and the Ohio Department of Natural Resources, Division of Lands and Soil, and the Ohio Agricultural Experiment Station. It is part of the technical assistance furnished to the Ross County Soil Conservation District.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY of Ross County, Ohio, contains information that can be applied in managing farms, and woodlands; in selecting sites for roads, ponds, buildings, and other structures; and in appraising the value of tracts of land for agriculture, industry, or recreation.

Locating Soils

All the soils of Ross County are shown on the detailed map at the back of this survey. This map consists of many sheets that are made from aerial photographs. Each sheet is numbered to correspond with numbers 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 also the page for the capability unit and woodland group in which the soil has been placed.

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

Farmers and those who work with farmers can learn about use and management of the soils in the section describing the soils and the section that discusses management of soils for cultivated crops and pasture.

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

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

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

Engineers and builders will find under "Use of Soils in Engineering" 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 Soils."

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

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

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NOTICE TO LIBRARIANS

Series year and series number are no longer shown on soil surveys. See explanation on the next page.

Issued November 1967

EXPLANATION

Series Year and Series Number

Series year and number were dropped from all soil surveys sent to the printer after December 31, 1965. Many surveys, however, were then at such advanced stage of printing that it was not feasible to remove series year and number. Consequently, the last issues bearing series year and number will be as follows:

Series 1957, No. 23, Las Vegas and Eldorado Valleys Area, Nev.
Series 1958, No. 34, Grand Traverse County, Mich.
Series 1959, No. 42, Judith Basin Area, Mont.
Series 1960, No. 31, Elbert County, Colo. (Eastern Part)
Series 1961, No. 42, Camden County, N.J.
Series 1962, No. 13, Chicot County, Ark.
Series 1963, No. 1, Tippah County, Miss.

Series numbers will be consecutive in each series year, up to and including the numbers shown in the foregoing list. The soil survey for Tippah County, Miss., will be the last to have a series year and series number.

SOIL SURVEY OF ROSS COUNTY, OHIO

BY JAMES H. PETRO, OHIO DEPARTMENT OF NATURAL RESOURCES, AND WILLIAM H. SHUMATE AND MARION F. TABB, SOIL CONSERVATION SERVICE

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OHIO DEPARTMENT OF NATURAL RESOURCES, DIVISION OF LANDS AND SOIL, IN COOPERATION WITH UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, AND OHIO AGRICULTURAL EXPERIMENT STATION

ROSS COUNTY is in the south-central part of Ohio (fig. 1). It has a total land area of 687 square miles, or 439,680 acres. Chillicothe, the county seat and largest town, is centrally located in the county and lies about 45 miles south of Columbus, the State capital. In 1960 the population of the county was 61,215, and that of Chillicothe was 24,957.

Most of Ross County is used for farming. Corn, soybeans, wheat, oats, and hay are the principal crops. In some areas lumbering is important, especially in the southern part of the county. Industrial plants that produce mainly paper, aluminumware, and shoes are located in Chillicothe.

How This Survey Was Made

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

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

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

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Miami and Celina, 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 go with their behavior in the natural, untouched landscape. Soils of one series can differ somewhat in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man.

Many soil series contain soils that differ in the texture of their surface layer. According to such differences in texture, separations called soil types are made. Within a series, all the soils having a surface layer of the same texture belong to one soil type. Fox silt loam and Fox

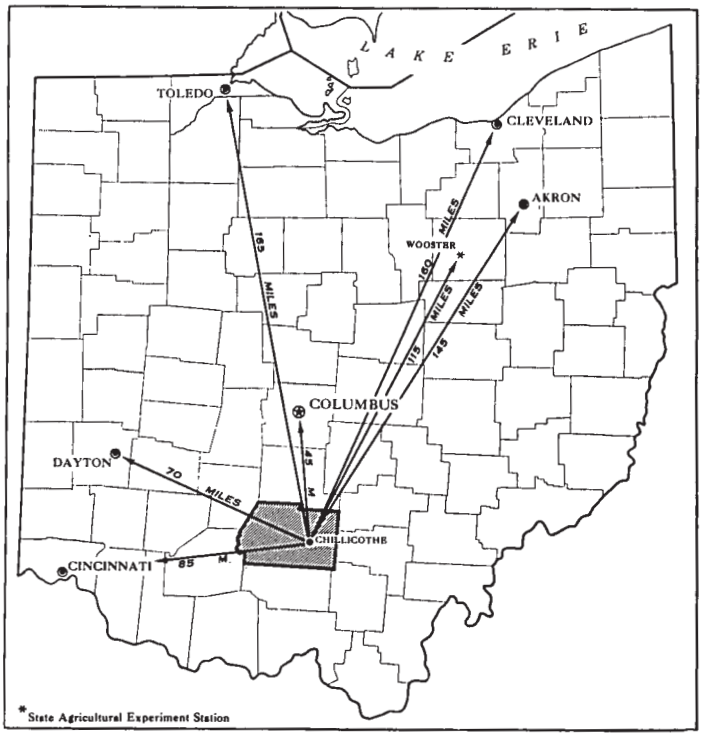

Figure 1.—Location of Ross County in Ohio.

loam are two soil types in the Fox series. The difference in texture of their surface layers is apparent from their names.

Some types vary so much in slope, degree of erosion, number and size of stones, or some other feature affecting their use, that practical suggestions about their management could not be made if they were shown on the soil map as one unit. Such soil types are divided into phases. The name of a soil phase indicates a feature that affects management. For example, Miami silt loam, 2 to 6 percent slopes, is one of several phases of Miami silt loam, a soil type that ranges from gently sloping to steep.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that greatly help in drawing boundaries accurately. The soil map in the back of this survey was prepared from the aerial photographs.

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

In preparing some detailed maps, the soil scientists have a problem of delineating areas where different kinds of soils are so intricately mixed and so small in size that it is not practical to show them separately on the map. Therefore, they show this mixture of soils as one mapping unit and call it a soil complex. Ordinarily, a soil complex is named for the major kinds of soil in it, for example, Rodman-Lorenzo complex, 25 to 50 percent slopes.

The undifferentiated soil group is another group of soils that is mapped as a single mapping unit. The soils in this kind of group do not occur in regular geographic association. An example of an undifferentiated soil group is Fox and Warsaw soils, 12 to 18 percent slopes, moderately eroded.

Also, on most soil maps, areas are shown that are so rocky, so shallow, or so frequently worked by wind and water that they scarcely can be called soils. These areas are shown on a soil map like other mapping units, but they are given descriptive names, such as Riverwash, and are called land types rather than soils.

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

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 a way that it is readily useful to different groups of readers, among them farmers, ranchers, managers of woodland, engineers, and homeowners. Grouping soils that are similar in suitability for each specified use is the method of organization commonly used in the soil survey. On basis of the yield and practice tables and other data, the soil scientists set up trial groups, and they test these by further study and by consultation with farmers, agronomists, engineers, and others. Then, the scientists adjust the groups according to the results of their studies and consultations. 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 report shows, in color, the soil associations in Ross County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

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

The 12 soil associations in Ross County are described briefly in this section. Of the 12 associations, seven consist of soils that developed in glacial material of Wisconsin age. These soils are on uplands, moraines, flood plains, and outwash terraces or in basins of former lakes. Two of the associations are made up of soils that developed in glacial deposits of Illinoian age, and three consist of soils that occur in unglaciated areas of the county or in areas where the glacial age is difficult to determine.

1. Miami-Celina Association

Deep, gently sloping to steep, well drained and moderately well drained soils on uplands; developed in calcareous glacial till of Wisconsin age

This soil association occupies many scattered areas on uplands in the northern and western parts of the county. Some of the association lies on the relatively smooth glacial till plain, but most of it is on the higher, rougher Allegheny Plateau and on hummocky glacial moraines.

The well drained Miami soils and the moderately well drained Celina soils are dominant in this association. The Miami soils make up about 50 percent of the total acreage, and the Celina soils, about 30 percent. Also in the association are areas of Crosby and Brookston soils, and there are small areas of Fox, Kendallville, Genesee, and Eel soils.

Except in the steeper areas, the soils of this association have a moderately thick root zone, have moderate avail-

able moisture capacity, and are fairly high in natural fertility. Crops respond well to lime and fertilizer. Consequently, the soils are among the most productive in the county.

The dominant soils are well suited to cultivated crops, and most of the association is cleared. Forested areas are mainly small woodlots on farms. The major farming enterprises are livestock raising and general farming, but some farmers are engaged in dairying.

The Miami and Celina soils have few characteristics that limit their use as building sites. Using the soils for home septic tanks is severely limited, however, because the underlying glacial till is moderately slow in its permeability to sewage effluent.

2. Crosby-Brookston Association

Deep, somewhat poorly drained and very poorly drained soils on uplands; developed in calcareous glacial till of Wisconsin age

This soil association consists mainly of nearly level areas west of the Scioto River in the northern part of the county. The somewhat poorly drained Crosby soils and the very poorly drained Brookston soils are dominant. The Crosby soils account for about 40 percent of the acreage, and the Brookston soils, about 35 percent. Also in the association are areas of Celina and Miami soils on uplands and small areas of Genesee and Eel soils on flood plains along streams.

If the soils of this association are adequately drained, they are among the most productive in the county. Slopes are mild, the root zone is thick, the available moisture capacity is high, and natural fertility is relatively high. Crops respond well to lime and fertilizer. The Brookston soils are especially productive.

Farms on this association are mainly of the livestock or general type, and farming is at a fairly high level. Practically all the land is cleared, and the only wooded areas are small woodlots on farms.

The Crosby and Brookston soils have moderate or severe limitations that affect their use as building sites. Because the soils are not well drained and are underlain by moderately slowly permeable glacial till, they have severe limitations affecting use for the disposal of sewage effluent from septic tanks.

3. Genesee-Fox Association

Nearly level to steep soils on flood plains and outwash terraces of Wisconsin age

This soil association occupies the valleys of the Scioto River, Paint Creek, and many of their tributaries that head in the Wisconsin glaciated area. Except on escarpments, the relief is nearly level or gently sloping.

Dominant in this association are the well-drained Genesee soils on flood plains and the well-drained Fox soils on adjacent terraces. The Genesee soils account for about 33 percent of the total acreage, and the Fox soils, about 28 percent. Other important soils are the Ross, Westland, Warsaw, and Wea soils on terraces and the Abscota, Eel, Ross, and Shoals soils on flood plains. In addition, there are minor areas of Sleeth, Thackery, Casco, Rodman, Carlisle, Willette, and Warners soils.

The dominant soils of the association have adequate available moisture capacity and are relatively high in natural fertility. Crops respond well to fertilization and liming.

Most of this association is used for livestock and general farming. The soils are among the most productive in the county, but the encroachment of johnsongrass has seriously reduced yields of row crops in recent years. Only a few areas are wooded; these are mainly along the banks of streams and on steep terrace escarpments. Some areas on terraces are used as a source of sand and gravel.

The soils on flood plains have severe limitations that affect their use for building sites and for disposing of sewage effluent from septic tanks. The Fox soils, as well as most other soils on terraces, are underlain by permeable sand and gravel. The well drained and moderately well drained soils on terraces have few characteristics that limit their use for building sites and for the disposal of effluent from septic tanks. Care must be taken, however, to locate wells for household use far enough from sewage systems to prevent contamination of well water.

4. Bonpas Association

Deep, nearly level soils developed in glacial lacustrine silt and silty clay loam of Wisconsin age

This soil association occurs mainly in the basins of former glacial lakes in the northeastern part of the county. The dark-colored, very poorly drained Bonpas soils are dominant and occupy about 75 percent of the acreage. Also in the association are areas of Uniontown and Henshaw soils and small areas of soils on flood plains.

General farming and livestock raising are the main types of farming. If the soils are adequately drained, they are among the most productive in the county and produce favorable yields of all the common crops. Slopes are dominantly mild, the root zone is thick, the available moisture capacity is high, and natural fertility is relatively high.

Because the soils of this association are not well drained, they generally have severe limitations affecting their use as building sites. In addition, using the soils as leaching fields for home septic tanks is severely limited because of slow percolation.

5. Kendallville-Fox-Miami Association

Deep, well-drained soils of the uplands on glacial moraines of Wisconsin age

This soil association is mainly in the northeastern part of the county. It generally occupies higher areas that are hummocky and somewhat rolling.

The well-drained Kendallville, Fox, and Miami soils are dominant. Kendallville soils make up about 50 percent of the association; Fox soils, 25 percent; and Miami soils, 15 percent. Minor areas of Celina, Crosby, and Brookston soils also occur, and there are small areas of soils on alluvial flood plains.

Although the soils of this association are subject to erosion, they are fairly productive in seasons of adequate

rainfall. Inherent fertility is favorable, and the response of crops to fertilization and liming is good. Livestock raising is the most common type of farming, but there are some dairy farms. Of the few scattered areas that remain wooded, most are farm woodlots on rather steep slopes.

Because of rolling relief, the soils in this association have some limitations that restrict their use as building sites. Where drainage is good and the underlying material is gravel and sand, the soils have few characteristics limiting their use for home septic tanks, but care must be taken not to locate the leaching fields too near water wells.

6. Cana-Miami Association

Deep soils in the Wisconsin glacial area of the uplands; underlain by material weathered from acid shale

This soil association lies in the Wisconsin glacial area of the Allegheny Plateau. Generally, it is underlain by weathered acid shale within 40 inches of the surface. Most areas are forested.

By far the largest part of the association consists of the well-drained Cana soils, which account for about 60 percent of the acreage. The well-drained Miami soils occupy about 20 percent of the total area. Colyer soils also are important, though they do not occur east of the Scioto River valley. In addition, there are small areas of Loudonville, Celina, and Crosby soils and of various alluvial soils on flood plains.

The Cana soils are less suitable for farming than the Miami soils. They are steeper, are lower in natural fertility, and have lower available moisture capacity. And because the Cana soils make up so much of the total area, only a few farms on the association are used for intensively tilled crops.

Few limitations except slope restrict the use of soils in this association as building sites, but slow permeability severely limits use of the soils for disposing of sewage effluent from septic tanks.

7. Cana-Rossmoyne-Latham Association

Soils of uplands in the Illinoian glacial area of the Allegheny Plateau

This soil association lies on the Allegheny Plateau and consists of valleys and ridges in which there is a great range in elevation. The association is made up of many soils that have widely contrasting characteristics.

Dominant are the Cana, Rossmoyne, and Latham soils. The Cana soils occupy about 40 percent of the acreage; Rossmoyne soils, about 30 percent; and Latham soils, about 15 percent. Smaller acreages are in Muskingum, Neotoma, and Colyer soils, and there are minor areas of Hickory, Avonburg, Clermont, and Loudonville soils and of various soils on flood plains along streams. All the Colyer soils are west of the Scioto River valley.

The Rossmoyne, Avonburg, and Clermont soils are well suited to cultivated crops, but other soils in the association have characteristics that make them undesirable for cultivation. They are steep, highly susceptible to erosion, low in inherent fertility, unfavorable in reaction, or low in available moisture capacity. Some of the soils have more than one of these undesirable features. The Cana and Latham soils are well suited to plants used for pasture.

Farms on this association are mainly of the general type, and many are farmed only part time.

The soils vary widely in degree of limitations affecting their use as building sites. In most of the soils, use for disposing of sewage effluent from septic tanks is limited mainly by slow permeability and steep slopes.

8. Alexandria-Fox Association

Soils of uplands in the Wisconsin glacial area in Paint Valley

This soil association consists of soils in Paint Valley that are underlain by glacial drift of Wisconsin age. The dominant soils vary widely in slope, though all are well drained.

Alexandria and Fox soils are the main soils, but there are smaller acreages of Cana, Cardington, Casco, Warsaw, Lorenzo, Kendallville, Negley, Parke, and Rodman soils. Alexandria soils make up about 50 percent of the association, and Fox soils, about 30 percent. Most of the acreage is in forest or permanent pasture. Owing largely to unfavorable slope, the soils are subject to erosion if cultivated.

Farming on the association is diversified, but the farms are mainly of the general type. Most of them are not intensively cropped.

Except in nearly level and gently sloping areas, the use of soils in this association as building sites is limited by slope. In areas underlain by sand and gravel, there are few limitations other than slope that restrict use of the soils for septic tanks. To avoid contamination of well water, leaching fields should be located at a safe distance from wells.

9. Parke-Rainsboro-Negley-Pike Association

Deep soils on glacial terraces of Illinoian age

This soil association is in valleys and consists of deep soils that formed on glacial terraces of Illinoian age. Except along sloping to steep escarpments, the soils are nearly level or gently sloping.

Dominant in the association are the Parke, Rainsboro, Negley, and Pike soils. Parke soils account for about 30 percent of the total acreage; Rainsboro soils, about 25 percent; Negley soils, about 20 percent; and Pike soils, about 15 percent. The Parke, Negley, and Pike soils are well drained, and the Rainsboro soils are moderately well drained.

Minor soils are the well-drained Fox and Alvin soils, the somewhat poorly drained Bartle soils, and other soils.

In most areas the soils of this association are suitable for farming and are among the most productive in the county (fig. 2). Crops respond to good management, and erosion is a problem only on escarpments. Livestock raising and general farming are the leading farm enterprises.

Figure 2.—**Farming on soils of the Parke-Rainsboro-Negley-Pike soil association.**

Except in steep areas, the dominant soils have few characteristics that limit their use as building sites, and they are sufficiently permeable for disposing of sewage effluent from septic tanks. However, the more poorly drained soils have severe limitations for these uses.

10. Latham-Muskingum Association

Dominantly moderately deep to shallow, steep, well-drained, locally stony soils in unglaciated areas of the Allegheny Plateau

This soil association is made up chiefly of forested soils. The Latham and Muskingum soils are dominant, but the Rarden and Coolville soils also are important. Latham soils occupy about 50 percent of the total area; Muskingum soils, about 20 percent; and Rarden and Coolville soils together, about 15 percent. Also, there are minor areas of Fawcett, Monongahela, Pope, Philo, Stendal, and other soils.

The Latham and Muskingum soils are steep, acid, low in inherent fertility, and moderate to low in available moisture capacity. Consequently, they are poorly suited to cultivated crops and are used mainly as woodland. The Coolville soils are better suited to crops because they are deeper and not so steep, but they need fairly large amounts of amendments for satisfactory yields. Nearly all the acreage of Rarden and Coolville soils is west of the Scioto River, and most of the acreage in Muskingum soils is east of it.

Farms on this dominantly forested association are mainly general farms. Many are operated at a low or average level of management. Productivity generally is low.

Shallowness to bedrock is a limitation that affects use of the major soils as building sites, except on narrow ridgetops where the soils are deeper. Using soils of the association for the disposal of sewage effluent from septic tanks generally is limited by shallowness, a slowly permeable soil layer, or both.

11. Bartle-Pekin-Markland Association

Soils on glacial lacustrine terraces of Wisconsin age

The largest areas of this soil association are in the valley of Salt Creek, but smaller areas are scattered in the valleys of Paint Creek and the Scioto River.

Dominant are the Bartle and Pekin soils, which developed in acid, silty lacustrine material on low terraces, and the Markland soils, which developed in calcareous, clayey lacustrine material on remnants of slightly higher terraces. The Bartle soils account for about 30 percent of the total acreage, the Pekin soils, about 24 percent, and the Markland soils, about 24 percent. The association also includes small areas of McGary and Bonpas soils on the higher terraces, Mentor soils on low terraces, and various alluvial soils on flood plains.

Except on terrace escarpments, the soils of this association have favorable slopes for crops. The root zone is thick, the available moisture capacity is adequate, natural fertility is medium to high, and crops respond to good management. In the Bartle, McGary, and Bonpas soils, artificial drainage is needed for satisfactory yields.

Farming on this association is diversified but is chiefly livestock raising and general farming. Practically all the acreage has been cleared and is used for crops.

Using the Bartle, Markland, and McGary soils as building sites or for disposing of sewage effluent from septic tanks is limited by the tight clay subsoil and underlying material. The Pekin soils have only slight limitations for such uses.

12. Monongahela-Cruze-Pope Association

Soils on terraces and flood plains in unglaciated valleys

This soil association occupies a small total area in the county. About 55 percent of it consists of Monongahela soils, which occur on terraces. The Cruze soils make up about 20 percent of the association and lie at the base of steep slopes and on stream fans. The Pope soils make up about 15 percent and are on flood plains. In addition, there are small areas of Philo and Stendal soils.

Although the soils of this association are low in natural fertility, they are mainly nearly level or gently sloping, are in favorable tilth, and have adequate available moisture capacity. Crops respond exceptionally well to lime and fertilizer, but rather large applications of lime are needed.

All but a small part of the association is cleared and farmed, though many areas are idle. Most of the farms are of the general type and are operated at a low or average level of management. Productivity is low to moderate.

Generally, the soils have limitations that restrict their use as building sites and for the disposal of sewage effluent from home septic tanks. The Monongahela soils contain a hard fragipan, and the Pope, Philo, and Stendal soils are subject to flooding.

Use and Management of Soils

The first part of this section describes the grouping of soils according to their capability and discusses the capability units in Ross County. In the second part, estimated acre yields are given for the principal crops under two levels of management. The third part describes the suitability of soils for irrigation. Next are discussions on the use of soils as woodland, for wildlife, and in engineering. Finally, there is a part that gives information about soils and land-use planning.

Capability Groups of Soils

Capability classification is the grouping of soils to show, in a general way, their suitability for most kinds of farming. It is a practical classification based on limitations of the soils, the risk of damage when they are used, and the way they respond to treatment. The soils are classified according to degree and kind of permanent limitation, but without consideration of major and generally expensive landforming that would change the slope, depth, or other characteristics of the soils; and without consideration of possible but unlikely reclamation projects.

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

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

Class I. Soils have few limitations that restrict their use.

Class II. Soils have some limitations that reduce the choice of plants or 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 restrict the choice of plants, require very careful management, or both.

Class V. Soils subject to little or no erosion but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife food and cover. (In Ross County there are no soils in class V.)

Class VI. Soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife food and cover.

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

Class VIII. Soils and landforms have limitations that preclude their use for commercial plant production and restrict their use to recreation, wildlife, or water supply, or to esthetic purposes. (In Ross County there are no soils in class VIII.)

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

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

Capability Units are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about the management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe–2 or IIIe–4. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation, and the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph. The Arabic numeral specifically identifies the capability unit within each subclass.

Management by capability units

In this subsection each capability unit in Ross County is described, and use and management are discussed. The names of soil series represented are mentioned in the description of each capability unit, but this does not mean that all the soils of a given series appear in the unit. To find the names of all the soils in any given capability unit, refer to the "Guide to Mapping Units" at the back of this survey.

Of the soils in the county that are suitable as cropland, the hazard of erosion is the main limitation on about 53 percent of the acreage; wetness is the main limitation on 40 percent; and droughtiness or shallowness is the main limitation on 4 percent. About 3 percent of the total area suitable for cropping is made up of soils in capability class I, in which there are few or no limitations that restrict use. Of the entire county, risk of erosion is the main limitation on about 60 percent of the acreage; wetness, about 27 percent; and droughtiness, shallowness, or stoniness, about 13 percent.

CAPABILITY UNIT I–1

This unit consists of nearly level, well drained or moderately well drained soils on uplands and terraces. These soils are friable, are moderately slowly or moderately permeable to air and moisture, and have moderate to high available moisture capacity. Their surface layer has a medium supply of organic matter. Erosion is slight or none. Except where they have been limed, the soils are acid. They are of the Celina, Kendallville, Mentor, Ockley, Pike, Thackery, Uniontown, and Wea series.

The soils in this unit can be cropped intensively if they are well managed, but they generally are low in phospho-

rus and low to medium in potassium. They require additions of lime. Practices are needed that maintain fertility, good tilth, and the supply of organic matter. Unless minimum tillage and green-manure crops are used, the rotation should include at least 1 year of hay or meadow every 4 years. If the level of productivity is high, a green-manure crop can be substituted for the meadow.

Tile drainage is not needed in areas used for ordinary field crops, but it is desirable in some places where specialty crops of high value are grown, especially in areas of moderately well drained Celina, Thackery, and Uniontown soils.

If the soils in this unit are adequately limed and fertilized, they can produce good pasture, though pasture normally is not grown on them. Ordinarily, trees are not planted on these soils.

CAPABILITY UNIT IIe–1

This unit consists of gently sloping, moderately well drained to well drained soils on uplands and terraces. The Cardington, Celina, Kendallville, and Miami soils are underlain by calcareous glacial till at a depth of 20 to 40 inches. Ockley, Thackery, and Wea soils have calcareous sand or gravel at a depth of 40 to 60 inches. Underlying the Mentor and Uniontown soils is medium-textured alluvial material. The Alvin, Parke, and Pike soils overlie sand or gravel, which is at a depth exceeding 60 inches. The Fox soils are underlain by gravel and sand at a depth of 40 inches or less; they tend to be more droughty than other soils in the unit.

The soils of this unit are acid in the surface layer and upper subsoil, except in areas that have been limed, and they are naturally low in plant nutrients. Erosion is a problem in cultivated fields unless runoff is controlled.

On slopes more than 150 feet long that are not broken by diversion terraces, hay or pasture needs to be grown 2 years in each 5 years. If long slopes are stripcropped and cultivated on the contour, 2 years of row crops and 1 year of small grain can safely be grown in each 4-year rotation.

On slopes less than 150 feet long, hay or pasture is needed 1 year out of every 4 if no other erosion control practices are used. If these short slopes are terraced or farmed in strips on the contour, a grass or legume catch crop, seeded in a small-grain crop grown once every 3 years, is needed to help control erosion. Tillage should be on the contour or parallel to the terraces. The Alvin soil has a sandy surface layer and is likely to be eroded by wind if left bare for a long period.

Outlet waterways should be constructed and sodded before field terraces or diversion terraces are built. In fields that are not terraced, sodded waterways should be established wherever water concentrates and flows in natural drainageways.

By fertilizing, liming, and seeding to a suitable mixture, favorable yields of hay or pasture can be obtained on these soils. Alfalfa does well if it is fertilized regularly.

CAPABILITY UNIT IIe–2

In this unit are gently sloping, moderately well drained or well drained soils on uplands and terraces. These soils have a moderately thick root zone, but their lower subsoil either is fine textured or has a fragipan and is slowly permeable to air and moisture. The upper subsoil is moderately permeable. Except in fields that have been limed, the soils are acid. Their content of plant nutrients is naturally rather low. Unless runoff is controlled, erosion is likely in areas used for crops. Surface drainage is moderate, and crusting is likely as the surface dries. The soils are of the Cana, Coolville, Cruze, Monongahela, Pekin, Rainsboro, and Rossmoyne series.

These soils generally are used for crops, but they also are suited to pasture and meadow. In fields that are terraced or farmed on the contour, the rotation should include 1 year of pasture or meadow every 3 years. In fields where neither terracing nor stripcropping is used to control erosion, meadow should be grown 3 years out of 5.

Cultivating on the contour is effective in checking soil losses on relatively short slopes. Crop rows should be on a slight grade to improve surface drainage. Erosion on long, uniform slopes can be controlled by terracing, but outlets should be constructed and protected with grass before the terraces are built. Keeping natural waterways in sod prevents gullying. Tile drains may be needed in scattered wet spots and along natural drainageways so that fields can be tilled evenly.

Meadow should be adequately limed and fertilized and then planted to grasses and legumes that are suited to moderately well drained soils on uplands. Grazing early in spring is not desirable on these soils because of wetness.

CAPABILITY UNIT IIw–1

This unit consists of level or nearly level, somewhat poorly drained soils on bottom lands that are wet part of the year. These soils are of the Algiers, Shoals, Stendal, and Wallkill series. They are likely to be flooded at times and, unless drained, may be covered by standing water for a while. The hazard of flooding varies from one area to another. These soils have a surface layer that tends to puddle or to get cloddy if tilled or pastured when wet. In undrained areas the response of crops to fertilization is limited. Except for the Stendal soil, the soils of the unit generally are not acid. The Wallkill soil is underlain, at a depth of 12 inches or more, by deposits of unstable muck that make the management of this soil a special problem.

In areas where flooding is only infrequent, the soils of this unit can be used mainly for row crops. If possible, however, the cropping system should include cover crops and green-manure crops. Where production is at a high level, cover crops that are frequently plowed down can be substituted for pasture or meadow in the rotation.

Shallow ditches help to improve surface drainage, especially in low areas. If tiling is feasible, a complete system of tile lines will increase productivity in most areas. Levees can be used in some places to protect fields from floodwater. Diversion terraces intercept runoff from higher slopes.

Pasture normally is good on these soils and is productive in dry periods. Frequent mowing controls weeds and keeps grasses from smothering legumes. Planting mix-

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tures should consist of at least one grass and one legume suited to wet soil. Although lime is seldom needed, except on the Stendal soil, fertilizer should be applied in amounts determined by soil tests. For draining permanent pasture, tile may not be economically feasible, but furrows or shallow ditches generally remove enough water to improve production.

CAPABILITY UNIT IIw–2

This unit is made up of nearly level and gently sloping, somewhat poorly drained soils of the Crosby, Henshaw, Sleeth, and Taggart series. These soils have a grayish surface layer that is medium to low in organic-matter content. Water and air movement is restricted; water moves slowly through the clayey subsoil; and the soils are likely to puddle and to clod if they are worked when wet. A high water table occurs during and after wet periods. The surface may crust when dry. The soils are naturally low in phosphorus and potassium, and they are acid except where sufficient lime has been applied.

Tile lines, improved surface drainage, or both, are needed for the successful management of farm crops on these soils. In most areas a complete system of tile is suitable if it is properly installed. Ditches that drain the surface may be useful, especially in areas where water ponds. On slopes of 2 percent or more, practices are needed for erosion control.

In gently sloping areas, the rotation needs to include 1 year of meadow every 3 or 4 years, or there should be 2 years of meadow in each 5-year rotation. Meadow helps to maintain good tilth and a supply of organic matter, and it aids in controlling erosion. Areas having slopes of less than 2 percent can be row cropped annually if minimum tillage is used and if a green-manure crop is grown every 2 or 3 years.

If a field is contour farmed, the crop rows should be on a slight grade that permits excess surface water to run off safely. Establish sodded waterways in places where water concentrates and flows across a field, and lay out the crop rows on a gentle grade toward the waterways. Waterway channels should be smooth and wide enough to carry away the runoff from the most severe storms. Fertilize and mow the waterways to help maintain a dense sod.

In areas that are adequately drained by tiling or ditching, the pasture mixture should be one that is suitable for drained soils. In places where drainage cannot readily be improved, a water-tolerant grass should be planted. Reed canarygrass grows well in such places, but it needs to be mowed regularly so that is does not get coarse and unpalatable. In areas planted to meadow, it is desirable that the mixture include a species suited to poorly drained soils; for an area may be occasionally wet, even after it is artificially drained. If the expected use of an area is permanent pasture that does not justify the expense of systematic tiling, draining the surface with furrows and shallow ditches may be useful.

CAPABILITY UNIT IIw–3

The soils in this unit are dark colored, level or nearly level, and poorly drained or very poorly drained. They occur on terraces and in depressional or basinlike areas on uplands. Their subsoil normally is highly mottled with grayish colors and has moderate to moderately slow permeability. Except in areas that are artificially drained, the water table is at or near the surface during wet periods, most commonly late in winter and in spring. Surface runoff is slow or, in some areas, is ponded. These soils are the most naturally fertile in the county, but lime and fertilizer, applied in amounts indicated by soil tests, are needed for the most favorable yields of crops. The soils are of the Bonpas, Brookston, Millsdale, and Westland series.

These soils are likely to puddle and clod if they are worked when too wet. Continuous row cropping tends to deplete the organic matter and to make the surface layer hard and cloddy. Nevertheless, the soils are very productive under good management.

Improved drainage is needed to lower the water table and thereby to deepen the root zone, especially in fields used for crops. Installing tile drains may be difficult in the Millsdale soil, however, because limestone bedrock underlies that soil at an average depth of 32 inches. Shallow ditches are useful for removing surface water, particularly from ponded areas. Diversion terraces or sodded waterways can be used to divert runoff from adjoining higher slopes.

Areas of these soils that are adequately drained and well managed produce satisfactory yields of small grains and row crops. In the wetter areas, however, wheat is often damaged by excess water in winter and spring. Because the surface layer tends to be more cloddy than that of lighter colored soils nearby, preparing an adequate seedbed is more difficult on these soils and stands of crops are likely to be poorer.

Suitable grasses and legumes grow well if adequate amounts of lime and fertilizer are applied. Grazing pasture when the soils are wet causes serious compaction. Tile drainage may not be economically feasible in areas that are to be used for long-term permanent pasture, but drainage can be considerably improved by use of shallow ditches.

CAPABILITY UNIT IIw–4

This unit consists of nearly level, moderately well drained soils on uplands and terraces. These soils have a fragipan or a restrictive layer in the subsoil that retards the movement of air and water and the penetration of roots. Natural drainage on the surface and in the subsoil is only fair. Tillage may be somewhat delayed in spring because of a temporary perched water table. The soils are of the Markland, Monongahela, Pekin, Rainsboro, and Rossmoyne series.

These soils can be cropped intensively if they are well managed. Returning organic matter regularly and maintaining fertility and good tilth are the major needs. The soils are naturally low in phosphorus and potassium, and they need lime. A suitable rotation includes 1 year of hay or meadow every 3 years. In fields that are highly productive, 1 year of meadow or of a green-manure crop returns a good supply of organic matter to the soil and maintains the favorable tilth that is necessary for satisfactory yields.

Tiling generally is impractical for draining areas used for field crops, but tile lines are needed in some areas that are used to grow specialty crops of high value. In

addition, random tiling is desirable in fields where improved drainage is needed in small wet spots and in wet strips along natural drainageways, for it helps to assure that soil moisture is uniform for tillage operations.

Although the soils of this unit normally are used for crops grown in rotations, they produce good pasture if they are well fertilized and limed.

CAPABILITY UNIT IIw–5

In this unit are nearly level, well drained or moderately well drained soils of the Abscota, Eel, Genesee, Philo, Pope, and Ross series. These soils are likely to be flooded occasionally, and in some areas flooding is a frequent or severe hazard. The likelihood of flooding varies from one area to another. The soils of this unit are friable and have a thick root zone. Except in the Abscota soil, the available moisture capacity is high. The Abscota soil has very low available moisture capacity and is droughty during dry periods in summer. Generally, the Eel and Philo soils are somewhat wet in winter and spring. Natural fertility is fairly high in most of the soils and is highest in the Eel, Genesee, and Ross soils. Unless limed, the Pope and Philo soils are strongly or very strongly acid.

The soils of this unit are used for crops in most areas. They can be row cropped more regularly than most other soils in the county (fig. 3), but the rotation should include cover crops and green-manure crops wherever possible. In places where flooding is infrequent enough that a regular rotation can be followed, growing a sod crop 1 year in 4 will keep the soil in good tilth. If row crops are grown continuously, minimum tillage and the return of crop residue are needed to maintain favorable tilth. Most areas of these soils in the county are infested with johnsongrass.

Flooding on these soils generally does not damage crops significantly. Levees are suitable for preventing stream overflow if the cost can be justified. Diversion terraces constructed along the base of slopes help to divert runoff from adjacent higher slopes. Standing water in low spots can be removed through surface ditches.

Figure 3.—**Corn on Ross silt loam in the valley of Paint Creek.**

Except in spots that are low and wet, tile drains generally are not needed.

The soils of this unit produce more forage in dry weather than most soils on uplands. Frequent mowing is needed to control weeds and to keep grasses from smothering the legumes.

In areas where flooding is a frequent or severe hazard, a permanent cover of trees or of grass should be maintained.

CAPABILITY UNIT IIs–1

The soils in this unit are nearly level, moderately deep, medium textured or moderately coarse textured, and well drained. Their surface layer ranges from silt loam to sandy loam, and their substratum consists of sand and gravel. Water percolates through these soils at a moderate or moderately rapid rate, and the available moisture capacity is low in the gravelly substratum. The surface layer has a low to medium content of organic matter. Little or no erosion is evident. The soils are of the Alvin, Fox, and Warsaw series.

These soils are suited to general farm crops and to specialty crops, both of which can be planted early. The soils are droughty but produce favorable yields of crops that mature ahead of the dry season. Because their texture is favorable and their subsurface drainage is good, the soils are highly suitable for irrigation.

A rotation that includes 1 year of meadow every 4 years will keep these soils in good condition. Where manure and crop residue are used efficiently, droughtiness is somewhat less of a problem. The sandy Alvin soil is subject to wind erosion if it is left bare for a long period.

The soils in this unit are moderately well suited to pasture. If they are well limed and fertilized, grasses and legumes grow well in periods of adequate rainfall. If moisture is inadequate, however, plants are adversely affected sooner on these soils than they are on many other soils in the county. Applying nitrogen to pasture is especially desirable early in spring.

CAPABILITY UNIT IIIe–1

In this unit are sloping, well drained or moderately well drained soils on uplands and terraces. These soils are of the Alexandria, Cardington, Hickory, Kendallville, Miami, and Uniontown series. Most of them are moderately eroded, and a few are severely eroded. All the soils are acid in the upper layers unless they have been limed, and all have a calcareous substratum at some depth. The root zone is friable to firm and moderately thick or thick. The available moisture capacity is moderate or high.

These soils have medium to rapid runoff and, in most places, are moderately susceptible to erosion. But in areas that are continuously cultivated up and down slope, erosion is a severe hazard.

Tillage is more difficult on the moderately eroded soils in this unit than it is on uneroded soils, and it is especially difficult on the Alexandria, Cardington, and Miami soils. In addition, the severely eroded Miami soils are very hard to work. The Kendallville and Miami soils generally are less acid and have a higher content of plant nutrients than the other soils, but adequate

amounts of lime and fertilizer are needed on all the soils.

The soils in this unit are suited to many kinds of crops (fig. 4), and they respond well to good management. In fields that are stripcropped and cultivated on the contour, meadow should be grown at least 3 years in each 5-year rotation. If terraces are used, however, along with stripcropping and contour cultivation, the number of years in meadow can be reduced. An adequate rotation in terraced fields is 2 years of row crops, 1 year of a small grain, and 2 years of meadow.

In fields where terracing is feasible on long and even slopes, the outlets should be built and sodded before the terraces are constructed. Fields having short slopes can be protected from erosion by cultivating on the contour and by laying out crop rows on a slight grade so that surface drainage is improved. Runoff from higher areas can be safely removed in grassed waterways, diversion terraces, or both. Tiling is suitable for draining wet spots and seepy areas in fields.

The soils of the unit are well suited to pasture and, if limed and fertilized, produce a plentiful growth of suitable grasses and legumes. Fertilizing pasture with nitrogen early in spring increases the yield of forage.

CAPABILITY UNIT IIIe-2

In this unit are sloping and gently sloping, well-drained soils of the Alvin, Fox, Milton, and Negley series. These soils occur on terraces and uplands. Sand and gravel underlie all of them but the Milton, which is underlain by limestone bedrock. Most soils in the unit are moderately eroded, and some are sandy or gravelly. Except in fields that have been limed, all the soils are acid in the upper layers. They have low to moderate available moisture capacity and are more droughty than many other soils in the county.

In fields that are terraced, a suitable rotation includes 1 year of meadow every 4 years. If contour cultivation is the only practice used, adequate rotations include 1 year of meadow every 3 years on short slopes and 2 years of meadow every 4 years on long slopes. If fields are neither terraced nor contour cultivated, they can be safely cropped in a rotation consisting of 1 year of a small grain and 1 year or more of meadow.

Figure 4.—Small grain on Miami silt loam, 6 to 12 percent slopes.

In some areas terracing is not feasible, because the soils are shallow to sand, gravel, or underlying bedrock. In fields where terracing is feasible, outlets should be constructed and stabilized with grass before the terraces are built. Runoff from adjoining higher slopes can be safely removed through sodded waterways, which should be large enough to dispose of excess water from the largest storms. Along with seeding and mowing, applications of lime and fertilizer are needed to produce a dense sod in waterways.

These soils are moderately well suited to pasture, but in dry periods they hold a limited amount of moisture available to plants. They produce favorable yields of forage early in spring if nitrogen fertilizer is applied.

CAPABILITY UNIT IIIe-3

This unit consists of medium-textured, well-drained soils in the Alford, Loudonville, Mentor, Negley, Parke, and Wellston series. These soils lie on sloping or rolling uplands and terraces. They have a thick, friable root zone, but they are acid and contain a relatively low supply of plant nutrients throughout. Except for the Negley soil, these soils have moderate to high available moisture capacity. In the Negley soil the available moisture capacity is moderate. Runoff is medium to rapid on all the soils, and erosion is a severe hazard in fields used for cultivated crops.

Because the soils are acid and low in natural fertility, crops respond exceptionally well to large applications of lime and fertilizer. If fields are stripcropped and cultivated on the contour, an adequate rotation includes at least 3 years of meadow in each 5 years. If terraces are used, together with stripcropping and contour cultivation, the frequency of meadow in the rotation can be reduced. A suitable rotation in terraced fields includes 1 year of meadow in every 4.

In areas that feasibly can be terraced, outlets should be built and stabilized with grass before the terraces are constructed. Runoff from higher slopes may be troublesome in some areas but can safely be handled in grassed waterways, diversion terraces, or both.

The soils of this unit are good for pasture. Suitable grasses and legumes grow well if adequate amounts of lime and fertilizer are applied.

CAPABILITY UNIT IIIe-4

This unit consists of sloping, medium-textured, moderately well drained and well drained soils on uplands and terraces. These soils are of the Cana, Coolville, Cruze, Markland, Monongahela, Pekin, Rainsboro, Rarden, and Rossmoyne series. Most of them are moderately eroded. The movement of air and water through the subsoil generally is restricted by a dense, firm or compact layer, which limits the thickness of the root zone. The soils are moderate to low in natural fertility and, except for the Markland soil, are acid throughout or to a great depth.

These soils are suited to many kinds of crops, and they respond well to good management. If fields are

stripcropped and cultivated on the contour, a rotation that provides at least 3 years of meadow in each 5 years is suitable. If terraces are used, along with stripcropping and contour cultivation, the rotation can safely include meadow for less than 3 years. To improve surface drainage, stripcropping and contouring should be on a slight grade. A dense cover of grass will control gullying in waterways and terrace outlets. Wet spots and strips along natural drainageways in fields can be drained by use of tile.

In areas where part of the original surface layer has been lost through erosion, the plow layer contains some of the subsoil. These areas are hard to till and tend to be somewhat cloddy, especially if they consist of Cana, Coolville, Markland, Rarden, or Cruze soils. Applying large amounts of manure and other organic material will improve such areas.

Favorable yields are obtained from pasture that is adequately limed and fertilized. Owing to strong acidity and low natural fertility, most of the soils need to be limed and fertilized rather heavily.

CAPABILITY UNIT IIIw–1

This unit consists of bog, or organic, soils in the Carlisle, Warners, and Willette series. The organic material that makes up these soils is about 1 foot thick in the Warners soil, about 2½ feet thick in the Willette soil, and 3½ to 5 feet thick in the Carlisle soil. Underlying this organic material is gray mineral material. Except in areas that have been artificially drained, water stands on the surface most of the time. The soils generally are low in potassium. They occupy only a small total acreage in the county but are important in local areas.

All the soils in this unit are suited to crops if drainage is adequate, but the Carlisle soil is most suitable for long-term cropping because it has the thickest layer of organic material. Although tile lines are difficult to lay in these soils, open ditches can be used for improving drainage to some extent. If further improvement is desired after the drained area has settled and is stabilized, tile can then be installed.

Row crops can be grown every year, but a cover crop or a green-manure crop should be grown to protect the soil in winter between one row crop and the next. Special fertilization is needed to provide enough potassium for crops. An occasional sod crop will supply fresh organic matter. Wind erosion is a problem if the surface is dry and bare, but soil blowing can be checked by using shrubs or willows as windbreaks or by laying out strips of tall-growing crops that alternate with strips of other crops.

In managing pasture on these soils, plant grasses that grow in wet soil and dispose of excess surface water by furrows and ditches. If water runs in from surrounding areas, a diversion ditch should be built along the edge of the bog. Reed canarygrass is suitable for permanent pasture in areas that cannot be drained. Mow when the soil is dry enough to support machinery, and keep livestock off the soil when it is wet.

The soils of this unit are not suitable as woodland.

CAPABILITY UNIT IIIw–2

The soils in this unit are nearly level or gently sloping, and in some areas they are in shallow basins. They are somewhat poorly drained or poorly drained and, unless drainage is improved, are saturated with water in spring. Their subsoil is slowly or very slowly permeable to air and water, for it is either clayey and plastic or has a strongly developed pan. These soils are acid unless they have been limed. Their supply of mineral nutrients and organic matter is likely to be low. Surface crusting is common in areas where there is little organic matter. The soils are of the Avonburg, Bartle, Clermont, Fawcett, McGary, Taggart, and Tyler series.

A crop rotation on these soils should include a meadow crop or a green-manure crop every 3 years. In areas where yields of crops and forage are poor, or in areas of stronger slope that need protection from erosion, meadow should be grown in the rotation. Productivity can be greatly improved by providing adequate drainage and by applying lime, fertilizer, and organic material.

Because permeability is slow or very slow, tile drains do not work well in these soils. Tiling is likely to work better in the Bartle, McGary, and Taggart soils than in other soils of the unit. Field bedding and shallow ditches, used together, generally are more feasible and more economical than tiling. Surface drainage can be improved by land smoothing that fills in low spots.

Grasses and legumes that are suited to wet soils grow well if they are properly limed and fertilized. To avoid puddling and compaction, livestock should be kept off pasture when the soils are wet. Drainage that improves the growth of pasture plants is provided by use of furrows or shallow ditches. Spots difficult to drain can be planted to reed canarygrass, which should be mowed frequently to keep the grass palatable.

CAPABILITY UNIT IVe–1

This unit consists of sloping to steep, well drained and moderately well drained soils on uplands and terraces. These soils are highly susceptible to erosion if cultivated, and nearly all of them are moderately eroded. They have a moderately thick or thick root zone and, unless limed, are acid in the upper layers. Most of the soils cannot hold as much available water as crops are likely to need, especially in dry periods. The soils in the unit are of the Alexandria, Alford, Cardington, Fox, Hickory, Kendallville, Loudonville, Mentor, Miami, Milton, Negley, Parke, and Warsaw series.

These soils generally are not suitable for intensive cultivation, because the erosion hazard is very severe. A row crop can be grown every 5 or 6 years if contouring or stripcropping is used. Terracing is difficult because of steep slopes. Legumes and grasses for hay or pasture grow well, but they need to be carefully seeded and then limed and fertilized. A small grain can be grown every 4 to 6 years. To control erosion, the trash-mulch method should be used for reseeding meadow. Keeping natural waterways in sod prevents them from gullying.

The moderately eroded soils in this unit have a plow layer that is a mixture of original surface soil and subsoil. These soils are difficult to till, and their plow layer tends to be somewhat cloddy, especially in areas of

Alexandria, Cardington, Miami, and Milton soils. On these soils an adequate seedbed is more difficult to prepare than it is on other soils of the unit.

CAPABILITY UNIT IVe-2

In this unit are sloping, severely eroded, well drained and moderately well drained soils of the Cardington, Fox, Kendallville, Miami, and Parke series. Because the plow layer consists mainly of subsoil material, it is in poor physical condition. The soils are likely to erode further if left unprotected. Consequently, they are more difficult to manage and produce much lower yields than less eroded soils having similar characteristics.

The soils of this unit should be kept in permanent vegetation most of the time. Cultivation is advisable only when it is needed in reseeding a mixture of grasses and legumes for long-term meadow. In fields where small areas of these soils adjoin soils that are more suitable for cultivation, the soils of this unit can be more easily worked with the rest of the field if they first are plentifully covered with manure or other organic material. If erosion control practices are used, a crop of small grain can be grown every 4 to 6 years.

Terraces or diversion ditches may be needed to divert runoff and to help control soil losses. In areas that are terraced, the outlets should be built and sodded before the terraces are started. Natural drainageways can be kept from eroding by protecting them with sod.

These soils are moderately well suited to pasture, but a good seedbed is difficult to prepare. In addition, a dense stand of desirable plants is more difficult to obtain and to keep than on less eroded soils. Applying manure at the time of seeding improves the chance of getting a good stand. Once the plants are established, they will stay thrifty and productive if grazing is regulated and if manure and fertilizer are applied periodically. These soils may need less lime than the less eroded soils because the underlying limy materials are nearer the surface.

CAPABILITY UNIT IVe-3

In this unit are moderately steep and sloping, medium-textured, moderately well drained and well drained soils of the Cana, Latham, Markland, Pekin, Rainsboro, and Rossmoyne series. These soils are moderately deep or deep, but their subsoil either is fine textured or contains a fragipan, and it restricts the movement of air and water and reduces the available moisture capacity. Except for the Markland soil and the Pekin soil, over clay, both of which are underlain by calcareous material, the soils of the unit are acid throughout or to a great depth. Almost all of them are moderately eroded.

If well managed, the soils in this unit can be used for semipermanent or long-term hay or pasture. A crop of small grain can be grown every 4 to 6 years as a nurse crop while a new sod is being established. The amounts of lime and fertilizer needed for satisfactory yields are likely to be rather large in most areas. The soils warm up slowly in spring, and in some fields there are wet spots or seepy areas.

If row crops are grown, a suitable rotation consists of 5 years of perennial sod and 1 year of a row crop. Extreme care should be taken to control erosion, including the use of such practices as mulch tillage and contour stripcropping. In some places diversion terraces are needed to protect fields that are row cropped.

CAPABILITY UNIT IVe-4

This unit consists of sloping, severely eroded soils with a plow layer that is mostly subsoil material. These soils are of the Cana, Coolville, Cruze, Pekin, Rainsboro, Rarden, and Rossmoyne series. In their subsoil is a dense, compact layer or a layer of heavy clay that slows the movement of air and water and hinders the growth of roots. Because of erosion, the plow layer is cloddy in many cultivated areas. The soils are less productive and more difficult to manage than less eroded soils.

The soils of this unit are suitable for occasional cultivation, but they need to be kept in permanent vegetation most of the time. A row crop can be safely grown only when old sod is broken out and before a mixture of grasses and legumes is seeded for long-term meadow. A crop of small grain can be grown every 4 to 6 years if erosion control practices are used.

Where these severely eroded soils occur in small areas that are farmed with larger areas of better soils, they should be given large applications of manure or other organic material to improve their condition so they can be more easily worked with the rest of the field. The amounts of lime and fertilizer needed on these soils are fairly large.

Terraces or diversion ditches are needed in some places to divert runoff and to check further soil losses. If terraces or diversions are used, they should not be constructed until suitable outlets are built and covered with sod.

These soils are moderately well suited to pasture, but a good stand of desirable plants may be more difficult to obtain and to keep than on the better soils. Preparing a good seedbed is difficult because the original surface layer is missing in most places. Applying manure at the time of seeding might increase chances of obtaining a good stand. After pasture is established, it can be maintained if grazing is controlled and if manure and fertilizer are applied periodically.

CAPABILITY UNIT VIe-1

This unit consists of moderately steep and steep, highly erodible soils that normally are underlain by calcareous material. These soils are of the Alexandria, Alford, Cardington, Casco, Fox, Hickory, Kendallville, Lorenzo, Mentor, Miami, Milton, Negley, Parke, Pekin, Rainsboro, and Warsaw series. Most of the soils are moderately or severely eroded, and many of the severely eroded areas have spots in which calcareous material is at the surface. Surface runoff is rapid, and the available moisture capacity generally is moderate.

The soils in this unit are better suited to pasture, hay, or trees than they are to row crops. Native pasture is good in spring and fall but is not dependable during hot or dry periods of midsummer.

Grasses and deep-rooted legumes, such as alfalfa, grow well in areas that are adequately limed and fertilized. If a small grain is used as a nurse crop, the pasture mixture can be seeded by the trash-mulch method. This method consists of disking residues from the preceding

crop thoroughly into the surface layer to prepare a seedbed. Applying manure at seeding time improves the chances of getting a good stand, especially on the severely eroded soils. Protecting the young plants from grazing enables them to get established. If pasture is mowed at timely intervals, unwanted plants are controlled and the desirable grasses and legumes grow more uniformly.

Slopes too rough to be mowed and fertilized are better suited to trees than to pasture.

CAPABILITY UNIT VIe–2

In this unit are moderately steep and steep, highly erodible soils that are underlain by acid material. These soils are of the Cana, Cruze, Latham, Markland, Rarden, and Rossmoyne series. All of the soils are acid, and most of them have a subsoil that restricts the movement of air and water and limits the amount of moisture available to plants. Most of the soils are moderately or severely eroded.

The soils in this unit are not suited to crops that require tillage, but they generally are well suited to pasture, hay, or trees. Native pasture produces fairly well in spring and fall, though it is not dependable during the hot and dry periods of midsummer.

Because of the restrictive subsoil and high acidity, alfalfa is not well suited to most of these soils, but it can be grown satisfactorily if heavily limed. It is well suited to the Markland soils. In addition to alfalfa, other legumes should be included in a mixture used for reseeding pasture. To control erosion, reseed pasture by the trash-mulch method. An application of manure at seeding time improves the chance of obtaining a good stand. Allow young plants to develop fully before they are grazed.

Needed to maintain pasture are manuring, fertilizing, and the control of grazing. In addition, timely mowing controls weeds, briers, and woody plants, and it encourages uniform growth of the desirable forage plants.

Slopes so rough that they cannot be mowed or fertilized are better suited to trees than to grass.

CAPABILITY UNIT VIs–1

In this unit are moderately steep and steep soils that are shallow, stony, or both. These soils are of the Cana, C lyer, Latham, and Muskingum series. Runoff is ra id, and the available moisture capacity is limited.

he soils of this unit are too stony, too shallow, or too steep for cultivated crops. Good pasture is obtained in areas that can be seeded, limed, fertilized, and mowed. In some places, however, woodland is a more suitable use than pasture.

The suitability of these soils for forest trees ranges from good to poor.

CAPABILITY UNIT VIIe–1

This unit consists of moderately steep to very steep soils that are underlain by calcareous material at some depth. These soils are highly susceptible to erosion, and many of them are moderately or severely eroded. Spots of calcareous material are exposed in many of the severely eroded areas. Runoff is rapid or very rapid, and the available moisture capacity is generally low. The soils are of the Alexandria, Casco, Fox, Hickory, Kendallville, Lorenzo, Markland, Miami, Negley, Ritchey, and Rodman series.

These soils should be kept in permanent vegetation, but their suitability for pasture is limited by the steep and rough slopes and by the difficulty in mowing and fertilizing. In dry periods native pasture is not productive and may easily be damaged by overgrazing. The Casco, Lorenzo, and Rodman soils, all of which are shallow to gravel, are especially droughty and produce little forage in dry weather. In many areas the quality and quantity of forage are improved if weeds are mowed and if the competition from woody plants is controlled.

Areas that are too steep or too rough for pasture generally can be used as woodland.

CAPABILITY UNIT VIIe–2

In this unit are acid, moderately steep to very steep soils of the Cana, Dekalb, Latham, Loudonville, Neotoma, and Rarden series. Most of these soils have a subsoil that slows the movement of air and water and limits the amount of moisture available to plants. Runoff is rapid or very rapid, and the available moisture capacity generally is moderate to low. Some of the soils are moderately or severely eroded. The Dekalb, Neotoma, and Rarden soils are shallow or only moderately deep.

Because erosion is a severe hazard, the soils of this unit should be kept in permanent vegetation. Their suitability for pasture is limited, however, and their best use generally is woodland.

CAPABILITY UNIT VIIs–1

Most of the soils in this unit are very steep. Some are not so steep but are very stony. Runoff is rapid or very rapid, and the available moisture capacity generally is low. The soils are of the Berks, Cana, Colyer, Dekalb, Latham, Muskingum, and Neotoma series.

These soils are either so steep or so stony that they are poorly suited to pasture. They can be used as woodland, but their suitability for forest trees ranges from good to poor.

Estimated Yields

Table 1 shows, for each soil in the county, the average yields per acre of the principal farm crops. The yields listed are those expected at two levels of management when weather conditions are average. Irrigation has not been considered in these estimates. The miscellaneous land types, Gravel pits, Made land, and Riverwash, were excluded from the table.

Yields listed in columns A are average yields that were obtained by farmers in Ross County during a period of 5 years under the level of management that was considered average in 1960. This level of management consisted of practices that generally were followed by the majority of farmers in the county at that time. Some of the yields shown, however, are considerably lower than those presently obtained by the better farmers.

Yields listed in columns B are yields that can be expected from each soil under improved management.

This level of management is made up of practices that have been successively and consistently used. On cropland, it consists of controlling erosion; using high-yielding varieties of seed; establishing surface and subsurface drainage, where needed; using cover crops and green-manure crops; controlling insect pests, diseases, and weeds; maintaining good tilth; and applying lime and fertilizer at suggested rates. The yields listed in columns B also are affected by the timeliness of tillage operations.

The estimated yields in columns B are not necessarily the highest yields obtainable on a given soil. They are yields that can be obtained by a large percentage of farmers if improved management is practiced. Some farmers in the county may have gotten yields as high as, or even higher than, the yields shown in the table.

The figures listed in table 1 do not apply directly to specific tracts of land for any particular year, because the soils vary from place to place, management practices differ from farm to farm, and weather conditions are variable from year to year. Also, yields may vary from one area to another because of differences in past management or in numbers and kinds of diseases and insects.

The yields in table 1 are based on information obtained from farmers, the county agent, workers with the Soil Conservation Service, Consumer and Marketing Service, and other agricultural leaders. These yields are useful in showing the relative productivity of the soils and how soils respond to improved management. Although the general level of crop yields and of yield estimates may change over a period of years, the relationship of the soils to each other normally remains the same.

Irrigation

On nearly all the cultivated soils in the county, there are periods when crops would be benefited by irrigation. A farmer who wants to irrigate should first find an adequate source of water and then determine his legal right to use it. Information about the use of water for irrigation can be obtained from the Division of Water, Ohio Department of Natural Resources, which also has information about the sources of underground water in most parts of the State.

Many soils in the county can be profitably irrigated if water is available and if crops of high value are grown. Some soils, however, are more suitable for irrigation than others. Features that affect the suitability of a soil for irrigation are slope, natural drainage, texture of the surface layer, movement of air and water in the subsoil, and inherent fertility. Soils having slopes of more than 6 percent should not be irrigated because of the erosion hazard. Soils in which the internal drainage is restricted should be drained before irrigation water is applied on them.

The irrigable soils of the county have been placed in five irrigation groups according to their suitability for sprinkler irrigation. These groups are discussed in the following paragraphs. The names of soil series represented are mentioned in the description of each irrigation group, but this does not mean that all the soils of a given series appear in the group. To find the names of all the soils in any given irrigation group, refer to the "Guide to Mapping Units" at the back of this survey.

IRRIGATION GROUP 1

The soils in this group are nearly level or gently sloping, well drained, and permeable. They are well suited to sprinkler irrigation and can be safely irrigated if care is taken to avoid erosion on slopes of 2 to 6 percent. Generally, these soils can even absorb rainwater that falls immediately after irrigation. Tiling ordinarily is not needed to remove excess water. In addition, the soils occur in stream valleys, where adequate water is most likely to be obtained, either from streams or from underground reservoirs. The soils are of the Abscota, Alvin, Fox, Genesee, Ockley, Parke, Pike, Pope, Ross, Warsaw, and Wea series. Because the available moisture capacity is lower in the Abscota, Alvin, Fox, and Warsaw soils, irrigation is required more often on these soils than on the other soils in the group.

IRRIGATION GROUP 2

In this group are nearly level or gently sloping, well-drained soils that have moderate or moderately slow permeability. These soils are moderately well suited to sprinkler irrigation, but care should be taken to avoid erosion on slopes of 2 to 6 percent. Although the available moisture is good, productivity is limited at times by the lack of adequate moisture. Ordinarily, tile drainage is not needed for removing excess water. The soils are of the Kendallville, Mentor, Miami, and Milton series. The Milton soil is more droughty than other soils in the group.

IRRIGATION GROUP 3

The soils in this group are nearly level or gently sloping, moderately well drained, and moderately to slowly permeable. They are moderately well suited to sprinkler irrigation, though care should be taken to avoid erosion on slopes of 2 to 6 percent. The available moisture capacity is good, but in some of the soils the root zone is limited by a dense, compact layer in the subsoil. If heavy rain falls just after irrigation, the soils may be so wet that plant growth is reduced and fieldwork is delayed. In some places tiling is needed to improve drainage. The soils are of the Cana, Cardington, Celina, Coolville, Cruze, Eel, Markland, Monongahela, Pekin, Philo, Rainsboro, Rossmoyne, Thackery, and Uniontown series.

IRRIGATION GROUP 4

The soils in this group are nearly level or gently sloping, poorly drained or very poorly drained, and moderately to slowly permeable. These soils should not be irrigated until they are drained by a complete system of drainage. Although the moisture available for plants is adequate most of the year, yields can be increased in some dry periods by timely irrigation. Care should be taken to avoid erosion on slopes of 2 to 6 percent. The soils are of the Avonburg, Bartle, Bonpas, Brookston, Clermont, Crosby, Fawcett, Henshaw, McGary, Millsdale, Shoals, Sleeth, Stendal, Taggart, Tyler, and Westland series. The dark-colored Bonpas, Brookston, Millsdale, and Westland soils are higher in natural fertility than the other soils in the group.

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

[Yields in columns A are those obtained under average management in the county; those in columns B are yields to be expected under improved management. Absence of yield indicates that crop is not generally grown on the soil or is not suited to it]

Soil	Corn		Wheat		Soybeans		Hay	
	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*
Abscota sandy loam, calcareous variant	50	70	20	35	18	30	2.0	4.0
Alexandria silt loam, 6 to 12 percent slopes, moderately eroded	60	80	25	36	20	26	2.5	4.0
Alexandria silt loam, 12 to 18 percent slopes, moderately eroded	60	80	25	36	20	26	2.5	4.0
Alexandria silt loam, 18 to 25 percent slopes, moderately eroded							2.2	3.7
Alexandria silt loam, 25 to 40 percent slopes, moderately eroded								
Alexandria soils, 12 to 18 percent slopes, severely eroded							2.3	3.8
Alexandria soils, 18 to 25 percent slopes, severely eroded							2.0	3.5
Alford silt loam, 6 to 12 percent slopes, moderately eroded	65	90	25	44	20	30	3.0	4.0
Alford silt loam, 12 to 18 percent slopes, moderately eroded	64	89	24	43	19	29	2.9	3.9
Alford silt loam, 18 to 25 percent slopes, moderately eroded							2.8	3.8
Algiers silt loam	75	120	26	40	26	36	2.5	4.5
Alvin fine sandy loam, 0 to 2 percent slopes	67	92	26	42	20	30	3.1	4.1
Alvin fine sandy loam, 2 to 6 percent slopes	67	92	26	42	20	30	3.1	4.1
Alvin fine sandy loam, 6 to 12 percent slopes, moderately eroded	64	89	24	40	18	28	3.0	4.0
Avonburg silt loam, 0 to 2 percent slopes	55	90	20	33	22	28	1.5	3.0
Avonburg silt loam, 2 to 6 percent slopes	55	90	20	33	22	28	1.5	3.0
Bartle silt loam, 0 to 2 percent slopes	55	95	22	36	18	34	2.5	4.0
Bartle silt loam, 2 to 6 percent slopes	55	95	22	36	18	34	2.5	4.0
Bonpas silty clay loam	85	120	30	45	28	42	3.0	5.0
Brookston silt loam	85	120	30	50	28	42	3.5	5.0
Brookston silty clay loam	85	120	30	50	28	42	3.5	5.0
Cana silt loam, 2 to 6 percent slopes	60	80	24	38	20	30	2.5	3.5
Cana silt loam, 2 to 6 percent slopes, moderately eroded	59	79	23	37	19	29	2.4	3.4
Cana silt loam, 6 to 12 percent slopes	60	80	24	38	20	30	2.5	3.5
Cana silt loam, 6 to 12 percent slopes, moderately eroded	58	78	23	37	19	29	2.4	3.4
Cana silt loam, 12 to 18 percent slopes	58	78	23	37	19	29	2.4	3.4
Cana silt loam, 12 to 18 percent slopes, moderately eroded	57	77	21	36	18	28	2.3	3.3
Cana silt loam, 18 to 25 percent slopes							.7	2.2
Cana silt loam, 25 to 45 percent slopes								
Cana soils, 6 to 12 percent slopes, severely eroded	55	75	21	35	17	27	2.3	3.3
Cana soils, 12 to 18 percent slopes, severely eroded							.7	2.2
Cana soils, 18 to 35 percent slopes, severely eroded							.5	2.0
Cana very flaggy silt loam, 18 to 25 percent slopes								
Cana very flaggy silt loam, 25 to 35 percent slopes								
Cana-Colyer very flaggy silt loams, 25 to 35 percent slopes								
Cardington silt loam, 2 to 6 percent slopes	62	82	25	39	21	31	2.6	3.6
Cardington silt loam, 6 to 12 percent slopes, moderately eroded	60	80	24	38	20	30	2.5	3.5
Cardington silt loam, 12 to 18 percent slopes, moderately eroded	60	80	24	38	20	30	2.5	3.5
Cardington soils, 6 to 12 percent slopes, severely eroded	57	77	22	36	18	28	2.3	3.3
Cardington soils, 12 to 18 percent slopes, severely eroded							2.3	3.4
Carlisle muck	80	120					3.0	4.5
Casco and Lorenzo soils, 18 to 25 percent slopes, moderately eroded							2.2	3.7
Casco and Lorenzo soils, 18 to 25 percent slopes, severely eroded								
Celina silt loam, 0 to 2 percent slopes	65	90	28	40	22	32	2.5	4.0
Celina silt loam, 2 to 6 percent slopes	65	90	28	40	22	32	2.5	4.0
Celina silt loam, 2 to 6 percent slopes, moderately eroded	63	88	27	39	21	31	2.4	3.9
Clermont silt loam	50	85	18	30	18	28	1.0	3.0
Colyer shaly silt loam, 12 to 25 percent slopes								
Colyer shaly silt loam, 25 to 75 percent slopes								
Colyer-Cana complex, 18 to 25 percent slopes								
Colyer-Cana complex, 25 to 75 percent slopes								
Coolville silt loam, 2 to 6 percent slopes	58	80	22	38	18	24	2.2	3.7
Coolville silt loam, 2 to 6 percent slopes, moderately eroded	57	80	21	37	17	23	2.1	3.6
Coolville silt loam, 6 to 12 percent slopes, moderately eroded	55	75	20	36	16	22	2.0	3.5
Crosby silt loam, 0 to 2 percent slopes	65	95	26	36	24	34	2.5	4.0
Crosby silt loam, 2 to 6 percent slopes	65	95	26	36	24	34	2.5	4.0
Cruze silt loam, 2 to 6 percent slopes	60	75	22	38	18	30	3.0	3.5
Cruze silt loam, 6 to 12 percent slopes, moderately eroded	56	70	20	36	16	28	2.9	3.4
Cruze silt loam, 12 to 18 percent slopes, moderately eroded	55	70	19	35	15	27	2.8	3.3
Cruze silt loam, 18 to 25 percent slopes							2.7	3.2
Cruze soils, 6 to 12 percent slopes, severely eroded	53	83	18	34	14	26	2.7	3.3
Cruze soils, 12 to 18 percent slopes, severely eroded							2.6	3.1
Dekalb and Neotoma extremely rocky fine sandy loams, 25 to 70 percent slopes								
Dekalb and Neotoma fine sandy loams, 35 to 70 percent slopes								
Eel silt loam	75	110	25	40	26	40	3.0	4.5
Fawcett silt loam	50	85	18	31	20	26	1.4	2.9
Fox gravelly loam, 0 to 2 percent slopes	57	86	26	36	18	28	2.9	4.4
Fox gravelly loam, 2 to 6 percent slopes	50	80	26	36	18	28	2.9	4.4

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

Soil	Corn		Wheat		Soybeans		Hay	
	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*
Fox gravelly loam, 6 to 12 percent slopes, moderately eroded	40	75	23	33	15	25	2.7	4.2
Fox loam, 0 to 2 percent slopes	62	90	27	37	19	29	3.0	4.5
Fox loam, 2 to 6 percent slopes	62	90	27	37	19	29	3.0	4.5
Fox loam, 6 to 12 percent slopes, moderately eroded	50	80	24	34	16	26	2.8	4.3
Fox sandy loam, 0 to 2 percent slopes	57	86	26	36	18	28	2.9	4.4
Fox sandy loam, 2 to 6 percent slopes	56	85	25	35	17	27	2.8	4.3
Fox silt loam, 0 to 2 percent slopes	65	90	28	38	20	30	3.0	4.5
Fox silt loam, 2 to 6 percent slopes	65	90	28	38	20	30	3.0	4.5
Fox silt loam, 2 to 6 percent slopes, moderately eroded	64	89	27	37	19	29	2.9	4.4
Fox silt loam, 6 to 12 percent slopes, moderately eroded	60	87	25	35	17	27	2.8	4.3
Fox soils, 6 to 12 percent slopes, severely eroded	50	80	20	30	12	22	2.5	4.0
Fox and Warsaw soils, 12 to 18 percent slopes, moderately eroded [1]	50	80	20	30	12	22	2.6	4.1
Fox and Warsaw soils, 12 to 18 percent slopes, severely eroded [1]							2.4	3.9
Genesee fine sandy loam	80	110	30	45	28	42	3.5	5.0
Genesee silt loam	80	110	30	45	28	42	3.5	5.0
Genesee silty clay loam	80	110	30	45	28	42	3.5	5.0
Henshaw silt loam	65	95	26	36	24	34	2.5	4.0
Hickory silt loam, 6 to 12 percent slopes, moderately eroded	50	85	24	36	16	26	2.0	4.0
Hickory silt loam, 12 to 18 percent slopes, moderately eroded	50	85	24	36	16	26	2.0	4.0
Hickory silt loam, 18 to 25 percent slopes							1.8	3.8
Hickory soils, 12 to 18 percent slopes, severely eroded							1.8	3.8
Hickory soils, 18 to 25 percent slopes, severely eroded							1.5	3.5
Hickory soils, 25 to 45 percent slopes								
Kendallville silt loam, 0 to 2 percent slopes	53	88	29	39	23	29	2.8	4.3
Kendallville silt loam, 2 to 6 percent slopes	53	88	29	39	23	29	2.8	4.3
Kendallville silt loam, 6 to 12 percent slopes, moderately eroded	49	84	25	35	19	25	2.4	3.9
Kendallville silt loam, 12 to 18 percent slopes, moderately eroded	49	84	25	35	19	25	2.4	3.9
Kendallville silt loam, 18 to 25 percent slopes, moderately eroded							2.1	3.6
Kendallville soils, 6 to 12 percent slopes, severely eroded	46	81	23	33	17	23	2.2	3.7
Kendallville soils, 12 to 18 percent slopes, severely eroded							2.2	3.7
Kendallville soils, 18 to 25 percent slopes, severely eroded							1.9	3.5
Kendallville soils, 25 to 40 percent slopes, moderately eroded								
Latham silt loam, 6 to 12 percent slopes, moderately eroded	50	75	20	34	16	26	2.0	3.5
Latham silt loam, 12 to 18 percent slopes, moderately eroded							1.0	2.5
Latham silt loam, 18 to 25 percent slopes							.7	2.2
Latham silt loam, 18 to 25 percent slopes, moderately eroded							.6	2.1
Latham soils, 12 to 18 percent slopes, severely eroded								
Latham soils, 18 to 25 percent slopes, severely eroded								
Latham soils, 25 to 40 percent slopes								
Loudonville silt loam, 6 to 12 percent slopes	60	90	22	36	20	26	3.0	4.0
Loudonville silt loam, 12 to 18 percent slopes, moderately eroded	59	84	21	32	19	24	2.9	3.9
Loudonville silt loam, 18 to 25 percent slopes, moderately eroded	58	83	20	30	18	22	2.8	3.9
Loudonville silt loam, 25 to 45 percent slopes, moderately eroded							2.7	3.8
Markland silt loam, 0 to 2 percent slopes	58	90	29	42	22	33	2.2	3.7
Markland silt loam, 2 to 6 percent slopes	56	87	29	42	21	32	2.2	3.7
Markland silt loam, 6 to 12 percent slopes, moderately eroded	50	80	26	38	18	28	2.0	3.5
Markland silt loam, 12 to 18 percent slopes, moderately eroded							2.0	3.5
Markland silt loam, 18 to 25 percent slopes, moderately eroded							1.7	3.2
Markland silt loam, 25 to 35 percent slopes, moderately eroded								
Markland soils, 6 to 12 percent slopes, severely eroded							1.8	3.3
Markland soils, 12 to 18 percent slopes, severely eroded								
McGary silt loam, 0 to 2 percent slopes	55	85	22	38	20	30	1.5	3.5
McGary silt loam, 2 to 6 percent slopes	55	85	22	38	20	30	1.5	3.5
Mentor soils, 12 to 18 percent slopes, severely eroded							2.8	3.8
Mentor very fine sandy loam, 0 to 2 percent slopes	75	110	25	40	26	40	3.0	4.5
Mentor very fine sandy loam, 2 to 6 percent slopes	57	100	26	38	20	28	3.2	4.2
Mentor very fine sandy loam, 6 to 12 percent slopes, moderately eroded	55	95	24	36	18	26	3.0	4.0
Mentor very fine sandy loam, 12 to 18 percent slopes, moderately eroded	54	90	23	36	17	25	2.9	3.9
Mentor very fine sandy loam, 18 to 25 percent slopes, moderately eroded							2.8	3.8
Miami silt loam, 2 to 6 percent slopes	53	88	29	39	23	29	2.8	4.3
Miami silt loam, 2 to 6 percent slopes, moderately eroded	51	86	27	37	21	27	2.6	4.1
Miami silt loam, 6 to 12 percent slopes	50	85	26	36	20	26	2.5	4.0
Miami silt loam, 6 to 12 percent slopes, moderately eroded	49	84	25	35	19	25	2.4	3.9
Miami silt loam, 12 to 18 percent slopes	50	85	26	36	20	26	2.5	4.0
Miami silt loam, 12 to 18 percent slopes, moderately eroded	49	84	25	35	19	25	2.4	3.9
Miami silt loam, 18 to 25 percent slopes							2.1	3.6
Miami soils, 2 to 6 percent slopes, severely eroded	46	81	23	33	17	23	2.2	3.7
Miami soils, 6 to 12 percent slopes, severely eroded	46	60	23	33	17	23	2.2	3.7
Miami soils, 12 to 18 percent slopes, severely eroded							2.2	3.7

See footnotes at end of table.

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

Soil	Corn		Wheat		Soybeans		Hay	
	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*
Miami soils, 18 to 25 percent slopes, severely eroded							1. 9	3. 5
Miami soils, 25 to 40 percent slopes								
Millsdale silty clay loam	65	105	25	38	24	36	3. 0	4. 5
Milton silt loam, 2 to 6 percent slopes	50	70	28	35	22	25	2. 5	3. 5
Milton silt loam, 6 to 12 percent slopes, moderately eroded	50	65	20	30	15	22	2. 0	3. 0
Milton silt loam, 18 to 25 percent slopes, moderately eroded								
Monongahela silt loam, 0 to 2 percent slopes	60	90	22	38	18	30	3. 0	3. 5
Monongahela silt loam, 2 to 6 percent slopes	60	90	22	38	18	30	3. 0	3. 5
Monongahela silt loam, 6 to 12 percent slopes, moderately eroded	56	86	20	36	16	28	2. 9	3. 4
Muskingum very stony silt loam, 6 to 18 percent slopes								
Muskingum and Latham stony silt loams, 12 to 25 percent slopes								
Muskingum and Latham very stony silt loams, 25 to 70 percent slopes								
Muskingum, Berks, and Neotoma very stony silt loams, 18 to 25 percent slopes								
Muskingum, Berks, and Neotoma very stony silt loams, 25 to 70 percent slopes								
Negley soils, 6 to 12 percent slopes, moderately eroded	50	85	18	31	20	26	1. 4	2. 9
Negley and Fox soils, 12 to 18 percent slopes, moderately eroded	48	78	20	32	14	24	2. 9	3. 4
Negley and Fox soils, 12 to 18 percent slopes, severely eroded							2. 7	3. 2
Negley and Fox soils, 18 to 25 percent slopes, moderately eroded							2. 2	3. 7
Negley and Fox soils, 18 to 25 percent slopes, severely eroded								
Negley, Fox and Lorenzo soils, 25 to 40 percent slopes								
Ockley silt loam, 0 to 2 percent slopes	75	105	30	40	25	38	3. 0	4. 2
Ockley silt loam, 2 to 6 percent slopes	75	105	30	40	25	38	3. 0	4. 2
Parke silt loam, 2 to 6 percent slopes	69	94	28	44	22	32	3. 2	4. 2
Parke silt loam, 6 to 12 percent slopes, moderately eroded	65	90	26	42	20	30	3. 0	4. 0
Parke silt loam, 12 to 18 percent slopes, moderately eroded	63	88	24	40	18	28	2. 9	3. 9
Parke silt loam, 18 to 25 percent slopes							2. 6	3. 7
Parke soils, 6 to 12 percent slopes, severely eroded	62	87	24	40	18	28	2. 9	3. 9
Parke soils, 12 to 18 percent slopes, severely eroded							2. 6	3. 7
Parke soils, 18 to 25 percent slopes, severely eroded							2. 3	3. 4
Parke-Negley complex, 6 to 12 percent slopes, moderately eroded [2]	65	90	26	42	20	30	3. 0	4. 0
Pekin fine sandy loam, 2 to 6 percent slopes	60	95	24	40	18	30	3. 0	4. 0
Pekin silt loam, 0 to 2 percent slopes	60	95	24	40	18	30	3. 0	4. 0
Pekin silt loam, 2 to 6 percent slopes	60	95	24	40	18	30	3. 0	4. 0
Pekin silt loam, 6 to 12 percent slopes, moderately eroded	57	92	22	38	16	28	2. 8	3. 8
Pekin silt loam, 12 to 18 percent slopes, moderately eroded	56	91	21	37	15	27	2. 7	3. 7
Pekin silt loam, over clay, 2 to 6 percent slopes	68	93	26	46	22	32	3. 2	4. 2
Pekin silt loam, over clay, 6 to 12 percent slopes, moderately eroded	65	90	25	44	20	30	3. 0	4. 0
Pekin silt loam, over clay, 12 to 18 percent slopes, moderately eroded	64	89	24	43	19	29	2. 9	3. 9
Pekin silt loam, over clay, 18 to 25 percent slopes, moderately eroded							2. 6	3. 6
Pekin soils, 6 to 12 percent slopes, severely eroded	54	89	20	36	14	26	2. 7	3. 7
Philo silt loam	70	110	26	40	24	40	2. 5	4. 5
Philo soils, channery variant	60	95	25	38	21	37	2. 4	4. 5
Pike silt loam, 0 to 2 percent slopes	69	110	28	44	22	32	3. 2	4. 2
Pike silt loam, 2 to 6 percent slopes	69	100	28	44	22	32	3. 2	4. 2
Pope silt loam	70	100	26	42	24	38	2. 5	4. 5
Pope soils, channery variant	60	90	24	40	21	34	2. 3	4. 5
Rainsboro silt loam, 0 to 2 percent slopes	60	95	24	40	18	30	3. 0	4. 0
Rainsboro silt loam, 2 to 6 percent slopes	60	95	24	40	18	30	3. 0	4. 0
Rainsboro silt loam, 6 to 12 percent slopes, moderately eroded	57	92	22	38	16	28	2. 8	3. 8
Rainsboro silt loam, 12 to 18 percent slopes, moderately eroded	56	91	21	37	15	27	2. 7	3. 7
Rainsboro soils, 6 to 12 percent slopes, severely eroded	54	89	20	36	14	26	2. 7	3. 7
Rainsboro soils, 12 to 18 percent slopes, severely eroded							2. 5	3. 6
Rarden silt loam, 12 to 18 percent slopes							2. 0	3. 5
Rarden silt loam, 12 to 18 percent slopes, moderately eroded							1. 9	3. 4
Rarden silt loam, 18 to 25 percent slopes, moderately eroded							1. 7	3. 2
Rarden soils, 12 to 18 percent slopes, severely eroded								
Rarden and Coolville silt loams, 6 to 12 percent slopes	56	80	21	37	17	23	2. 1	3. 6
Rarden and Coolville silt loams, 6 to 12 percent slopes, moderately eroded	55	80	20	36	16	22	2. 0	3. 5
Rarden and Coolville soils, 6 to 12 percent slopes, severely eroded	53	77	18	34	14	20	1. 9	3. 4
Ritchey silt loam, 25 to 35 percent slopes, moderately eroded								
Rodman-Lorenzo complex, 25 to 50 percent slopes								
Ross fine sandy loam	85	120	30	40	28	38	3. 0	4. 5
Ross silt loam	85	120	30	40	28	38	3. 0	4. 5
Ross silty clay loam	85	120	30	40	28	38	3. 0	4. 5
Rossmoyne silt loam, 0 to 2 percent slopes	60	90	26	38	24	32	2. 0	4. 0
Rossmoyne silt loam, 2 to 6 percent slopes	60	90	26	38	24	32	2. 0	4. 0
Rossmoyne silt loam, 2 to 6 percent slopes, moderately eroded	59	89	25	37	23	31	1. 9	3. 9

See footnotes at end of table.

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

Soil	Corn		Wheat		Soybeans		Hay	
	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*
Rossmoyne silt loam, 6 to 12 percent slopes, moderately eroded	57	87	24	36	22	30	1. 8	3. 8
Rossmoyne silt loam, 12 to 18 percent slopes, moderately eroded	56	86	23	35	21	29	1. 7	3. 7
Rossmoyne silt loam, 18 to 25 percent slopes, moderately eroded							1. 5	3. 6
Rossmoyne soils, 6 to 12 percent slopes, severely eroded	54	84	22	34	20	28	1. 7	3. 7
Rossmoyne soils, 12 to 18 percent slopes, severely eroded								
Shoals silt loam	65	100	28	40	24	36	2. 6	3. 6
Sleeth silt loam	70	100	25	40	25	36	1. 5	3. 5
Stendal silt loam	55	100	22	34	22	30	2. 0	3. 5
Stone quarries								
Taggart silt loam, 0 to 2 percent slopes	55	95	24	35	22	30	1. 5	3. 0
Taggart silt loam, 2 to 6 percent slopes	55	95	24	35	22	30	1. 5	3. 0
Taggart silt loam, wet	50	85	18	30	18	28	1. 0	3. 0
Thackery silt loam, 0 to 2 percent slopes	75	105	30	40	26	36	2. 0	4. 0
Thackery silt loam, 2 to 6 percent slopes	75	105	30	40	26	36	2. 0	4. 0
Tyler silt loam	55	85	20	36	18	26	2. 5	3. 5
Uniontown silt loam, 0 to 2 percent slopes	75	105	28	40	26	38	2. 0	4. 0
Uniontown silt loam, 2 to 6 percent slopes	75	105	28	40	26	38	2. 0	4. 0
Uniontown silt loam, 6 to 12 percent slopes, moderately eroded	72	102	26	38	24	36	1. 8	3. 8
Wallkill silt loam	75	120	26	40	26	36	2. 5	4. 5
Warners mucky silt loam	75	115	26	42	32	36	3. 5	5. 0
Warsaw loam	75	110	30	40	24	36	3. 0	4. 0
Wea silt loam, 0 to 2 percent slopes	80	120	30	45	28	42	3. 0	4. 5
Wea silt loam, 2 to 6 percent slopes	80	120	30	45	28	42	3. 0	4. 5
Wellston silt loam, 6 to 12 percent slopes	60	90	22	44	20	30	3. 0	4. 5
Westland silty clay loam	85	120	26	40	28	42	3. 0	4. 5
Willette muck	75	115						

[1] Fox soils only; for estimated yields on the Warsaw soils, see Warsaw loam.
[2] Parke soils only; for estimated yields on the Negley soils, see Negley soils, 6 to 12 percent slopes, moderately eroded.

IRRIGATION GROUP 5

In this group are level or nearly level, very poorly drained soils that have a high content of organic matter. They are of the Carlisle, Wallkill, Warners, and Willette series. These are the only soils in the county that are suited to subirrigation. They can be subirrigated by use of gates that control the level of water in the drainage ditch. In addition, the soils are well suited to sprinkler irrigation if they are adequately drained.

Use of Soils as Woodland

Except for small, scattered openings of prairie, Ross County was covered by dense forest when the area was first settled. At that time there were five main kinds of forest—oak-hickory, swamp, beech-maple, oak-maple, and oak-maple-yellow-poplar. Today, woodland occurs chiefly in the southern half of the county and generally occupies the steeper, shallower soils. Wooded areas in the northern half are mostly small woodlots.

The Conservation Needs Inventory reported that in 1961 the woodland in the county amounted to 152,000 acres. Of this total, 130,000 acres were privately owned. The rest was publicly owned and consisted mainly of Tar Hollow and Scioto Trail State Forests.

In the glaciated part of the county, the stands are made up chiefly of beech and maple, though many of the drier areas are covered with oak and hickory. In the unglaciated part, woodland is dominantly oak and hickory, but cool, moist slopes are in stands of mixed hardwoods.

Redcedar is most common on soils that are shallow and droughty. Hemlock grows only in heavily shaded areas of very shallow, acid soils in Alum Cliffs gorge along Paint Creek. Trees that favor soils of the flood plains include willow, aspen, cottonwood, river birch, sycamore, silver maple, and boxelder. Also common on flood plains are bitternut hickory, ash, American elm, slippery elm, shingle oak, swamp white oak, hackberry, black cherry, red maple, buckeye, black walnut, butternut, American hornbeam, and honeylocust. These trees also grow in moist areas on the uplands.

Chestnut oak and scarlet oak are normally on steep, shallow, droughty, acid soils, and pin oak generally occurs only on light-colored, poorly drained soils in the Illinoian glacial area. Black locust attains its best growth on the relatively fertile soils in the late Wisconsin glacial area, but it volunteers abundantly in abandoned areas on almost all of the well-drained soils in the county. Yellow-poplar, or tulip tree, generally grows in moist, shaded hollows and on northeast-facing slopes in both the Illinoian glacial area and the unglaciated area of the Allegheny Plateau.

Woodland suitability groups

To assist the owners of woodland in planning the use of their soils, the soils of the county have been placed in nine woodland suitability groups. Each group is made up of soils that are similar in potential productivity, are suitable for similar trees, and require similar management. These groups are described later in this subsection.

Listed in the descriptions are average site indexes for several kinds of oaks and, where useful, for yellow-poplar and various pines. Site index is the total height, in feet, that dominant and codominant trees of a given species, growing on a given soil in an even-aged, well-stocked stand, will attain in 50 years. It is, therefore, a measure of potential productivity. The site index listed for some species is based on the measurement of many trees in Ross County and nearby counties. For other species the site index is estimated.

Of the features that determine the suitability and the productivity of a soil for trees, two of the most important are aspect and position on the slope. Aspect is the direction in which a slope faces. Slopes that face north or east of a line drawn from true northwest to true southeast are commonly indicated as north; those that face south or west of this line are indicated as south.

The descriptions of woodland groups also give lists of trees to favor in natural stands and trees to use in plantings. The preferred species are listed for warm, dry sites and for cool, moist sites. Warm, dry sites are those on ridgetops and on the upper and middle parts of south-facing slopes. Cool, moist sites are those in coves, on the concave lower part of south-facing slopes, and on north-facing slopes.

Also given in the descriptions are ratings of hazards and limitations to management. These ratings require explanation.

Equipment limitation refers to soil characteristics that restrict or prohibit the use of equipment commonly used to tend wood crops and harvest them. Among these characteristics are slope, soil texture, stones or other obstructions, wetness, and risk of injury to tree roots. The limitation is *slight* if there is little or no restriction on the type of equipment or the time of year that equipment can be used. The limitation is *moderate* if the use of equipment is restricted by one or more unfavorable characteristics. The limitation is *severe* if special equipment is needed and the use of such equipment is severely restricted by one or more unfavorable soil characteristics.

Plant competition refers to the degree that weeds and brush compete with desirable trees when openings are made in the canopy. Competition is *slight* if it does not present adequate natural regeneration and early growth, or interfere with the normal development of planted seedlings. Competition is *moderate* if it delays the establishment and slows the growth of seedlings, either naturally occurring or planted, but does not prevent the eventual development of a normal, fully stocked stand. Competition is *severe* if it prevents adequate restocking, either natural or artificial, without intensive preparation of the site and without special maintenance practices, including weeding.

Seedling mortality is the failure of seedlings to grow in a soil after natural seeding or after seedlings have been planted. Mortality is *slight* if not more than 25 percent of the planted seedlings die, or if trees ordinarily regenerate naturally in places where there are enough seeds. It is *moderate* if 25 to 50 percent of the seedlings die, or if trees do not regenerate naturally in numbers needed for adequate restocking. Mortality is *severe* if more than 50 percent of the planted seedlings die, or if trees do not ordinarily reseed naturally in places where there are enough seeds.

Windthrow hazard depends on the development of roots and on the capacity of soils to hold trees firmly. The hazard is *slight* on deep soils where windthrow is no special problem and where trees can be expected to remain standing after a moderate thinning of the stand. It is *moderate* on soils that are moderately deep or seasonally very wet. The hazard is *severe* on soils that are shallow or poorly drained and on soils having an impermeable or a clayey subsoil.

Erosion hazard is rated according to the risk of erosion on well-managed woodland that is not protected by special practices. It is *slight* where only a slight loss of soil is expected. The hazard is *moderate* if the loss of soil is moderate in places where runoff is not controlled and the vegetative cover is not adequate for protection. It is *severe* if steep slopes, rapid runoff, slow infiltration and permeability, and past erosion make the soil susceptible to severe erosion.

Discussed in the following pages are the woodland suitability groups of Ross County. The names of soil series represented are mentioned in the description of each woodland group, but this does not mean that all the soils of a given series appear in the group. To find the names of all the soils in any given woodland group, refer to the "Guide to Mapping Units" at the back of this report.

WOODLAND SUITABILITY GROUP 1

The soils in this group are deep, medium textured or moderately fine textured, and poorly drained or very poorly drained. They are of the Algiers, Bonpas, Brookston, Clermont, Millsdale, Taggart, Wallkill, and Westland series and generally are nearly level. All the soils but the Algiers formed in glacial material and are subject to ponding. The Algiers soil formed in alluvium and may be flooded at times.

The soils of this group have been cleared for cultivation in most places, but woodlots occupy many small areas. Productivity is moderate, though the only suitable trees are those that are tolerant of water. The estimated site index for pin oak is 80. For white oak the site index is 70 to 80.

The preferred species in natural stands are white ash, red maple, bur oak, swamp white oak, and pin oak. White ash is suitable for planting.

The equipment limitation is severe. Because of ponding and poor drainage, the soils are wet longer in spring than most other soils. Using equipment during this wet period causes compaction and injures tree roots.

Plant competition and seedling mortality are slight, but windthrow is a severe hazard, for the trees have shallow roots. Along the edge of stands that have been thinned, all the trees should be left as windbreaks to reduce the hazard of windthrow.

The erosion hazard is slight except on the Algiers soil, where it is moderate because of floodwater.

WOODLAND SUITABILITY GROUP 2

The soils in this group are deep, nearly level or gently sloping, medium textured, and somewhat poorly drained. These soils are of the Avonburg, Bartle, Crosby, Fawcett,

Henshaw, McGary, Shoals, Sleeth, Stendal, Taggart, and Tyler series. They formed in glacial and alluvial materials. The Shoals and Stendal soils are subject to flooding.

Soils of this group generally have been cleared for crops, but they are used for woodlots in small areas. Productivity is moderate. The site index is 75 to 80 for oaks and is 90 to 95 for yellow-poplar. Among the common trees in some areas is sugar maple, which is tapped for the production of maple sirup and other products.

The species preferred in natural stands are red oak, yellow-poplar, white ash, sugar maple, white oak, and black walnut. Suitable for planting are yellow-poplar, black walnut, and white ash.

The use of equipment is severely limited on these soils because drainage is somewhat poor. In spring, operations can safely begin first in gently sloping areas, which dry out more rapidly than nearly level areas.

Plant competition and seedling mortality are slight for naturally occurring hardwoods. For planted trees, however, competition is moderate, and either cultivation or spraying is needed for at least two seasons after planting.

Windthrow can occasionally occur during severe storms in spring. No trees should be cut along the windward edge of wooded areas.

Erosion is a slight hazard on all the soils except the Shoals and Stendal soils, where floodwaters may cause channeling.

WOODLAND SUITABILITY GROUP 3

The soils in this group formed in alluvial material and are generally deep, medium textured, and well drained or moderately well drained. These soils are nearly level and subject to flooding. They are of the Abscota, Eel, Genesee, Philo, Pope, and Ross series.

Almost all the acreage of these soils has been cleared. Although productivity for wood crops is high, the only wooded areas are field corners and the edges of streambanks. Areas that are no longer needed for crops or are subject to frequent flooding could well be used for the production of tree crops. The estimated site index is 75 to 85 for red oak, 70 to 80 for white oak, and 95 to 105 for yellow-poplar.

The species to favor in natural stands are cottonwood, sycamore, hackberry, black walnut, yellow-poplar, red oak, white ash, white oak, and basswood. Preferred for planting in the highest areas is a mixture of black walnut, white ash, and red oak. Suitable for planting in low areas are cottonwood and sycamore.

The equipment limitation is moderate on the silty clay loams in this group, but it is only slight on the other soils. Plant competition is severe. In places there is moderate erosion during periods of peak flooding, and deposition may damage seedlings or larger trees. Along stream channels the trees should be left standing because they help to keep streambanks from eroding.

WOODLAND SUITABILITY GROUP 4

The soils in this group are deep, nearly level to very steep, chiefly medium textured, and well drained or moderately well drained. Most of them formed in glacial material. These soils are of the Alexandria, Alford, Alvin, Cardington, Celina, Hickory, Kendallville, Markland, Mentor, Miami, Milton, Monongahela, Negley, Ockley, Parke, Pekin, Pike, Rainsboro, Ritchey, Rossmoyne, Thackery, Uniontown, and Wea series.

Productivity of these soils for wood crops is moderate to high. On warm, dry sites the site index is 65 to 75 for red oak and 60 to 70 for white oak. On cool, moist sites it is 80 to 90 for red oak, 75 to 80 for white oak, and 96 to 105 for yellow-poplar. The estimated site index is 85 to 95 for white pine, 55 to 65 for shortleaf pine, and 75 to 85 for Virginia pine. On moist sites there are a few stands of sugar maple, which can be tapped for the production of maple sirup.

The species preferred in natural stands on warm, dry sites are red oak, white oak, black oak, and black cherry. On cool, moist sites the preferred species are yellow-poplar, red oak, black walnut, white oak, and sugar maple. Suitable for planting for wood crops are yellow-poplar, black walnut, white ash, and red oak in cool, moist areas and white pine in warm, dry areas. Scotch pine makes good Christmas trees.

Competition from unwanted plants is severe on these soils. Other hazards and limitations range from slight to severe and are determined by the supply of available moisture, which depends mainly on aspect and position on the slope. Generally, the cool sites are those on north-facing slopes and south-facing toe slopes. The warm sites are those on other south-facing slopes and on upper banks and knolls.

WOODLAND SUITABILITY GROUP 5

The soils in this group are deep, nearly level to very steep, medium textured, and well drained. They are underlain by sandy or gravelly glacial material and tend to be droughty. These soils are of the Casco, Fox, Lorenzo, Negley, Rodman, and Warsaw series.

Productivity for wood crops is high on the Fox and Warsaw soils and is moderate on the other soils. The site index on warm, dry sites is 60 to 70 for red oak and 55 to 65 for white oak. On cool, moist sites it is 75 to 85 for red oak, 70 to 80 for white oak, and 85 to 95 for yellow-poplar. The estimated site index for white pine is 75 to 85. Stands on moist sites contain a fair amount of sugar maple, from which the sap can be drawn off for maple sirup.

On moist sites the trees preferred in natural stands include yellow-poplar, red oak, and black walnut, and these species are suitable for planting for wood crops, especially where seepage from adjacent slopes provides added moisture. White pine is suitable for planting on the drier sites. The soils of this group generally are moderate to good for Christmas trees, though the Rodman soils are poorly suited to this use.

The mortality of planted and naturally occurring tree seedlings is moderate. The equipment limitation and the erosion hazard are slight on the milder slopes, but they are moderate on the stronger slopes.

WOODLAND SUITABILITY GROUP 6

The soils in this group are gently sloping to very steep, moderately deep to shallow, medium textured,

and well drained or moderately well drained. These soils occur mainly in the unglaciated part of the county and are underlain by soft, acid clay shale. They are of the Cana, Colyer, Coolville, Cruze, Latham, and Rarden series.

These soils are used chiefly as woodland, especially in the steeper areas. Their productivity for wood crops is moderate on the cool, moist sites and is low on the warm, dry sites. The Cana and Cruze soils are the most productive, and the Colyer and Rarden soils are the least. The site index on warm, dry sites is 50 to 65 for red oak and is 50 to 60 for white oak. On cool, moist sites it is 60 to 70 for red and white oaks and is 80 to 90 for yellow-poplar. On dry sites the estimated site index is 80 to 90 for white pine and 65 to 75 for Virginia pine. Stands on moist sites contain a large number of sugar maple trees, which provide a good supply of sap for maple sirup.

The species to favor in natural stands on warm, dry sites are black and white oaks, Virginia pine, and shortleaf pine. On cool, moist sites the species to favor are black, white, and red oaks, yellow-poplar, white ash, and sugar maple. Suitable for planting are shortleaf and Virginia pines on dry sites and white pine, yellow-poplar, and white ash on moist sites.

The equipment limitation is moderate to severe on slopes exceeding 20 percent, but it is slight on lesser slopes. Competing plants are a severe hazard on toe slopes and on cool, moist exposures. Competition is slight or moderate in other areas. Seedling mortality is severe on warm, dry sites. The erosion hazard is moderate on slopes of 20 percent or less and is severe on slopes that are greater than 20 percent.

WOODLAND SUITABILITY GROUP 7

This group consists of sloping to very steep, medium-textured, well-drained soils of the uplands that formed in material weathered from acid siltstone and sandstone. These soils are of the Berks, Dekalb, Latham, Loudonville, Muskingum, Neotoma, and Wellston series. Nearly all are moderately deep, but the Wellston soil is deep.

In Ross County most of the woodland is on these soils. Practically all of the steeper areas are wooded. In places there are abandoned fields and brushy areas, but these are slowly reverting to native trees. Wildlife is abundant; many areas are used for recreation; and the watersheds are well protected by forest.

Productivity for wood crops is moderate to high. On warm dry sites the site index is 65 to 75 for red oak and 65 to 75 for white oak. On cool, moist sites it is 75 to 85 for red oak, 70 to 80 for white oak, and 90 to 100 for yellow-poplar. On dry sites the site index is 80 to 90 for white pine, 65 to 75 for shortleaf pine, and 60 to 70 for Virginia pine.

The species preferred in natural stands on moist sites are yellow-poplar (fig. 5), white ash, red oak, black oak, sugar maple, white oak, and black walnut. On dry sites the species to favor are black and white oaks, shortleaf pine, and Virginia pine. Suitable for planting in moist areas are yellow-poplar, white ash, and white pine. White, shortleaf, and Virginia pines are suitable for planting in dry areas. Christmas trees grow well on the gentler side slopes.

Figure 5.—A stand of yellow-poplar on Wellston silt loam, 6 to 12 percent slopes.

The erosion hazard and the equipment limitation generally are slight on the soils of this group, but they are moderate to severe on the steeper slopes.

WOODLAND SUITABILITY GROUP 8

In this group are mucks and mucky soils of the Carlisle, Warners, and Willette series. These soils are saturated with water and are not wooded. Their native cover is mostly reeds and sedges. The soils occupy only a small acreage and are of no importance as woodland.

WOODLAND SUITABILITY GROUP 9

This group consists of land types that generally are unsuitable for use as commercial woodland. Trees can be established, however, in places having enough soil material for a root zone.

Wildlife

The kinds of wildlife that live in a given area and the number of each kind are closely related to land use and the resulting kinds and patterns of vegetation. These in turn are generally related to the kinds of soils.

Before Ross County was settled, wildlife and fish were abundant in this area. And because the use of the land was relatively stable at that time, the kinds and numbers of wildlife were stable. Presently, a few kinds of wildlife are newcomers in the county, but many species are no longer found here, because either the species or their food and cover have been destroyed. Clearing of forests, intensive cropping and pasturing, expansion of urban areas, and other changes have caused marked shifts in the wildlife population, and these changes continue.

The principal game species in the county are ruffed grouse, bobwhite quail, ringneck pheasant, cottontail rabbit, fox squirrel, gray squirrel, and whitetail deer. Common furbearers are muskrat, opossum, raccoon, red fox, gray fox, and skunk. In addition, there are many songbirds, small mammals, and other nongame species.

Most kinds of fish common in Ohio live in the streams of Ross County. Smallmouthed bass, rock bass, and sunfish are the main game fish. Largemouthed bass and walleyed pike are among the game fish in upland reservoirs. Catfish, carp, minnows, suckers, and many other nongame fish occur in streams throughout the county. The number and distribution of fish are affected by stream pollution, siltation, streambank erosion, water fertility, and other factors that are directly or indirectly related to soils.

The amount of food and cover available for wildlife varies with the kind and intensity of farming. In the northern part of the county, where farming is intensive, cover for nesting, shelter in winter, and protection at other times generally are deficient. This area, however, has an abundance of such wildlife foods as small grains, weed seeds, and insects. Both food and cover may be scarce in pastured fields because the plants are kept grazed by livestock. Small woodlots on farms commonly provide adequate cover but, in many places, are deficient in winter food. Idle and abandoned fields and similar areas generally furnish the best habitat for wildlife.

Discussed in the following paragraphs is the relationship between the 12 soil associations in the county and the distribution and abundance of wildlife. Several of the associations have been grouped because of similarities in land use and plant cover. The colored general soil map at the back of this report outlines the boundaries of the different soil associations. More complete descriptions of the associations are given in the section "General Soil Map."

Soil associations 1, 6, and 8.—These associations are in the Wisconsin glacial area on the Allegheny Plateau, in scattered areas on uplands in the northern and western parts of the county, and in Paint Creek valley. The main soils are the Alexandria, Cana, Celina, Fox, and Miami. About 60 percent of the acreage is used for crops, principally corn, wheat, soybeans, and hay. About 20 percent of the total area is pastured, 15 percent is wooded, and the rest is idle. Pasture, wooded tracts, and idle fields are scattered throughout the associations. Ditches and natural drainageways are common.

This pattern of land use and vegetation is favorable for pheasants, rabbits, songbirds, and small mammals that frequent open areas. Quail occur near woody cover. Fox squirrels are found in grazed woods, as are red fox and whitetail deer.

Soil association 2.—This association occupies large areas in the northern part of the county. The Crosby and Brookston soils are the dominant soils. About 80 percent of the acreage is cropped, principally to corn and soybeans but also to wheat and meadow. Pasture and woodland occur in small tracts and, in about equal acreages, make up 20 percent of the total area. In some places there are drainageways, and a limited amount of cover and water is available for wildlife.

This pattern of land use and vegetation is favorable for pheasants, rabbits, songbirds, and small mammals that live in open areas. Quail are common near woody cover, and fox squirrels occur in grazed woods.

Soil association 3.—This association lies along some of the major streams in the county. It consists of long, narrow areas that are occupied mainly by the Fox and Genesee soils. Most of the association is farmed intensively. Corn, soybeans, and hay are the principal crops, but specialty crops are grown on the Fox soils. Generally, the only areas used for pasture or trees are those that are frequently flooded. Trees, shrubs, and weeds grow in narrow areas along most streams and ditches.

Because food, cover, and water are well distributed, the wildlife population is large and diverse. Quail and rabbit are the chief game species. Gray and fox squirrels, raccoons, and opossums are found in woods and along streambanks.

Soil associations 4, 11, and 12.—These associations are mainly on terraces. The dominant soils are the Bartle, Bonpas, Cruze, Markland, Monongahela, Pekin, and Pope. These soils produce satisfactory yields of farm crops, and about 60 percent of the total acreage is used for corn, soybeans, small grains, and meadow. Pasture and woodland, which make up the remaining acreage, are on terrace escarpments and in other areas difficult to farm.

On these associations the fields are not large, and the pattern of land use is favorable for wildlife. In many places the soils adjoin streams, where ample water is available. In and near farmed areas, there is a good supply of small grains and seed. Many kinds of plants can be grown for food and cover.

Rabbit, quail, and fox squirrel are the principal game species. Pheasants are common on the Bonpas soil, which is used for small grains much of the time. Raccoons and opossums occur in wooded areas along streambanks.

Soil associations 5 and 9.—These associations lie on glacial moraines and terraces and are dominantly Fox, Kendallville, Miami, Negley, Parke, and Pike soils. Most of the acreage is farmed. Corn, wheat, and hay are generally the principal crops, but specialty crops are grown on the Fox soils. Scattered throughout the associations are small areas that are pastured, wooded, or idle. Ditches and natural drainageways are numerous.

Quail and pheasant are the main game birds, and rabbit is the principal game animal. In wooded areas there are fox and gray squirrels, raccoons, and opossums.

Soil associations 7 and 10.—These associations occupy large areas in the southern and eastern parts of the county. The main soils are the Cana, Latham, Muskingum, and Rossmoyne. In most places these soils are steep or very steep and wooded. Cropped fields and pasture are not extensive, but they are well distributed throughout the associations. Some of the major streams in the county flow through this part, and there are many smaller streams and drainageways.

This pattern of open fields and woodland is favorable for whitetail deer, rabbit, quail, ruffed grouse, gray fox, and gray squirrel. Songbirds that prefer wooded areas are common here, and so are raccoons and small animals of the forest. Fox squirrels generally occur only in wooded tracts that are grazed by livestock.

Use of Soils in Engineering [1]

Some soil properties are of special interest to engineers because they affect the construction and maintenance of roads, airports, pipelines, building foundations, facilities for water storage, structures for erosion control, and drainage systems. The soil properties most important to the engineer are grain size distribution, permeability to water, bearing and shear strength, consolidation characteristics, texture, plasticity, and reaction. Depth of unconsolidated materials and relief also are important.

The information in this report can be used to—

1. Make soil and land use studies that will aid in selecting and developing industrial, business, residential, and recreational sites.
2. Make preliminary estimates of the engineering properties of soils that will help in planning agricultural drainage systems, farm ponds, irrigation systems, waterways, and diversion terraces.
3. Make preliminary evaluations of soil and ground conditions that will aid in selecting locations for highways and airports and assist in planning detailed investigations of selected locations.
4. Locate probable sources of gravel, sand, and other material used in construction.
5. Correlate performance of engineering structures with soil mapping units and thus develop information that will be useful in designing and maintaining the structures.
6. Determine the suitability of soil units for cross-country movement of vehicles and construction equipment.
7. Supplement information obtained from other published maps and reports and aerial photographs for the purpose of making maps and reports that can be readily used by engineers.
8. Develop other preliminary estimates for construction purposes pertinent to the particular area.

It is not intended that this report will eliminate the need for on-site sampling and testing of sites for design and construction of specific engineering works and uses. It should be used only in planning more detailed field surveys to determine the condition of the soil, in place, at the site of the proposed engineering construction.

Although the detailed soil map and the tables serve as a guide for evaluating most soils, a detailed investigation at the site of the proposed construction is needed because as much as 15 percent of an area designated as a specific soil on the map may consist of areas of other soils too small to be shown on the published map. By comparing the soil description with the result of investigations at the site, the presence of an included soil can usually be determined.

Some of the terms used by soil scientists may not be familiar to the engineer, and some terms may have a special meaning in soil science. Several of these terms are defined in the Glossary at the back of this survey.

Engineering classification systems

Two systems of classifying soils, the AASHO and the Unified, are in general use among engineers. Both are used in this report. Following is a description of these classification systems.

AASHO Classification System.—Most highway engineers classify soil materials in accordance with the system approved by the American Association of State Highway Officials (AASHO) (*1*).[2] In this system, classification is based on the gradation of particle sizes, liquid limit, and plasticity index of the soil materials. Highway performance has been related to this system of classification. In the AASHO system all soil materials are classified in seven principal groups. The groups range from A–1 (gravelly soils of high bearing capacity, the best soils for subgrade) to A–7 (clayey soils having low strength when wet, the poorest soils for subgrade). Within each group, the relative engineering value of the soil material is indicated by a group index number. Group index numbers range from 0 for the best material to 20 for the poorest. The group index number is given in parentheses after the soil group symbol (as in table 2).

Unified Classification System.—Some engineers prefer to use the United soil classification system established by the Waterways Experiment Station, Corps of Engineers (*11*). This system is based on identification of soils according to their texture and plasticity and their performance as engineering construction materials. In the Unified system soil materials are identified as coarse grained (eight classes), fine grained (six classes), or highly organic. The classification of the tested soils according to the Unified system is given in table 2, and the estimated classification of all the soils is given in table 3.

Ohio Classification System.—Except for some relatively minor modifications, the classification system of the Ohio Department of Highways is identical to the AASHO classification system. In the Ohio system, an A–3a group designation is added, the A–4 group is subdivided into A–4a and A–4b groups, and the A–6 group is subdivided into A–6a and A–6b groups. Anyone using this system should contact the Ohio Department of Highways for a more detailed explanation of its soil classification system.

[1] Prepared by RALPH L. MEEKER, assistant State soil scientist, Soil Conservation Service, in collaboration with ARNOLD F. KLEINHENZ, State conservation engineer.

[2] Italic numbers in parentheses refer to Literature Cited, p. 158.

TABLE 2.—*Engineering test data for soil*

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

Soil name and location	Parent material	Ohio report No.	Depth	Horizon
			Inches	
Coolville silt loam:				
2 miles north of Nipgen, 300 feet east of State Route 772, Twin Township.	Thin loess over Cuyahoga clay shale and thin strata of siltstone.	(6)	0–7	Ap
		(6)	7–15	B1&B2
		7141	21–36	IIB2
		(6)	36–42	IIC
Crosby silt loam:				
NW¼NW¼ sec. 15, T. 9 N., R. 21 W., Green Township.	Glacial till	37699	0–11	Ap&A2
		37700	11–35	B
		37701	35–92	C
Muskingum silt loam:				
SE¼NE¼ sec. 36, T. 10 N., R. 20 W., Colerain Township. (Less stony than modal.)	Sandstone and shale	(6)	0–9	A
		90075	9–24	B
		90076	24–32	C
Wellston silt loam:				
NE¼SW¼ sec. 26, T. 10 N., R. 20 W., Colerain Township.	Loess over sandstone and shale	37696	0–7	Ap
		37697	7–25	B2
		37698	[8] 25–45	IIB3

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

[2] Mechanical analyses according to the AASHO Designation: T 88 (*1*). Results by this procedure frequently may differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method, and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method, and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analysis data used in this table are not suitable for naming textural classes for soils.

[3] Based on AASHO Designation M 145–49 (*1*).

TABLE 3.—*Estimated*

[Absence of data indicates

Soil series and map symbols	Depth to bedrock	Depth to seasonally high water table	Depth from surface	Classification		
				USDA texture	Unified	AASHO
			Inches			
Abscota (Ab)	More than 5 feet	3 feet or more.	0–4	Sandy loam	SP–SM or SM.	A–2
			4–13	Sandy loam	SM or SC	A–2 or A–4
			13–44	Sand	SW, SP, or SM.	A–1 or A–3
Alexandria (AdC2, AdD2, AdE2, AdF2, AeD3, AeE3).	More than 10 feet	3 feet or more.	0–6	Silt loam	CL or ML	A–6 or A–4
			6–16	Silty clay loam.	CL	A–6 or A–7
			16–28	Clay	CH	A–7
			28–60	Silty clay loam.	CL	A–6
Alford (AfC2, AfD2, AfE2)	More than 10 feet	3 feet or more.	0–13	Silt loam	ML–CL	A–4
			13–36	Silty clay loam.	CL	A–6
			36–60	Silt loam	ML	A–4

See footnotes at end of table.

samples taken from four soil profiles

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

Moisture density [1]		Mechanical analysis [2]						Liquid limit	Plasticity index	Classification		
		Percentage passing sieve—					Percentage smaller than—					
Maximum dry density	Optimum moisture	¾-in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.005 mm.			AASHO [3]	Unified [4]	Ohio [5]
				100	99	97	37	29	5	A–4(8)	ML–CL	A–4b.
			96	95	93	92	48	36	8	A–4(8)	ML	A–4a.
93				100	99	99	77	58	30	A–7–6(20)	CH	A–7–6.
			98	97	94	93	65	43	14	A–7–6(10)	ML	A–7–6.
110	15		99	95	90	79	45	23	4	A–4(8)	ML	A–4a.
104	19		99	92	88	79	27	41	18	A–7–6(11)	CL	A–7–6.
121	12	87	78	70	62	51	10	24	4	A–4(3)	ML	A–4a.
			98	97	96	95	23	[7] NP	NP	A–4(8)	ML	A–4b.
111	15	92	98	97	89	85	24	NP	NP	A–4(8)	ML	A–4b.
114	14	92	89	86	80	74	26	23	10	A–4(8)	CL	A–4a.
101	18			100	99	98	35	NP	NP	A–4(8)	ML	A–4b.
102	20					99	45	42	18	A–7–6(12)	ML–CL	A–7–6.
117	15	100	74	58	55	53	22	30	6	A–4(5)	ML–CL	A–4a.

[4] Based on the Unified Soil Classification System, Tech. Memo. No. 3–357 v. 1, Corps of Engineers (*11*). SCS and the Bureau of Public Roads have agreed to consider that all soils having plasticity indexes within two points of the A-line are to be given a borderline classification. An example of a borderline classification obtained by this use is ML–CL.

[5] Based on "Classification of Soils," Ohio State Highway Testing Laboratory. Dec. 3, 1959.

[6] Tests performed by the Division of Lands and Soil, Ohio Department of Natural Resources, at the Soil Physics Laboratory, Ohio State University, in accordance with standard procedures of AASHO.

[7] Nonplastic.

[8] About 70 percent of this layer, by weight, was discarded. Percentage consisted of angular cobblestones of sandstone, 3 to 6 inches across.

properties of the soils

estimate was not made]

Percentage passing sieve—			Permeability	Available moisture capacity	Reaction	Shrink-swell potential	Soil corrosion potential	
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)					Concrete	Metal
			Inches per hour	*Inches per inch of soil*	*pH value*			
85–100	80–100	10–35	>6. 3	0. 04–0. 06	(1)	Low	Low	Low.
85–100	80–100	25–45	2. 0–6. 3	0. 10–0. 14	(1)	Low	Low	Low.
85–100	85–100	5–15	>6. 3	0. 02–0. 04	(1)	Low	Low	Low.
95–100	85–100	70–95	0. 63–2. 0	0. 19–0. 23	6. 2	Low	Low	Moderate.
85–100	80–100	80–100	0. 2–0. 63	0. 19–0. 21	5. 6	Moderate	Moderate	Moderate.
85–100	80–100	70–100	0. 2–0. 63	0. 15–0. 18	6. 1	High	Low	Moderate.
85–100	80–100	80–100	0. 2–0. 63	0. 19–0. 21	(1)	Moderate	Low	Moderate.
100	100	70–85	0. 63–2. 0	0. 19–0. 24	5. 5	Low	Moderate	Moderate.
100	100	80–90	0. 63–2. 0	0. 19–0. 21	5. 2	Low	Moderate	Moderate.
100	100	80–90	0. 63–2. 0	0. 18–0. 23	6. 2	Low	Low	Moderate.

TABLE 3.—*Estimated properties*

Soil series and map symbols	Depth to bedrock	Depth to seasonally high water table	Depth from surface	Classification		
				USDA texture	Unified	AASHO
			Inches			
Algiers (Ag)	More than 10 feet	0 to 1 foot.	0–18	Silt loam	ML	A–4
			18–28	Silty clay loam.	ML or CL	A–4 or A–6
			28–37	Silty clay	CL or CH	A–6 or A–7
Alvin (AlA, AlB, AlC2)	More than 10 feet.	3 feet or more.	0–16	Fine sandy loam.	SM or ML	A–2 or A–4
			16–35	Sandy clay loam.	SC or CL	A–2 or A–6
			35–60	Fine sandy loam.	SM or ML	A–2 or A–4
Avonburg (AvA, AvB)	More than 10 feet.	0 to 1 foot.	0–16	Silt loam	ML	A–4
			16–60	Silty clay loam.	CL	A–6
Bartle (BaA, BaB)	More than 10 feet.	0 to 1 foot.	0–7	Silt loam	ML or CL	A–4
			7–27	Fine silt loam or silty clay loam.	CL	A–6
			27–60	Silt loam	ML	A–4
Berks (MuE, MuG) (For properties of the Muskingum and Neotoma soils in mapping units MuE and MuG, see the Muskingum and Neotoma series in this table.)	2 to 4 feet	2 to 4 feet.	0–15	Stony silt loam.	ML or SM	A–2 or A–4
			15–34	Very channery silt loam.	GM	A–2 or A–4
			34	Sandstone bedrock.		
Bonpas (Bo)	More than 10 feet.	0 to 1 foot.	0–18	Silty clay loam.	CL or CH	A–6 or A–7
			18–66	Silty clay loam.	CL or CH	A–6 or A–7
			66–72	Silt loam	ML or CL	A–4 or A–6
Brookston (Br, Bs)	More than 10 feet.	0 to 1 foot.	0–16	Silty clay loam.	OL or CL	A–6 or A–7
			16–50	Clay loam	CL or CH	A–6 or A–7
			50–62	Silt loam	CL	A–6 or A–4
Cana (CaB, CaB2, CaC, CaC2, CaD, CaD2, CaE, CaF, CeC3, CeD3, CeF3, CfE, CfF, CgF, CsE, CsG). (For properties of Colyer soil in mapping units CgF, CsE, and CsG, see the Colyer series in this table.)	3 to 5 feet	2 to 3 feet.	0–7	Silt loam	ML	A–4
			7–29	Silty clay loam.	CL	A–6
			29–47	Clay	CL or CH	A–7
			47	Bedrock		
Cardington (ChB, ChC2, ChD2, CkC3, CkD3).	More than 10 feet.	2 to 3 feet.	0–10	Silt loam	CL	A–6 or A–4
			10–29	Silty clay loam.	CL	A–7 or A–6
			29–50	Clay loam	CL	A–6 or A–7
Carlisle (Cm)	More than 10 feet.	At the surface.	0–50	Muck	Pt	A–7
			50–60	Generally clay but variable.	CH	A–7
Casco (CnE2, CnE3) (For properties of Lorenzo soil in mapping units CnE2 and CnE3, see the Lorenzo series in this table.)	More than 10 feet.	3 feet or more.	0–6	Loam	SM or ML	A–2 or A–4
			6–15	Clay loam	CL or SC	A–4 or A–6
			15	Gravel and sand.	GW, GP, GP–GM, SW, SP or SP–SM.	A–1

See footnotes at end of table.

of the soils—Continued

Percentage passing sieve—			Permeability	Available moisture capacity	Reaction	Shrink-swell potential	Soil corrosion potential	
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)					Concrete	Metal
			Inches per hour	*Inches per inch of soil*	*pH value*			
85–100	80–100	65–100	0. 63–2. 0	0. 18–0. 23	6. 3	Low	Low	High.
85–100	80–100	65–100	0. 2–0. 63	0. 18–0. 21	6. 3	Moderate	Low	High.
85–100	80–100	80–100	0. 2–0. 63	0. 15–0. 21	6. 3	Moderate	Low	Very high.
85–100	80–100	25–60	2. 0–6. 3	0. 12–0. 16	5. 6	Low	Moderate	Moderate.
85–100	80–100	20–55	0. 63–2. 0	0. 14–0. 18	5. 4	Low	Moderate	Moderate.
85–100	80–100	25–60	2. 0–6. 3	0. 12–0. 16	5. 5	Low	Moderate	Low.
100	100	90–100	0. 2–0. 63	0. 18–0. 22	5. 0	Low	Moderate	High.
100	100	75–100	<0. 063	0. 18–0. 22	4. 8	Moderate	High	High.
100	95–100	70–85	0. 63–2. 0	0. 18–0. 23	5. 8	Low	Moderate	High.
100	95–100	80–90	0. 063–0. 2	0. 19–0. 21	5. 3	Moderate	Moderate	High.
100	90–100	50–80	0. 2–0. 63	0. 18–0. 23	5. 3	Low	Moderate	High.
70–80	50–80	30–55	2. 0–6. 3	0. 14–0. 17	5. 5	Low	Moderate	Low.
35–70	25–50	20–45	2. 0–6. 3	0. 08–0. 12	5. 0	Low	High	Low.
95–100	80–100	80–100	0. 63–2. 0	0. 19–0. 21	6. 2	Moderate to high	Low	High.
95–100	80–100	80–100	0. 63–0. 02	0. 18–0. 21	6. 9	High	Low	High.
95–100	80–100	80–100	0. 63–0. 02	0. 18–0. 23	(1)	Moderate	Low	High.
95–100	90–100	70–90	0. 63–2. 0	0. 20–0. 24	6. 6	Moderate	Low	High.
95–100	90–100	60–85	0. 2–0. 63	0. 19–0. 22	7. 0	Moderate	Low	High.
95–100	90–100	50–80	0. 2–0. 63	0. 14–0. 18	(1)	Low	Low	High.
100	90–95	80–90	0. 63–2. 0	0. 18–0. 23	5. 3	Low	Moderate	High.
100	95–100	85–95	0. 2–0. 63	0. 19–0. 21	4. 9	Moderate	High	High.
80–95	75–95	60–80	0. 063–0. 2	0. 15–0. 18	4. 3	Moderate		
95–100	85–100	70–95	0. 63–2. 0	0. 19–0. 23	6. 1	Low	Low	High.
95–100	85–100	70–85	0. 2–0. 63	0. 16–0. 18	5. 9	Moderate	Moderate	High.
90–100	80–95	60–80	0. 2–0. 63	0. 16–0. 18	(1)	Moderate	Low	High.
100	100	80–100	0. 63–2. 0	0. 25	6. 2	High	Moderate	Very high.
85–100	80–100	70–100	<0. 063	0. 15–0. 18	6. 8	High	Low	Very high.
85–100	80–100	25–80	2. 0–6. 3	0. 10–0. 18	6. 8	Low	Low	Moderate.
85–100	50–75	40–65	2. 0–6. 3	0. 14–0. 18	6. 8	Moderate	Low	Low.
25–60	15–40	2–12	>6. 3	<0. 02	(1)	Low	Low	Very low.

TABLE 3.—*Estimated properties*

Soil series and map symbols	Depth to bedrock	Depth to seasonally high water table	Depth from surface	Classification		
				USDA texture	Unified	AASHO
			Inches			
Celina (CoA, CoB, CoB2)	More than 10 feet.	2 to 3 feet.	0–12	Silt loam	ML	A–4
			12–28	Clay loam or silty clay loam.	CL	A–6
			28–60	Loam	CL or ML	A–4
Clermont (Cp)	More than 10 feet.	0 to 1 foot.	0–14	Silt loam	ML	A–4
			14–36	Silty clay loam.	CL	A–6
			36–60	Silty clay loam.	CL	A–6
Colyer (CgF, CrE, CrG, CsE, CsG) (For properties of Cana soil in mapping units CgF, CsE, and CsG, see the Cana series in this table.)	1 to 1½ feet	2 feet or more.	0–7	Shaly silty clay loam.	SC or ML	A–6
			7–17	Very shaly silty clay.	GC	A–6
			17	Bedrock (shale).		
Coolville (CtB, CtB2, CtC2, RfC, RfC2, RgC3). (For properties of Rarden soil in mapping units RfC, RfC2, and RgC3, see the Rarden series in this table.)	3 feet or more	1½ to 2 feet.	0–7	Silt loam	ML	A–4
			7–21	Silty clay loam.	CL	A–6
			21–36	Silty clay or clay.	CH	A–7
			36	Bedrock (shale).		
Crosby (CvA, CvB)	More than 10 feet.	0 to 1 foot.	0–12	Silt loam	ML	A–4
			12–32	Clay loam or silty clay loam.	CH or CL	A–7 or A–6
			32–60	Loam	ML–CL or CL.	A–4 or A–6
Cruze (CwB, CwC2, CwD2, CwE, CzC3, CzD3).	More than 5 feet	3 feet or more.	0–11	Silt loam or silty clay loam.	ML or CL	A–4 or A–6
			11–31	Gravelly or channery silty clay.	CH	A–7
			31–60	Shaly silty clay.	CH	A–7
Dekalb (DnG, DoG) (For properties of Neotoma soil in mapping units DnG and DoG, see the Neotoma series in this table.)	1½ to 4 feet	3 feet or more.	0–36	Fine sandy loam.	ML or SM	A–2, A–4
			36–44	Channery loam.	ML, SM, or GM.	A–2 or A–4
			44	Bedrock		
Eel (Ee)	More than 5 feet	2 to 3 feet.	0–24	Silt loam	ML or CL	A–4 or A–6
			24–42	Silt loam to silty clay loam.	ML or CL	A–4 or A–6
			42	Sand	SP–SM or SM.	A–1 or A–2
Fawcett (Fa)	3 to 4 feet	1 to 2 feet.	0–8	Silt loam	ML or CL	A–4 or A–6
			8–39	Silty clay loam.	CH	A–6 or A–7
			39	Clay shale		

See footnotes at end of table.

of the soils—Continued

Percentage passing sieve—			Permeability	Available moisture capacity	Reaction	Shrink-swell potential	Soil corrosion potential	
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)					Concrete	Metal
			Inches per hour	*Inches per inch of soil*	*pH value*			
95–100	90–100	65–85	0. 63–2. 0	0. 18–0. 22	5. 8	Low	Moderate	High.
95–100	90–100	65–85	0. 63–2. 0	0. 17–0. 21	5. 4	Moderate	Moderate	High.
90–95	90–100	60–80	0. 2–0. 63	0. 14–0. 18	(1)	Low	Low	Moderate.
100	100	90–100	0. 2–0. 63	0. 18–0. 22	5. 0	Low	Moderate	High.
100	100	85–100	<0. 063	0. 17–0. 22	4. 8	Moderate	High	High.
95–100	95–100	75–90	<0. 063	0. 10–0. 15	5. 4	Moderate	Moderate	High.
45–95	40–90	40–80	0. 2–0. 63	0. 15–0. 18	4. 4	Moderate	High	Moderate.
50–75	25–50	25–50	0. 2–0. 63	0. 08–0. 10	4. 5	Moderate	High	Moderate.
98–100	95–100	75–95	0. 63–2. 0	0. 18–0. 23	5. 0	Low	Moderate	High.
98–100	95–100	80–95	0. 2–0. 63	0. 19–0. 21	4. 8	Moderate	High	High.
90–100	85–95	75–90	0. 063–0. 2	0. 15–0. 18	4. 8	Moderate	High	High.
95–100	90–100	65–95	0. 63–2. 0	0. 18–0. 22	6. 2	Low	Low	High.
95–100	90–100	60–85	0. 2–0. 63	0. 16–0. 20	6. 5	Moderate	Low	High.
90–95	90–100	60–80	0. 2–0. 63	0. 14–0. 18	(1)	Low	Low	High.
85–100	80–100	65–100	0. 63–2. 0	0. 18–0. 23	5. 8	Moderate	Moderate	High.
70–85	65–75	50–70	0. 63–2. 0	0. 15–0. 18	5. 5	Moderate	Moderate	High.
70–85	65–75	50–70	0. 2–0. 63	0. 15–0. 18	5. 2	Moderate	Moderate	High.
70–95	65–95	30–60	>6. 3	0. 13–0. 17	4. 8	Low	High	Low.
60–95	55–90	25–55	>6. 3	0. 10–0. 15	4. 8	Low	High	Low.
85–100	80–100	65–100	0. 63–2. 0	0. 18–0. 23	6. 9	Low	Low	Moderate.
85–100	80–100	50–85	0. 63–2. 0	0. 14–0. 23	7. 0	Low	Low	Moderate to high.
85–100	85–100	5–15	>6. 3	<0. 02	7. 0	Low	Low	Moderate.
85–100	80–100	65–100	0. 63–2. 0	0. 18–0. 23	5. 6	Moderate	Moderate	High.
85–100	80–100	80–100	0. 063–0. 2	0. 19–0. 21	5. 0	Moderate	Moderate	High.
					4. 8		High	High.

TABLE 3.—*Estimated properties*

Soil series and map symbols	Depth to bedrock	Depth to seasonally high water table	Depth from surface	Classification		
				USDA texture	Unified	AASHO
			Inches			
Fox (FgA, FgB, FgC2, FlA, FlB, FlC2, FmA, FmB, FnA, FnB, FnB2, FnC2, FoC3, FwD2, FwD3, NfD2, NfD3, NfE2, NfE3, NlF). (For properties of Warsaw soil in mapping units FwD2 and FwD3, see the Warsaw series in this table. For properties of Negley soil in units NfD2, NfD3, NfE2, and NfE3, see the Negley series. For properties of Lorenzo soil in unit NlF, see the Lorenzo series.)	More than 10 feet	3 feet or more.	0–17	Silt loam to loam.	ML or SM	A–4
			17–38	Sandy clay loam.	CL	A–6 or A–7
			38–60	Gravel and sand.	GW, GP, GM, SW, SP, or SM.	A–1
Genesee (Ge, Gn, Go)	More than 5 feet	3 feet or more.	0–8	Silt loam	CL or ML	A–6 or A–4
			8–48	Silt loam	CL or ML	A–6 or A–4
			48–60	Silt loam	CL or ML	A–6 or A–4
Gravel pits (map symbol not assigned)	(2)	(2).		Gravel	GP–GM or GW–GM.	A–1
Henshaw (He)	More than 10 feet	0 to 1 foot.	0–13	Silt loam	ML	A–4
			13–43	Silty clay loam.	CL or CH	A–7
			43–60	Silt loam	CL	A–6
Hickory (HkC2, HkD2, HkE, HoD3, HoE3, HoF).	More than 5 feet	3 feet or more.	0–11	Silt loam	ML or CL	A–4 or A–6
			11–41	Silty clay loam.	CL	A–6 or A–7
			41–60	Silt loam or loam.	ML or CL	A–4 or A–6
Kendallville (KeA, KeB, KeC2, KeD2, KeE2, KnC3, KnD3, KnE3, KnF2).	More than 10 feet	3 feet or more.	0–13	Silt loam to silty clay loam.	ML or CL	A–4 or A–6
			13–42	Clay loam, gravelly clay loam, or sandy clay loam.	CL or SC	A–6
			42–60	Loam	ML or CL	A–4 or A–6
Latham (LaC2, LaD2, LaE, LaE2, LhD3, LhE3, LhF, MsE, MtG). (For properties of Muskingum soil in mapping units MsE and MtG, see the Muskingum series in this table.)	1½ to 3½ feet	3 feet or more.	0–11	Silt loam to silty clay loam.	ML	A–4
			11–25	Silty clay loam to clay.	CH	A–7
			25–60	Clay shale		
Lorenzo (CnE2, CnE3, NlF, RlG) (For properties of Casco soil in mapping units CnE2 and CnE3, see the Casco series in this table. For properties of Negley and Fox soils in unit NlF, see the Negley and Fox series. For properties of Rodman soil in unit RlG, see the Rodman series.)	More than 10 feet	3 feet or more.	0–6	Loam	ML or CL	A–4 or A–6
			6–19	Clay loam	CL or SC	A–6 or A–7
			19	Gravel and sand.	GW, GP, or GM; SW, SP, or SM.	A–1
Loudonville (LoC, LoD2, LoE2, LoF2)	2 to 3½ feet	3 feet or more.	0–11	Silt loam	CL or ML	A–4
			11–21	Clay loam	CL or CH	A–6 or A–7
			21–40	Stony clay loam.	CL	A–6
			40	Bedrock (sandstone).		

See footnotes at end of table.

of the soils—Continued

Percentage passing sieve—			Permeability	Available moisture capacity	Reaction	Shrink-swell potential	Soil corrosion potential	
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)					Concrete	Metal
			Inches per hour	*Inches per inch of soil*	*pH value*			
75–100	70–100	40–85	0. 63–2. 0	0. 17–0. 20	6. 0	Low	Low	Moderate.
75–100	80–100	50–70	0. 63–2. 0	0. 14–0. 18	6. 0	Moderate	Low	Moderate.
40–80	20–70	0–20	>6. 3	<0. 02	(1)	Low	Low	Very low.
100	90–100	70–90	0. 63–2. 0	0. 19–0. 24	7. 0	Low to moderate	Low	Low.
100	90–100	65–90	0. 63–2. 0	0. 19–0. 23	7. 0	Low to moderate	Low	Low.
100	90–100	65–90	0. 63–2. 0	0. 19–0. 23	(1)	Low to moderate	Low	Moderate to high.
20–55	10–20	5–10	>6. 3			Low		
100	80–95	85–95	0. 63–2. 0	0. 18–0. 23	6. 8	Low	Low	High.
100	95–100	90–100	0. 2–0. 63	0. 19–0. 21	6. 9	Moderate	Low	High.
100	100	85–95	0. 2–0. 63	0. 18–0. 23	(1)	Low	Low	High.
85–100	80–100	65–100	0. 63–2. 0	0. 18–0. 23	6. 0	Low	Moderate	Low.
85–100	80–100	80–100	0. 63–2. 0	0. 19–0. 21	5. 4	Moderate	Moderate	Moderate.
85–100	80–100	65–100	0. 63–2. 0	0. 18–0. 23	5. 2	Low	Moderate	Low.
90–100	85–100	55–90	0. 63–2. 0	0. 19–0. 24	6. 1	Low	Low	Moderate.
75–80	65–75	40–65	0. 63–2. 0	0. 14–0. 18	5. 4	Moderate	Moderate	Moderate.
85–100	85–95	60–80	0. 2–0. 63	0. 14–0. 18	(1)	Low	Low	Low.
70–95	70–95	65–95	0. 2–0. 63	0. 18–0. 22	4. 8	Low	High	Moderate.
70–90	70–95	65–95	0. 063–0. 2	0. 15–0. 18	4. 8	Moderate	High	High.
85–100	80–100	55–85	2. 0–6. 3	0. 15–0. 19	6. 6	Low	Low	Moderate.
80–95	75–95	45–75	2. 0–6. 3	0. 16–0. 18	6. 8	Low	Low	Moderate.
35–65	20–60	0–20	>6. 3	<0. 02	(1)	Low	Low	Low.
80–95	70–90	60–80	0. 63–2. 0	0. 19–0. 23	5. 2	Low	Moderate	Moderate.
85–100	80–100	70–85	0. 63–2. 0	0. 16–0. 18	5. 0	Moderate	Moderate	Moderate.
75–90	65–85	50–75	0. 63–2. 0	0. 12–0. 16	5. 0	Low	Moderate	Moderate.

TABLE 3.—*Estimated properties*

Soil series and map symbols	Depth to bedrock	Depth to seasonally high water table	Depth from surface	Classification		
				USDA texture	Unified	AASHO
			Inches			
Made land (map symbol not assigned)	(2)	(2).				
Markland (MaA, MaB, MaC2, MaD2, MaE2, MaF2, MeC3, MeD3).	More than 10 feet	2½ feet or more.	0–7	Silt loam	ML or CL	A–4 or A–6
			7–34	Silty clay	CH	A–7
			34–44	Clay	CH or CL	A–7
McGary (MgA, MgB)	More than 10 feet.	0 to 1 foot.	0–9	Silt loam	ML or CL	A–4 or A–6
			9–37	Silty clay loam or silty clay.	CH	A–7
			37–61	Clay of silty clay.	CH or CL	A–7
Mentor (MhD3, MkA, MkB, MkC2, MkD2, MkE2).	More than 10 feet.	3 feet or more.	0–8	Very fine sandy loam.	ML	A–4
			8–17	Very fine sandy loam.	ML–CL or ML.	A–4
			17–60	Fine silt loam or silty clay loam.	SM or ML	A–4 or A–6
Miami (MIB, MIB2, MIC, MIC2, MID, MID2, MIE, MmB3, MmC3, MmD3, MmE3, MmF).	More than 10 feet.	3 feet or more.	0–11	Silt loam	ML or ML–CL.	A–4 or A–6
			11–33	Silty clay loam or clay loam.	CL	A–6 or A–7
			33–48	Loam	ML or CL	A–4 or A–6
Millsdale (Mn)	1½ to 3½ feet	0 to 1 foot.	0–9	Silty clay loam.	CL or CH	A–6 or A–7
			9–32	Silty clay loam or silty clay.	CH or MH.	A–7
			32	Bedrock (limestone).		
Milton (MoB, MoC2, MoE2)	1½ to 3½ feet	3 feet or more.	0–8	Silt loam	ML or ML–CL.	A–4 or A–6
			8–34	Clay loam to clay.	CL or CH	A–6 or A–7
			34	Bedrock (limestone).		
Monongahela (MpA, MpB, MpC2)	More than 10 feet.	2 to 3 feet.	0–24	Silt loam to silty clay loam.	ML	A–4
			24–60	Silty clay loam.	CL	A–6
Muskingum (MrD, MsE, MtG, MuE, MuG). (For properties of Latham soil in mapping units MsE and MtG, see the Latham series in this table. For properties of Berks and Neotoma soils in units MuE and MuG, see the Berks and Neotoma series.)	1½ to 3 feet	3 feet or more.	0–15	Silt loam	ML	A–4
			15–34	Silt loam	ML or GM	A–4
			34	Bedrock (shale or fine-grained sandstone).		

See footnotes at end of table.

of the soils—Continued

Percentage passing sieve—			Permeability	Available moisture capacity	Reaction	Shrink-swell potential	Soil corrosion potential	
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)					Concrete	Metal
			Inches per hour	*Inches per inch of soil*	*pH value*			
100	95–100	80–95	0. 63–2. 0	0. 18–0. 23	5. 8	Low	Moderate	Moderate.
100	95–100	90–100	0. 2–0. 63	0. 15–0. 18	5. 6	High	Moderate	High.
100	95–100	90–100	0. 2–0. 63	0. 15–0. 18	(1)	High	Low	High.
100	95–100	80–95	0. 63–2. 0	0. 18–0. 23	5. 4	Low	Moderate	High.
100	95–100	90–100	0. 063–0. 2	0. 15–0. 18	5. 0	High	Moderate	High.
100	95–100	85–95	0. 063–0. 2	0. 15–0. 18	(1)	High	Low	High.
95–100	80–100	65–100	0. 63–2. 0	0. 18–0. 23	5. 8	Low	Moderate	Low.
95–100	80–100	50–65	0. 63–2. 0	0. 14–0. 18	5. 0	Low	Moderate	Low.
95–100	80–90	70–95	0. 63–2. 0	0. 18–0. 22	5. 0	Low	Moderate	Low.
95–100	90–100	65–90	0. 63–2. 0	0. 18–0. 22	6. 0	Low	Moderate	Moderate.
90–100	90–100	65–85	0. 63–2. 0	0. 16–0. 20	5. 8	Moderate	Moderate	Moderate.
90–100	85–95	55–75	0. 2–0. 63	0. 14–0. 18	(1)	Low	Low	Low.
95–100	90–100	70–90	0. 63–2. 0	0. 20–0. 22	6. 8	Moderate	Low	High.
90–100	85–100	70–95	0. 2–0. 63	0. 19–0. 21	7. 4	High	Low	High.
95–100	90–100	60–90	0. 63–2. 0	0. 18–0. 23	6. 9	Low	Low	Moderate.
80–100	80–100	70–90	0. 2–0. 63	0. 15–0. 18	6. 0	Moderate	Moderate	Moderate to high.
95–100	95–100	60–90	0. 63–2. 0	0. 18–0. 22	4. 8	Low	High	High.
95–100	95–100	60–90	0. 063–0.2	0. 10–0. 14	4. 7	Moderate	High	High.
75–95	70–90	50–80	2. 0–6. 3	0. 16–0. 20	4. 8	Low	High	Low.
60–90	55–85	45–75	2. 0–6. 3	0. 13–0. 17	4. 8	Low	High	Low.

TABLE 3.—*Estimated properties*

Soil series and map symbols	Depth to bedrock	Depth to seasonally high water table	Depth from surface	Classification		
				USDA texture	Unified	AASHO
			Inches			
Negley (NeC2, NfD2, NfD3, NfE2, NfE3, NIF, PgC2). (For properties of Fox soil in mapping units NfD2, NfD3, NfE2, NfE3, and NIF, see the Fox series in this table. For properties of the Parke soil in unit PgC2, see the the Parke series.)	More than 10 feet.	3 feet or more.	0–12	Loam	ML or CL	A–4 or A–6.
			12–53	Sandy clay loam.	SC or CL	A–6, A–2, or A–4.
			53–76	Sandy loam	SM	A–2 or A–4.
			76–86	Gravel and sand.	GP–GM, GW.	A–1
Neotoma (DnG, DoG, MuE, MuG) (For properties of Dekalb soil in mapping units DnG and DoG, see the Dekalb series in this table. For properties of Muskingum and Berks soils in units MuE and MuG, see the Muskingum and Berks series.)	2½ to 5 feet	2½ feet or more.	0–6	Channery silt loam.	SM or GM	A–4
			60–40	Channery silt loam to loam.	ML or GM	A–4
			40	Bedrock (sandstone).		
Ockley (OcA, OcB)	More than 10 feet.	3 feet or more.	0–12	Silt loam	ML	A–4
			12–17	Loam	CL	A–6 or A–7.
			17–48	Sandy clay loam.	CL or SC	A–6 or A–7.
			48	Gravel and sand.	GP–GM or GM; SP–SM or SM.	A–1
Parke (PaB, PaC2, PaD2, PaE, PeC3, PeD3, PeE3, PgC2). (For properties of Negley soil in mapping unit PgC2, see the Negley series in this table.)	More than 10 feet.	3 feet or more.	0–10	Silt loam	ML	A–4 or A–6.
			10–21	Silty clay loam.	CL	A–6
			21–30	Loam	ML or CL	A–4 or A–6.
			30–60	Clay loam to sandy clay loam.	CL or CH	A–6 or A–7.
Pekin (PhB, PkA, PkB, PkC2, PkD2 PIB, PIC2, PID2, PIE2, PmC3).	More than 10 feet.	2 to 3 feet.	0–7	Silt loam	ML	A–4
			7–24	Silt loam	ML	A–4
			24–60	Silty clay loam.	CL	A–6 or A–7.
Philo (Pn, Po)	More than 5 feet.	2 to 3 feet.	0–6	Silt loam	ML or ML–CL.	A–4
			6–46	Silt loam	ML or ML–CL.	A–4
			46–60	Loam	SM or ML	A–4
Pike (PpA, PpB)	More than 10 feet.	3 feet or more.	0–20	Silt loam	ML	A–4
			20–30	Silty clay loam.	CL	A–6 or A–7.
			30–60	Silt loam	ML	A–4
Pope (Pr, Ps)	More than 5 feet.	3 feet or more.	0–12	Silt loam	CL or ML	A–6 or A–4.
			12–60	Silt loam	CL or ML	A–6 or A–4.
Rainsboro (RaA, RaB, RaC2, RaD2, RbC3, RbD3).	More than 10 feet.	2 to 3 feet.	0–13	Silt loam	ML or CL	A–4 or A–6.
			13–35	Silt loam to silty clay loam.	CL, MH, or CH.	A–6 or A–7.
			35–74	Loam, clay loam, or sandy clay loam.	ML, CL, or SC.	A–6 or A–4.

See footnotes at end of table.

of the soils—Continued

Percentage passing sieve—			Permeability	Available moisture capacity	Reaction	Shrink-swell potential	Soil corrosion potential	
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)					Concrete	Metal
			Inches per hour	*Inches per inch of soil*	*pH value*			
85–100	80–100	50–80	2. 0–6. 3	0. 14–0. 18	5. 8	Low	Moderate	Moderate.
85–100	80–100	20–55	2. 0–6. 3	0. 14–0. 18	5. 4	Low	Moderate	Moderate.
85–100	80–100	25–45	2. 0–6. 3	0. 08–0. 12	5. 5	Low	Moderate	Low.
0–55	0–10	0–10	>6. 3	<0. 02	(1)	Low	Low	Low.
70–85	60–70	40–50	2. 0–6. 3	0. 19–0. 24	6. 1	Low	Low	Low.
55–65	50–60	40–55	2. 0–6. 3	0. 14–0. 18	5. 5	Low	Moderate	Low.
85–100	80–100	50–90	0. 63–2. 0	0. 19–0. 24	6. 2	Low	Low	Moderate.
85–100	80–100	75–100	0. 63–2. 0	0. 19–0. 21	5. 5	Moderate	Moderate	Moderate.
85–95	75–90	35–70	0. 63–2. 0	0. 16–0. 18	5. 5	Moderate	Moderate	Moderate.
40–80	20–70	5–20	2. 0–6. 3	<0. 02	(1)	Low	Low	Low.
100	100	65–100	0. 63–2. 0	0. 18–0. 23	5. 5	Low	Moderate	Low.
100	100	80–100	0. 63–2. 0	0. 14–0. 18	5. 2	Moderate	Moderate	Moderate.
85–100	80–100	70–80	0. 63–2. 0	0. 14–0. 18	5. 2	Moderate	Moderate	Low.
85–100	80–100	65–75	0. 63–2. 0	0. 14–0. 18	5. 4	Moderate	Moderate	Low.
85–100	80–100	65–100	0. 63–2. 0	0. 18–0. 23	5. 7	Low	Moderate	Moderate.
85–100	80–90	65–100	0. 63–2. 0	0. 19–0. 21	4. 8	Low	High	Moderate.
85–100	85–100	80–90	0. 2–2. 0	0. 18–0. 23	5. 6	Moderate	Moderate	High.
100	90–100	50–70	0. 63–2. 0	0. 19–0. 24	6. 2	Low	Low	Moderate.
100	90–100	50–70	0. 63–2. 0	0. 18–0. 23	5. 8	Low	Moderate	Moderate.
95–100	85–100	60–75	0. 63–2. 0	0. 14–0. 18	5. 8	Low	Moderate	Moderate.
100	100	85–100	0. 63–2. 0	0. 18–0. 23	5. 0	Low	Moderate	Low.
100	100	80–100	0. 63 2. 0	0. 19–0. 21	5. 0	Moderate	Moderate	Moderate.
100	100	80–100	0. 63–2. 0	0. 18–0. 23	5. 4	Low	Moderate	Low.
95–100	90–100	65–80	0. 63–2. 0	0. 19–0. 23	6. 0	Moderate	Low	Low.
95–100	90–100	65–80	0. 63–2. 0	0. 19–0. 23	5. 0	Moderate	Moderate	Low.
85–100	80–100	65–100	0. 63–2. 0	0. 18–0. 23	5. 0	Low	Moderate	Moderate.
85–100	80–100	80–100	0. 2–0. 63	0. 19–0. 21	4. 9	Moderate	Moderate	Moderate.
85–100	80–100	35–60	2. 0–6. 3	0. 14–0. 18	5. 5	Low	Moderate	Moderate to high.

TABLE 3.—*Estimated properties*

Soil series and map symbols	Depth to bedrock	Depth to seasonally high water table	Depth from surface	Classification		
				USDA texture	Unified	AASHO
			Inches			
Rarden (RdD, RdD2, RdE2, ReD3, RfC, RfC2, RgC3).	1½ to 3½ feet	1½ to 3½ feet.	0–9	Silt loam	ML	A–4
			9–38	Silty clay or clay.	CH	A–7
(For properties of Coolville soil in mapping units RfC, RfC2, and RgC3, see the Coolville series in this table.)			38	Bedrock (clay shale).		
Ritchey (RhF2)	1 to 2 feet	1 to 2 feet.	0–9	Silt loam	ML	A–4
			9–20	Clay loam to silt loam.	CL or CH	A–6 or A–7
			20	Limestone bedrock.		
Riverwash (Rk)	(2)	(2)				
Rodman (RlG)	More than 10 feet	3 feet or more.	0–9	Gravelly loam to sandy loam.	SM or SC	A–2 or A–4
(For properties of the Lorenzo soil in mapping unit RlG, see the Lorenzo series in this table.)			9–21	Gravel and sand.	GP–GM or GW.	A–1
Ross (Rm, Rn, Ro)	More than 5 feet	3 feet or more.	0–14	Silt loam to loam.	ML	A–4
			14–57	Loam	CL or ML	A–4, A–6
			57–64	Sand	SW or SM	A–1 or A–3
Rossmoyne (RpA, RpB, RpB2, RpC2, RpD2, RpE2, RsC3, RsD3).	More than 10 feet	2 to 3 feet.	0–16	Silt loam	ML	A–4
			16–38	Silty clay loam.	CL	A–6 or A–7
			38–60	Silty clay	CH	A–7
Shoals (Sh)	More than 5 feet	0 to 1 foot.	0–7	Silt loam	ML or CL	A–4 or A–6
			7–49	Silt loam to loam to sandy loam.	ML or CL	A–4 or A–6
			49	Gravelly loamy sand.	SW, SP, or SM.	A–1 or A–3
Sleeth (Sl)	More than 10 feet	0 to 1 foot.	0–12	Silt loam	ML or CL	A–4 or A–6
			12–46	Silty clay loam to sandy clay loam.	CL	A–6 or A–7
			46	Gravel and sand.	GP–GM or GM; SP–SM or SM.	A–1, A–2
Stendal (Sn)	More than 5 feet	0 to 1 foot.	0–9	Silt loam	CL or ML	A–4 or A–6
			9–60	Silt loam	CL or ML–CL.	A–4 or A–6
Stone quarries (Sr)	At the surface					
Taggart (TaA, TaB, Te)	More than 10 feet	0 to 1 foot.	0–10	Silt loam	ML	A–4
			10–50	Silt loam to silty clay loam.	CL	A–6
			50–70	Clay loam	SC or CL	A–6
Thackery (ThA, ThB)	More than 10 feet.	2 to 3 feet.	0–17	Silt loam to loam.	ML	A–4
			17–49	Clay loam to gravelly sandy clay loam.	CL	A–6 or A–7

See footnotes at end of table.

of the soils—Continued

Percentage passing sieve—			Permeability	Available moisture capacity	Reaction	Shrink-swell potential	Soil corrosion potentia	
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)					Concrete	Metal
			Inches per hour	*Inches per inch of soil*	*pH value*			
90–100	85–95	70–90	0. 63–2. 0	0. 18–0. 23	4. 7	Low	High	High.
80–100	75–95	75–90	0. 063–0. 2	0. 15–0. 18	4. 5	Moderate	High	High.
95–100	95–100	90–100	0. 63–2. 0	0. 18–0. 23	6. 8	Low	Low	Moderate.
100	75–85	70–80	0. 63–2. 0	0. 19–0. 21	6. 7	Moderate	Low	Moderate.
						Low		
70–85	60–75	25–45	>6. 3	0. 10–0. 14	6. 9	Low	Low	Low.
0–55	0–10	0–10	>6. 3	<0. 02	(1)	Low	Low	Low.
85–100	80–100	50–80	0. 63–2. 0	0. 15–0. 19	6. 8	Low	Low	Low.
85–100	80–100	50–80	0. 63–2. 0	0. 14–0. 18	7. 2	Low	Low	Low.
85–100	85–100	0–15	>6. 3	0. 02–0. 04	(1)	Low	Low	Moderate.
100	100	90–100	0. 63–2. 0	0. 18–0. 22	5. 0	Low	Moderate	High.
100	100	85–100	0. 063–0. 2	0. 18–0. 22	4. 8	Moderate	High	High.
95–100	95–100	80–95	0. 2–0. 63	0. 16–0. 20	5. 4	High	Moderate	High.
100	95–100	80–90	0. 63–2. 0	0. 18–0. 23	6. 3	Low	Low	High.
85–100	80–100	50–80	0. 2–0. 63	0. 18–0. 23	6. 7	Low	Low	High.
85–100	85–100	0–15	>6. 3	0. 02–0. 04	(1)	Low	Low	High.
95–100	95–100	80–95	0. 63–2. 0	0. 18–0. 23	6. 1	Low	Low	High.
95–100	85–95	60–80	0. 2–0. 63	0. 19–0. 21	5. 8	Moderate	Moderate	High.
40–90	20–50	5–35	2. 0–6. 3	<0. 02	(1)	Low	Low	High.
95–100	90–100	75–90	0. 63–2. 0	0. 18–0. 22	5. 9	Low	Moderate	High.
95–100	90–100	75–90	0. 2–0. 63	0. 18–0. 21	5. 5	Low	Moderate	High.
						Low		
100	100	70–85	0. 63–2. 0	0. 18–0. 23	5. 2	Low	Moderate	High.
100	100	80–90	0. 063–0. 2	0. 19–0. 21	5. 2	Moderate	Moderate	High.
95–100	85–95	40–60	0. 2–0. 63	0. 16–0. 18	5. 7	Moderate	Moderate	High.
95–100	95–100	80–95	0. 63–2. 0	0. 18–0. 23	6. 2	Low	Low	Moderate.
85–95	80–90	55–70	0. 63–2. 0	0. 16–0. 18	5. 8	Moderate	Moderate	Moderate.

TABLE 3.—*Estimated properties*

Soil series and map symbols	Depth to bedrock	Depth to seasonally high water table	Depth from surface	Classification		
				USDA texture	Unified	AASHO
Thackery—Continued			49–62	Gravel and sand.	GP–GM, or GM; SP–SM, or SM.	A–1, A–2
Tyler (Ty)	More than 10 feet.	0 to 1 foot.	0–14	Silt loam	ML	A–4
			14–59	Silty clay loam.	CL	A–6 or A–7
Uniontown (UnA, UnB, UnC2)	More than 10 feet.	3 feet or more.	0–11	Silt loam	ML–CL	A–4
			11–60	Silty clay loam.	CH or CL	A–6, A–7
			60–70	Silt loam	CL	A–4, A–6
Wallkill (Wa)	More than 10 feet.	At the surface.	0–12	Silt loam	CL	A–6
			12–60	Muck	Pt	[3]
Warners (We)	More than 10 feet.	At the surface.	0–13	Muck	OH	[3]
			13	Marl		A–7
Warsaw (WI, FwD2, FwD3) (For properties of Fox soil in mapping units FwD2 and FwD3, see the Fox series in this table.)	More than 10 feet.	3 feet or more.	0–12	Loam	ML	A–4
			12–35	Gravelly clay loam.	CL or SC	A–6
			35	Gravel and sand.	GP–GM or GM; SP–SM or SM.	A–1, A–2, A–3.
Wea (WsA, WsB)	More than 10 feet.	3 feet or more.	0–25	Silt loam	ML, CL	A–4, A–6
			25–30	Silty clay loam.	CL	A–6
			30–45	Clay loam	CL	A–6, A–7
			45–51	Gravel and sand.	GP–GM or GM; SP–SM or SM.	A–1, A–2, A–3.
Wellston (WtC)	3 to 5 feet	3½ to 5 feet.	0–7	Silt loam	ML	A–4
			7–31	Silty clay loam.	ML–CL or CL.	A–4 or A–6
			31–45	Silt loam	ML, or GM.	A–2 or A–4
			45	Bedrock (sandstone).		
Westland (Wu)	More than 10 feet.	0 to 1 foot.	0–13	Silty clay loam.	CL	A–6 or A–7
			13–28	Clay loam	CL	A–6, A–7
			28–50	Fine gravelly loam.	ML or CL	A–4 or A–6
			50–56	Gravel and sand.	GP–GM or GM; SP–SM or SM.	A–1, A–2
Willette (Wv)	More than 10 feet.	At the surface.	0–27	Muck	OH	[3]
			27–36	Clay	CH	A–7

[1] Calcareous.

of the soils—Continued

Percentage passing sieve—			Permeability	Available water capacity	Reaction	Shrink-swell potential	Soil corrosion potential	
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)					Concrete	Metal
40–90	20–50	5–35	>6. 3	<0. 02	(1)	Low	Low	Moderate.
100	90–100	75–90	0. 2–0. 63	0. 18–0. 23	4. 7	Low	High	High.
100	90–100	75–90	0. 063–0. 2	0. 19–0. 21	4. 6	Moderate	High	High.
100	95–100	85–95	0. 63–2. 0	0. 18–0. 23	6. 5	Low	Low	Moderate.
100	95–100	85–95	0. 63–2. 0	0. 19–0. 21	5. 8	Moderate	Moderate	Moderate.
90–100	80–95	50–80	0. 2–0. 63	0. 18–0. 23	6. 9	Moderate	Low	Low.
95–100	95–100	80–95	0. 63–2. 0	0. 19–0. 23	6. 6	Low	Low	High.
100	100	80–100	2. 0–6. 3	>0. 25	6. 8	High	Low	High.
100	100	80–90	0. 63–2. 0	>0. 25	(1)	High	Low	High.
100	90–100	80–95	(2)	0. 10–0. 14	(1)	High	Low	High.
75–100	70–100	40–85	0. 63–2. 0	0. 14–0. 18	6. 2	Low	Low	Moderate.
85–100	80–95	45–80	2. 0–6. 3	0. 14–0. 18	5. 8	Low	Moderate	Moderate.
40–80	20–70	5–20	>6. 3	<0. 02	(1)	Low	Low	Low.
80–100	75–100	60–80	0. 63–2. 0	0. 19–0. 24	5. 9	Moderate	Moderate	Low.
85–100	80–100	80–100	0. 63–2. 0	0. 18–0. 24	5. 9	Moderate	Moderate	Moderate.
85–95	80–95	50–85	0. 63–2. 0	0. 16–0. 18	5. 6	Moderate	Moderate	Moderate.
45–85	25–75	5–25	>6. 3	<0. 02	(1)	Low	Low	Low.
90–100	85–100	70–95	0. 63–2. 0	0. 19–0. 24	5. 2	Low	Moderate	Low.
70–90	65–95	55–90	0. 63–2. 0	0. 16–0. 20	4. 8	Low	High	Moderate.
60–70	50–65	25–50	0. 63–2. 0	0. 15–0. 19	4. 8	Low	High	Low.
95–100	95–100	75–95	0. 63–2. 0	0. 20–0. 22	6. 3	High	Low	High.
95–100	85–95	65–85	0. 63–2. 0	0. 16–0. 18	6. 7	High	Low	High.
85–90	75–85	50–75	0. 63–2. 0	0. 10–0. 14	7. 0	Moderate	Low	High.
35–90	20–50	5–25	>6. 3	0. 02–0. 04	(1)	Low	Low	High.
100	100	90–100	0. 63–2. 0	>0. 25	6. 3	High	Moderate	High.
80–100	80–100	75–95	0. 063–0. 2	0. 15–0. 18	(1)	High	Low	High.

[2] Variable.

[3] Organic material.

Engineering test data

Soil samples from four of the principal soil series in the county were tested by standard AASHO procedures to help evaluate the soils for engineering purposes. Only selected layers of each soil were sampled. The results of these tests are given in table 2.

The engineering soil classification shown in table 2 are based on data obtained by grain-size analysis and by tests to determine liquid limit and plastic limit. The grain-size analysis was made by using a combination of the sieve and hydrometer methods. The percentage of clay obtained by the hydrometer method should not be used in naming textural classes of soils.

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 a semisolid to a plastic state. As the moisture content is further increased, the material changes from a plastic state to a 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 a semisolid to a plastic state. The liquid limit is the moisture content at which the material passes from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which the soil material is in a plastic condition. Some silty and sandy soils are nonplastic; that is, they will not become plastic at any moisture content.

Table 2 also gives moisture-density, or compaction, data for the tested soils. If a soil material is compacted at successively higher moisture content, assuming that the compactive effort remains constant, the density of the compacted material increases until the optimum moisture content is reached. After that, the density decreases with increase in moisture content. The highest dry density obtained in the compaction test is termed "maximum dry density." Moisture-density data are important in earthwork, for as a rule, soil material is most stable if it is compacted to about the maximum dry density when it is at approximately the optimum moisture content.

Soils in some of the soil series that occur in Ross County have been sampled for engineering test data in other parts of the State. Among these series are the Avonburg, Berks, Cardington, Clermont, Fox, Miami, Ockley, Parke, Shoals, and Warsaw series. Data obtained from these tests are on file at the State Office, Soil Conservation Service, Columbus, Ohio, and at the Ohio Department of Natural Resources, Division of Lands and Soil, Columbus.

Estimated properties of the soils

Table 3 shows some estimated soil properties that are important in engineering, and it gives estimated AASHO and Unified classifications for the soils. The textural terms used to describe the soil material in the main horizons are those used by the U.S. Department of Agriculture and are defined in the Glossary. The data are based on the results of laboratory tests, on field observations, on experience with the same kinds of soils in other counties, and on information in other parts of this survey.

An explanation of some of the terms in table 3 may be helpful. The estimated depth to a seasonally high water table is for soils that have not been artificially drained. The water table is high for periods of variable length, but generally it is high for a much longer period in poorly drained soils than it is in somewhat poorly drained soils.

Permeability refers to the movement of water through the soil material in place. It depends largely on the texture and structure of the soil material.

The available moisture capacity is of particular value to engineers concerned with irrigation. It is the approximate amount of capillary water in the soil when wet to field capacity. When the soil is air dry, this amount of water will wet the soil material described to a depth of 1 inch without deeper percolation.

The shrink-swell potential is an indication of the change in volume to be expected with a change in moisture content. Soils having high shrink-swell potential are normally undesirable for engineering structures because an increase in volume generally is accompanied by a loss in bearing capacity.

In general, soils classified as CH and A–7 have a high shrink-swell potential. Clean sand and gravel (single grain structure) and those containing small amounts of nonplastic to slightly plastic fines, as well as most other nonplastic to slightly plastic soil material, have a low shrink-well potential.

The Unified classification provides useful groupings of soils according to grain size, as well as according to cohesive and plastic properties that influence bearing strength under various moisture conditions. The natural drainage class indicates the degree of wetness. Wet soils that are high in clay and silt content and low in bulk density have low bearing strength.

For the Philo and Pope series, the only data in table 3 that apply to the Philo soils, channery variant, and the Pope soils, channery variant, are those listed for permeability, reaction, shrink-swell potential, and soil corrosion potential. Other data shown for the Philo and Pope series do not apply to these channery variants, because they have such a high content of coarse fragments.

Engineering interpretations of the soils

Table 4 indicates the suitability of the soils for various engineering uses. It also names the soil features and problems that affect use of the soils in highway and conservation engineering.

In table 4 the suitability as a source of topsoil refers to the soil material that is usable in landscaping, topdressing embankments, and the like. Normally, the natural surface layer is the most desirable source of topsoil. The ratings are based on soil fertility, organic-matter content, and structure. Ratings of suitability of the Philo and Pope soils as a source of topsoil do not apply to Philo soils, channery variant, and Pope soils, channery variant. These channery soils are a poor source of topsoil because of their high content of coarse fragments.

The suitability of the soils as a source of sand and gravel is not rated in the table, but soils in the Abscota, Casco, Fox, Lorenzo, Negley, Ockley, Parke, Rodman, Sleeth, Thackery, Warsaw, Wea, and Westland series are good sources of these materials. This does not necessar-

ily mean, however, that commercial operations would be profitable in all areas of these soils. In some areas the sand or gravel is in layers only 2 to 3 feet thick, and in places there are other limitations that make it impractical to remove the sand and gravel commercially.

Where there is a high water table or flooding, road or highway fill is generally needed. The features considered in rating the suitability of a soil for road fill are plasticity, content of water, compaction characteristics, and erodibility. The presence of rock within the normal depth of excavation where a road is to be built was also considered. Well-graded, coarse-grained material or mixtures of clay and coarse-grained material are desirable for road fill. Highly plastic, clayey soils; poorly graded, silty soils; and organic soils are difficult to compact and low in stability. Consequently, they are less desirable for road fill.

Natural material suitable for a base course is fairly abundant in this county. The Casco, Fox, Lorenzo, Negley, Ockley, Parke, Thackery, Warsaw, and Wea soils are underlain by fairly well washed, stratified gravel and sand. They are generally on terraces along the Scioto River and Paint Creek. The Rainsboro and Pike soils are underlain by fine gravel and sand, which in most places contain varying amounts of silt and clay. The Sleeth and Westland soils are also underlain by gravel and sand, but they have a seasonally high or perched water table and are therefore considered somewhat poorly drained or very poorly drained. All of the soils underlain by gravel and sand are on stream terraces, kames, eskers, and outwash plains in areas that are scattered along the major streams and in the northern part of the county.

The determination of whether the soil material is suitable for road subgrade below the base course is based on the estimated AASHO classifications given in table 3. Coarse-textured material is rated good, and fine-textured material is rated fair or poor. The soil material rated fair is silt that has low plasticity; the materials rated poor are organic soil and plastic clay that loses strength when wet. In areas where the soil material freezes to a depth greater than 6 inches or where the water table is within 3 feet of the subgrade surface, the susceptibility to frost action should be considered.

The rating of a soil as to its susceptibility to frost action depends on texture, moisture content, and permeability. Soils that contain more than 10 percent silt and clay are likely to heave when subjected to moisture and freezing. Soils having a high content of silt or very fine sand are more susceptible to damaging frost action, that is, damage from frost heaving and subsequent frost boils, than soils that are a mixture of clay, silt, and coarse material.

The suitability of soils for winter grading depends on the ease with which the soil material can be excavated and compacted by ordinary construction equipment in winter. The ratings are based primarily on properties of the subsoil and the substratum. Features having the greatest effect on suitability are soil texture, moisture content, depth to water table, and natural drainage. Suitability also is influenced by the shape of the surface and the presence of a vegetative cover. Suspending earthwork in winter to prevent using frozen material for embankments is not always economically feasible, though it might be desirable. Earthwork can be done in gravelly or sandy material that does not contain more than a small amount of silt and clay, provided the soil material is compacted and frozen material is excluded.

In the column "Highway Location" are given characteristics of the soils that might influence the selection of routes and highways, including secondary roads, streets, or lanes in parks. The features considered detrimental are a high water table, flooding, seepage, plastic soil material, the presence of muck, peat, or rock, unstable slopes, and material that is susceptible to frost action.

The vertical alinement, or placement, of the roadway is affected primarily by local drainage and by the stability of the soil material. Those soils having an unconsolidated substratum deeper than 60 inches are indicated. For satisfactory drainage to be provided in areas that are occasionally or seasonally flooded, or where the water table is high, the surface of the pavement should be built above the highest point reached by high water or above the highest level reached by the ground water table, in accordance with specifications provided by the Ohio Department of Highways. Interceptor ditches or underdrains help control seepage. Seepage over impermeable strata in the back slopes of cuts may cause sliding of the overlying material. If serious enough, the sliding sometimes influences both the location and the cross section design of the roadway. Some areas of bottom lands are flooded each year. A continous embankment may be needed to raise the roadway in those lowlands above the level reached by high water. Some soils that have a high water table can be made more suitable for roads and also more suitable as a source of borrow material by building drainage ditches before earthwork is started. Underdrains may be required where either a perched or a normal water table might make the soil material unstable.

Also given in table 4 are soil features that affect the application of practices that control water. These practices include use of dikes or levees, farm ponds, agricultural drainage, irrigation, terraces, diversions, and waterways. The features that affect these practices are evaluated on the basis of estimates given in table 3, on test data for some of the soils, and on field experience.

Soil drainage and the construction of farm ponds, diversion ditches, and waterways are the most important agricultural engineering practices in this county. Terraces and diversions are used and waterways are established on the gently sloping or sloping soils of the uplands. Waterways are also established in areas of gently sloping or nearly level soils of the uplands and terraces.

All the somewhat poorly drained and poorly drained soils of first bottoms, stream terraces, and uplands must be drained before crops can be grown satisfactorily. Adequate drainage can be provided by drainage system consisting of tile lines of the proper size tile placed at intervals suitable for the particular soils. A random system of tiling is adequate for removing water in wet spots within large areas of Celina and Monongahela soils.

For Carlisle muck, Willette muck, and some of the other very poorly drained soils, open ditches provide the

TABLE 4.—*Engineering*

[Dashes indicate that information

Soil series and map symbols	Suitability as source of topsoil	Suitability of soil material for—		Susceptibility to frost action	Suitability for winter grading	Soil features affecting—
		Highway subgrade	Highway fill			Highway location
Abscota (Ab)	Fair	Fair	Fair	Low	Fair	Sandy material difficult to haul; subject to flooding.
Alexandria (AdC2, AdD2, AdE2, AdF2, AeD3, AeE3).	Fair	Poor	Fair	Moderate	Poor	Good drainage; rapid surface runoff.
Alford (AfC2, AfD2, AfE2)	Good	Poor	Poor	Moderate	Poor	Highly erodible if exposed on embankments.
Algiers (Ag)	Good	Poor	Poor	High	Poor	Seasonally high water table; subject to flooding.
Alvin (AlA, AlB, AlC2)	Good	Fair	Fair	Low	Poor	Good drainage; medium surface runoff.
Avonburg (AvA, AvB)	Fair	Poor	Fair	High	Poor	Restricted internal drainage; medium surface runoff.
Bartle (BaA, BaB)	Good	Poor	Fair	High	Poor	Restricted internal drainage; highly erodible if exposed on embankments; soft when wet.
Berks (MuE, MuG) (For interpretations of Muskingum and Neotoma soils in mapping units MuE and MuG, see the Muskingum and Neotoma series in this table.)	Poor	Poor	Fair	Moderate	Poor	Stony; moderately deep to bedrock.
Bonpas (Bo)	Good	Poor	Poor	High	Poor	Restricted internal drainage; located in low areas; soft when wet.
Brookston (Br, Bs)	Good	Poor	Poor	High	Poor	Restricted internal drainage; located in low areas.
Cana (CaB, CaB2, CaC, CaC2, CaD, CaD2, CaE, CaF, CeC3, CeD3, CeF3, CfE, CfF, CgF, CsE, CsG). (For interpretations of Colyer soil in mapping units CgF, CsE, and CsG, see the Colyer series in this table.)	Fair	Poor	Poor	Moderate	Poor	Bedrock at depth of about 3 feet; sloping to steep.
Cardington (ChB, ChC2, ChD2, CkC3, CkD3).	Fair	Poor	Fair	High	Poor	Good surface drainage; moderately slowly permeable.

interpretations of the soils

is not available or does not apply]

Soil features affecting—Continued					
Dikes, levees, and embankments	Ponds, lakes, and reservoir areas	Agricultural drainage	Waterways	Terraces and diversions	Sprinkler irrigation
Sandy material; subject to piping; poor core material.	Sandy material; moderately rapid permeability.	Not needed; subject to flooding.	Not needed	Not needed	Very low moisture-holding capacity.
Stable; fair to good compaction; good core material.	Slow seepage	Not needed	Soil features favorable.	Soil features generally favorable; slopes steep in some areas.	Slopes of more than 6 percent.
Fair stability; poor to fair compaction.	Slow seepage	Not needed	Soil features favorable.	Soil features favorable.	Slopes of more than 6 percent.
Poor stability; slow permeability.	Possible seepage if excavated below depth of 5 feet.	Subject to flooding; moderately slow permeability.	Not needed	Not needed	Medium intake rate; very poorly drained; high water table; subject to flooding.
Poor to fair stability and compaction.	High to medium rate of seepage unless carefully compacted.	Not needed	Soil features favorable.	Soil features favorable.	Rapid intake rate; low fertility.
Poor to fair stability and compaction; good core material.	Nearly impermeable	Very slow permeability.	Soil features favorable.	Soil features favorable.	Medium intake rate; low fertility; somewhat poorly drained; high water table.
Fair stability and compaction; slow permeability; good core material.	Slow seepage	Slow permeability	Soil features favorable.	Soil features favorable.	Medium intake rate; low fertility; somewhat poorly drained; high water table.
Stony; moderately deep to bedrock.	Moderately deep to permeable sandstone and siltstone.	Not needed	Stoniness and steep slopes.	Stoniness; shallowness to bedrock; steep slopes.	Stony; shallow to bedrock; low moisture-holding capacity; steep slopes.
Poor to fair stability; slow permeability; good core material.	Very slow seepage	Slow permeability	Not needed	Soil features favorable.	Medium intake rate; very poorly drained.
Fair stability and compaction; slow permeability; good core material.	Very slow seepage	Moderately slow permeability.	Not needed	Soil features favorable.	Medium intake rate; very poorly drained.
Bedrock at depth of about 3 feet.	Bedrock at depth of about 3 feet.	Slow permeability	Soil features favorable.	Soil features favorable.	Medium intake rate; low productivity.
Good stability; fair compaction; slow permeability; good core material.	Slow seepage	Moderately slow permeability.	Soil features favorable.	Soil features favorable.	Medium intake rate; moderately slow permeability.

TABLE 4.—*Engineering*

Soil series and map symbols	Suitability as source of topsoil	Suitability of soil material for—		Susceptibility to frost action	Suitability for winter grading	Soil features affecting—
		Highway subgrade	Highway fill			Highway location
Carlisle (Cm)	Poor	Not suitable.	Not suitable.	High	Poor	Limited internal drainage; located in depressions; organic soil; may subside when drained.
Casco (CnE2, CnE3) (For interpretations of Lorenzo soil in mapping units CnE2 and CnE3, see the Lorenzo series in this table.)	Fair	Good	Good	Low	Good	Good drainage; steep slopes.
Celina (CoA, CoB, CoB2)	Fair	Poor	Fair	High	Poor	Moderately slow permeability; adequate surface runoff.
Clermont (Cp)	Fair	Poor	Fair	High	Poor	Restricted internal drainage; high water table; unstable and flows when wet.
Colyer (CgF, CrE, CrG, CsE, CsG) (For interpretations of Cana soil in mapping units CgF, CsE, and CsG, see the Cana series in this table)	Poor	Poor	Poor	Moderate	Poor	Shallow to bedrock; steep.
Coolville (CtB, CtB2, CtC2, RfC, RfC2, RgC3). (For interpretations of Rarden soil in mapping units RfC, RfC2, and RgC3, see the Rarden series in this table.)	Fair	Poor	Poor	Moderate	Poor	Bedrock at depth of 3 to 4 feet; exposed embankments highly erodible.
Crosby (CvA, CvB)	Fair	Poor	Fair	High	Poor	Restricted internal drainage; medium surface runoff.
Cruze (CwB, CwC2, CwD2, CwE, CzC3, CzD3).	Fair	Poor	Fair	Moderate	Poor	Subject to slipping and to seepage.
Dekalb (DnG, DoG) (For interpretations of Neotoma soil in mapping units DnG and DoG, see the Neotoma series in this table.)	Poor	Fair	Fair	Low	Fair	Bedrock at depth of 1 ½ to 4 feet; stony; steep.
Eel (Ee)	Good	Poor	Poor	High	Poor	Seasonally high water table; subject to flooding.
Fawcett (Fa)	Fair	Poor	Poor	Moderate	Poor	Restricted drainage; highly erodible if exposed on embankments.

interpretations of the soils—Continued

Soil features affecting—Continued					
Dikes, levees, and embankments	Ponds, lakes, and reservoir areas	Agricultural drainage	Waterways	Terraces and diversions	Sprinkler irrigation
Not feasible; organic soil (muck).	Organic soil (muck)--	High water table; moderate permeability.	Not needed-------	Not needed-------	Rapid intake rate; high water table.
Gravelly material; good stability; moderately rapid permeability; poor core material.	Gravelly material; excessive rate of seepage.	Not needed-------	Steep slopes; erodible.	Steep, irregular slopes.	Rapid intake rate; low moisture-holding capacity; low fertility.
Good stability; slow permeability; good core material.	Slow seepage--------	Moderately slow permeability.	Soil features favorable.	Soil features favorable.	Medium intake rate; moderately well drained.
Poor to fair stability; slow permeability; good core material.	Nearly impermeable-	Very slow permeability.	Soil features favorable.	Soil features favorable.	Low intake rate; crusts easily; low fertility; poorly drained; high water table.
Shaly; shallow to bedrock.	Shallow to bedrock--	Not needed-------	Stoniness; shallowness to bedrock; steep slopes.	Stoniness; shallowness to bedrock; steep slopes.	Medium intake rate; stony; shallow to bedrock; low moisture-holding capacity; steep slopes.
Good stability; slow permeability; 3 to 4 feet to shale bedrock; good core material.	Slow seepage; 3 to 4 feet to shale bedrock.	Slow permeability.	Soil features favorable.	Soil features favorable.	Medium intake rate.
Good stability; slow permeability; good core material.	Slow seepage--------	Moderately slow permeability.	Soil features favorable.	Soil features favorable.	Medium intake rate; somewhat poorly drained; high water table.
Good stability; slow permeability; about 2½ feet to shaly colluvial material.	Slow seepage; about 2½ feet to shaly colluvial material.	Moderately slow permeability.	Soil features favorable.	Soil features favorable.	Medium intake rate.
Stony; bedrock at depth of 1½ to 4 feet.	Bedrock at depth of 1½ to 4 feet; rapid seepage.	Not needed-------	Stoniness; shallowness to bedrock; steep slopes.	Stoniness; shallowness to bedrock; steep slopes.	Rapid intake rate; stony; shallow to bedrock; steep slopes; low moisture-holding capacity.
Fair stability and compaction; moderate permeability; poor core material.	Possible seepage; subject to flooding.	Subject to flooding; moderate permeability.	Not needed-------	Soil features favorable.	Medium intake rate; subject to flooding.
Fair stability; slow permeability; about 3 feet to shale; good core material.	Slow seepage; about 3 feet to shale.	Slow permeability-	Soil features favorable.	Soil features favorable.	Medium intake rate; somewhat poorly drained;high water table.

TABLE 4.—*Engineering*

Soil series and map symbols	Suitability as source of topsoil	Suitability of soil material for—		Susceptibility to frost action	Suitability for winter grading	Soil features affecting—
		Highway subgrade	Highway fill			Highway location
Fox (FgA, FgB, FgC2, FlA, FlB, FlC2, FmA, FmB, FnA, FnB, FnB2, FnC2, FoC3, FwD2, FwD3, NfD2, NfD3, NfE2, NlF). (For interpretations of Warsaw soil in mapping units FwD2 and FwD3, see the Warsaw series in this table. For interpretations of Negley soil in units NfD2, NfD3, NfE2, and NfE3, see the Negley series. For interpretations of Lorenzo soil in unit NlF, see the Lorenzo series.)	Fair	Good	Good	Low	Fair; good below depth of 24 inches.	Good drainage; no adverse features.
Genesee (Ge, Gn, Go)	Good	Poor	Fair	Moderate	Poor	Good drainage; subject to flooding.
Gravel pits (map symbol not assigned)	Not suitable.	Good	Good	Low	Good	
Henshaw (He)	Fair	Poor	Fair	High	Poor	Restricted drainage; slow surface runoff.
Hickory (HkC2, HkD2, HkE, HoD3, HoE3, HoF).	Fair	Poor	Fair	Moderate	Poor	Good drainage; generally no adverse features, but slopes steep in some places.
Kendallville (KeA, KeB, KeC2, KeD2, KeE2, KnC3, KnD3, KnE3, KnF2).	Fair to good.	Fair	Fair	Moderate	Poor	Good drainage; generally, no adverse features, but slopes steep in some places.
Latham (LaC2, LaD2, LaE, LaE2, LhD3, LhE3, LhF, MsE, MtG). (For interpretations of Muskingum soil in mapping units MsE and MtG, see the Muskingum series in this table)	Fair	Poor	Poor	Moderate	Poor	Bedrock at depth of 1½ to 3½ feet; highly erodible if exposed on embankments.
Lorenzo (CnE2, CnE3, NlF, RlG) (For interpretations of Casco soil in mapping units CnE2 and CnE3, see the Casco series in this table. For interpretations of Negley and Fox soils in unit NlF, see the Negley and Fox series. For interpretations of Rodman soil in unit RlG, see the Rodman series.)	Fair	Good	Good	Low	Good	Good drainage; sloping to steep.
Loudonville (LoC, LoD2, LoE2, LoF2)	Fair	Poor	Fair	Moderate	Poor	Bedrock at depth of 2 to 3½ feet; sloping to steep.
Made land (map symbol not assigned)						
Markland (MaA, MaB, MaC2, MaD2, MaE2, MaF2, MeC3, MeD3).	Fair	Poor	Poor	Moderate	Poor	Highly erodible if exposed on embankments; soft when wet.
McGary (MgA, MgB)	Fair	Poor	Poor	High	Poor	Restricted drainage; highly erodible if exposed on embankments; soft when wet.

interpretations of the soils—Continued

Soil features affecting—Continued					
Dikes, levees, and embankments	Ponds, lakes, and reservoir areas	Agricultural drainage	Waterways	Terraces and diversions	Sprinkler irrigation
Gravelly and sandy material; very stable and permeable; poor core material.	Gravelly and sandy material; excessive rate of seepage.	Not needed	Soil features generally favorable; slopes steep in some areas.	Soil features favorable.	Medium intake rate; moderate moisture-holding capacity.
Fair stability and compaction; moderate permeability.	Possible seepage; subject to flooding.	Not needed; subject to flooding.	Not needed	Soil features favorable.	Medium intake rate; subject to flooding.
Fair stability and compaction; slow permeability.	Slow seepage	Moderately slow permeability.	Not needed	Soil features favorable.	Medium intake rate; somewhat poorly drained; high water table.
Poor to fair stability and compaction; slow permeability.	Nearly impermeable	Not needed	Soil features favorable.	Soil features favorable.	Medium intake rate; low in natural fertility.
Good stability and compaction; slow to moderate permeability; good core material.	Slow seepage	Not needed	Soil features favorable.	Soil features favorable.	Medium intake rate.
Shale bedrock at depth of 1½ to 2 feet.	Shale bedrock at depth of 1½ to 2 feet.	Very slow permeability.	Soil features favorable.	Soil features favorable.	Medium intake rate; low natural fertility.
Gravelly material; very stable; moderately rapid permeability; poor core material.	Gravelly material; excessive rate of seepage.	Not needed	Soil features favorable.	Soil features favorable.	Medium intake rate; low moisture-holding capacity.
Bedrock at depth of 2 to 3½ feet.	Bedrock at depth of 2 to 3½ feet.	Not needed	Soil features favorable.	Shallowness to bedrock.	Medium intake rate.
Poor to fair stability; slow permeability; good core material.	Moderately slow permeability.	Moderately slow permeability.	Soil features favorable.	Soil features generally favorable; slopes steep in some areas.	Slow intake rate.
Poor to fair stability; slow permeability; good core material.	Nearly impermeable	Slow permeability.	Soil features favorable.	Soil features favorable.	Medium intake rate; somewhat poorly drained; high water table.

TABLE 4.—*Engineering*

Soil series and map symbols	Suitability as source of topsoil	Suitability of soil material for—		Susceptibility to frost action	Suitability for winter grading	Soil features affecting—
		Highway subgrade	Highway fill			Highway location
Mentor (MhD3, MkA, MkB, MkC2, MkD2, MkE2).	Good	Poor	Fair	Moderate	Poor	Highly erodible if exposed on embankments; soft when wet.
Miami (MIB, MIB2, MIC, MIC2, MID, MID2, MIE, MmB3, MmC3, MmD3, MmE3, MmF).	Fair	Poor	Fair	Moderate	Poor	Good drainage; rapid surface runoff.
Millsdale (Mn)	Good	Poor	Poor	High	Poor	Restricted drainage; moderately deep to bedrock.
Milton (MoB, MoC2, MoE2)	Fair	Poor	Poor	Moderate	Poor	Good drainage; moderately deep to bedrock.
Monongahela (MpA, MpB, MpC2)	Good	Poor	Poor	Moderate to high.	Poor	Restricted drainage; highly erodible if exposed on embankments.
Muskingum (MrD, MsE, MtG, MuE, MuG). (For interpretations of Latham soil in mapping units MsE and MtG, see the Latham series in this table. For interpretations of Berks and Neotoma soils in units MuE and MuG, see the Berks and Neotoma series.)	Fair	Fair	Fair	Moderate	Poor	Bedrock at depth of 1½ to 3 feet; sloping to steep.
Negley (NeC2, NfD2, NfD3, NfE2, NfE3, NIF, PgC2) (For interpretations of Fox soil in mapping units NfD2, NfD3, NfE2, NfE3, and NIF, see the Fox series in this table. For interpretations of Lorenzo soil in unit NIF, see the Lorenzo series. For interpretations of Parke soil in unit PgC2, see the Parke series.)	Good	Good	Good	Moderate	Fair	Good drainage; sloping to steep.
Neotoma (DnG, DoG, MuE, MuG) (For interpretations of Dekalb soil in mapping units DnG and DoG, see the Dekalb series in this table. For interpretations of Muskingum and Berks soils in units MuE and MuG, see the Muskingum and Berks series.)	Poor	Fair	Fair	Low	Fair	Stony; steep; moderately deep or deep to bedrock.
Ockley (OcA, OcB)	Good	Good	Good	Moderate	Fair	Good drainage; no adverse features.
Parke (PaB, PaC2, PaD2, PaE, PeC3, PeD3, PeE3, PgC2). (For interpretations of Negley soil in mapping unit PgC2, see the Negley series in this table.)	Good	Good	Good	Moderate	Fair	Good drainage; no adverse features.
Pekin (PhB, PkA, PkB, PkC2, PkD2, PIB, PIC2, PID2, PIE2, PmC3).	Good	Poor	Fair	Moderate	Poor	Highly erodible if exposed on embankments.

interpretations of the soils—Continued

Soil features affecting—Continued					
Dikes, levees, and embankments	Ponds, lakes, and reservoir areas	Agricultural drainage	Waterways	Terraces and diversions	Sprinkler irrigation
Poor to fair stability; slow permeability.	Moderate permeability.	Moderate permeability.	Soil features favorable.	Soil features favorable.	Medium intake rate.
Stable; fair to good compaction; slow permeability; good core material.	Slow seepage	Not needed	Soil features favorable.	Soil features generally favorable; slopes steep in some areas.	Medium intake rate.
Bedrock at depth of 2 to 4 feet; poor stability.	Bedrock at depth of 2 to 4 feet.	Bedrock 2 to 4 feet below surface; moderately slow permeability.	Not needed	Shallowness to bedrock.	Medium intake rate; very poorly drained; high water table.
Bedrock at depth of 2 to 4 feet; fair stability.	Bedrock at depth of 2 to 4 feet.	Not needed	Shallowness to bedrock.	Shallowness to bedrock.	Medium intake rate.
Poor stability; slow permeability; good core material.	Slow seepage	Moderately slow permeability.	Soil features favorable.	Soil features favorable.	Medium intake rate; fragipan restricts permeability; low fertility.
Bedrock at depth of 1½ to 3 feet.	Bedrock at depth of 1½ to 3 feet.	Not needed	Stoniness; shallowness to bedrock; steep slopes.	Stoniness; shallowness to bedrock; steep slopes.	Medium intake rate; stony; shallow to bedrock; low moisture-holding capacity; steep slopes.
Gravelly material; stable; permeable; poor core material.	Gravelly material; excessive rate of seepage.	Not needed	Soil features favorable.	Soil features favorable.	Medium intake rate and permeability; low fertility.
Fair stability; moderate permeability; 2½ to 5 feet to bedrock.	Bedrock at depth of 2½ to 5 feet.	Not needed	Stoniness; shallowness to bedrock; steep slopes.	Stoniness; shallowness to bedrock; steep slopes.	Medium intake rate; stony; shallow to bedrock; steep slopes.
Gravelly material; stable; permeable; poor core material.	Gravelly material; excessive rate of seepage.	Not needed	Soil features favorable.	Soil features favorable.	Medium intake rate.
Gravelly material; stable; permeable; poor core material.	Gravelly material; excessive rate of seepage.	Not needed	Soil features favorable.	Soil features favorable.	Medium intake rate; low fertility.
Fair to poor stability; moderate permeability.	Slow to moderate seepage.	Moderate permeability.	Soil features favorable.	Soil features favorable.	Medium intake rate.

TABLE 4.—*Engineering*

Soil series and map symbols	Suitability as source of topsoil	Suitability of soil material for—		Susceptibility to frost action	Suitability for winter grading	Soil features affecting—
		Highway subgrade	Highway fill			Highway location
Philo (Pn, Po)	Good	Poor	Poor	High	Poor	Restricted drainage; subject to flooding.
Pike (PpA, PpB)	Good	Fair	Fair	Moderate	Poor	Good drainage; highly erodible if exposed on embankments.
Pope (Pr, Ps)	Good	Poor	Fair	Moderate	Poor	Good drainage; subject to flooding.
Rainsboro (RaA, RaB, RaC2, RaD2, RbC3, RbD3).	Good	Poor	Fair	Moderate to high.	Poor	Restricted; drainage susceptible to frost heaving.
Rarden (RdD, RdD2, RdE2, ReD3, RfC, RfC2, RgC3). (For interpretations of Coolville soil in mapping units RfC, RfC2, and RgC3, see the Coolville series in this table.)	Fair	Poor	Poor	Moderate	Poor	Moderately deep to bedrock.
Ritchey (RhF2)	Poor	Not suitable.	Not suitable.	High	Poor	Stony; shallow to bedrock.
Riverwash (Rk)	Not suitable.	Fair	Fair	Low	Good	
Rodman (RlG) (For interpretations of Lorenzo soil in mapping unit RlG, see the Lorenzo series in this table.)	Poor	Good	Good	Low	Good	Good drainage
Ross (Rm, Rn, Ro)	Good	Fair	Fair	Moderate	Poor	Good drainage; subject to flooding.
Rossmoyne (RpA, RpB, RpB2, RpC2, RpD2, RpE2, RsC3, RsD3).	Fair	Poor	Fair	Moderate	Poor	Restricted drainage; unstable and flows when wet.
Shoals (Sh)	Good	Poor	Poor	High	Poor	Restricted drainage; subject to flooding.
Sleeth (Sl)	Good	Fair	Fair to good.	High	Poor	Restricted drainage
Stendal (Sn)	Good	Poor	Poor	High	Poor	Restricted drainage; subject to flooding.
Stone quarries (Sr)						
Taggart (TaA, TaB, Te)	Good	Fair	Poor	High	Poor	Restricted drainage; highly erodible if exposed on embankments.

interpretations of the soils—Continued

Soil features affecting—Continued					
Dikes, levees, and embankments	Ponds, lakes, and reservoir areas	Agricultural drainage	Waterways	Terraces and diversions	Sprinkler irrigation
Fair stability and compaction; slow to moderate permeability.	Possible seepage; subject to flooding.	Subject to flooding; moderate permeability.	Not needed	Soil features favorable.	Medium intake rate; subject to flooding.
Fair to poor stability; moderate permeability.	Slow to moderate seepage.	Not needed	Soil features favorable.	Soil features favorable.	Medium intake rate.
Fair stability and compaction; slow to moderate permeability.	Possible seepage; subject to flooding.	Not needed; subject to flooding.	Not needed	Soil features favorable.	Medium intake rate; subject to flooding.
Fair stability; moderate to slow permeability.	Excessive rate of seepage.	Moderately slow permeability.	Soil features favorable.	Soil features favorable.	Medium intake rate; fragipan restricts permeability.
Poor stability; slow permeability; 1½ to 3 feet to shale bedrock.	Slow permeability; 1½ to 3 feet to shale bedrock.	Not needed	Soil features favorable.	Shallowness to bedrock.	Medium intake rate; low fertility.
Bedrock at depth of 1½ to 2 feet.	Bedrock at depth of 1½ to 2 feet.	Not needed	Shallowness to bedrock.	Shallowness to bedrock.	Medium intake rate; low moisture-holding capacity.
Gravelly material; very stable and permeable; poor core material.	Gravelly material; excessive rate of seepage.	Not needed	Soil features favorable.	Soil features favorable.	Rapid intake rate; low moisture-holding capacity.
Fair stability and compaction; slow permeability.	Subject to flooding; seepage in some areas.	Not needed; subject to flooding.	Not needed	Soil features favorable.	Medium intake rate; subject to flooding.
Poor to fair stability and compaction; slow permeability; good core material.	Nearly impermeable	Slow permeability.	Soil features favorable.	Soil features favorable.	Medium intake rate; fragipan restricts permeability.
Fair stability and compaction; slow permeability.	Subject to flooding; slow seepage.	Subject to flooding; moderately slow permeability.	Not needed	Soil features favorable.	Medium intake rate; somewhat poorly drained; high water table; subject to flooding.
Gravelly material; good stability; moderately slow permeability; poor core material.	Gravelly material	Moderately slow permeability.	Soil features favorable.	Soil features favorable.	Medium intake rate; somewhat poorly drained; high water table.
Fair stability and compaction; slow permeability.	Subject to flooding; slow seepage.	Subject to flooding; moderately slow permeability.	Not needed	Soil features favorable.	Medium intake rate; somewhat poorly drained; high water table; subject to flooding.
Fair to good stability; good core material.	Slow seepage	Slow permeability	Soil features favorable.	Soil features favorable.	Medium intake rate; somewhat poorly drained; high water table.

TABLE 4.—*Engineering*

Soil series and map symbols	Suitability as source of topsoil	Suitability of soil material for—		Susceptibility to frost action	Suitability for winter grading	Soil features affecting—
		Highway subgrade	Highway fill			Highway location
Thackery (ThA, ThB)	Good	Fair	Good	High	Poor	Restricted drainage
Tyler (Ty)	Fair	Poor	Fair	Moderate	Poor	Restricted drainage; unstable and flows when wet.
Uniontown (UnA, UnB, UnC2)	Good	Poor	Fair	Moderate	Poor	Unstable and flows when wet.
Wallkill (Wa)	Poor	Not suitable.	Not suitable.	High	Poor	Ponding; organic soil; unstable.
Warners (We)	Poor	Not suitable.	Not suitable.	High	Poor	Ponding; unstable when wet.
Warsaw (WI, FwD2, FwD3) (For interpretations of Fox soil in mapping units FwD2 and FwD3, see the Fox series in this table.)	Good	Good	Good	Low	Fair; good below depth of 24 inches.	Good drainage
Wea (WsA, WsB)	Good	Good	Good	Moderate	Fair; good below depth of 48 inches.	Good drainage
Wellston (WtC)	Fair	Poor	Fair	Moderate	Poor	Good drainage; 2½ to 5 feet to bedrock.
Westland (Wu)	Good	Fair	Good	High	Poor	Restricted drainage; high water table.
Willette (Wv)	Poor	Not suitable.	Not suitable.	High	Poor	Ponding; organic soil; unstable.

best drainage. In low areas of these soils, however, good outlets are difficult to obtain. A tile system may be used for draining mucky areas, but the tile are difficult to keep at proper grade in such areas, and mucky soils are also much less stable than mineral soils.

In the construction of ponds, lakes, and reservoirs, seepage rates are of primary concern. The soils that formed in alluvium on first bottoms and the soils of stream terraces, which are underlain in most places by sand and gravel, generally are poorly suited to farm ponds, for seepage is excessive in the underlying material. Some soils of first bottoms can be used for farm ponds, however, if extraordinary precautions are taken during construction of the pond. If bentonite or a sim-

interpretations of the soils—Continued

Soil features affecting—Continued					
Dikes, levees, and embankments	Ponds, lakes, and reservoir areas	Agricultural drainage	Waterways	Terraces and diversions	Sprinkler irrigation
Gravelly material; very stable and permeable; poor core material.	Gravelly material; excessive rate of seepage in substratum.	Moderately slow permeability.	Soil features favorable.	Soil features favorable.	Medium intake rate.
Poor stability; slow permeability; good core material.	Nearly impermeable.	Slow permeability.	Soil features favorable.	Soil features favorable.	Medium intake rate; somewhat poorly drained; high water table.
Fair to good stability and compaction; slow permeability; good core material.	Slow seepage.	Not needed.	Soil features favorable.	Soil features favorable.	Medium intake rate.
Organic soil (muck).	Organic soil (muck).	High water table; moderately rapid permeability.	Not needed; level organic soil (muck).	Organic soil (muck); unstable.	Rapid intake rate; high water table.
Organic soil (muck).	Organic soil (muck).	High water table; moderately rapid permeability.	Not needed; level organic soil (muck).	Organic soil (muck); unstable.	Rapid intake rate; high water table.
Gravelly material; very stable; permeable; poor core material.	Gravelly material; excessive rate of seepage.	Not needed.	Soil features favorable.	Soil features favorable.	Medium intake rate.
Gravelly material; very stable; permeable; poor core material.	Gravelly material; excessive rate of seepage.	Not needed.	Soil features favorable.	Soil features favorable.	Medium intake rate.
Good to fair stability; good compaction; slow permeability; 2½ to 5 feet to bedrock.	Slowly permeable; 2½ to 5 feet to bedrock.	Not needed.	Soil features favorable.	Shallowness to bedrock.	Medium intake rate.
Gravelly material; good stability and compaction; moderate permeability; poor core material.	Gravelly material; seepage rate excessive in some places.	Moderate permeability.	Not needed.	Soil features favorable.	Medium intake rate; very poorly drained; high water table.
Organic soil (muck).	Organic soil (muck).	High water table; muck is moderately deep and moderately permeable; underlying clay is slowly permeable	Not needed; level organic soil (muck).	Organic soil (muck); unstable.	Rapid intake rate; high water table.

ilar sealing agent is used, some ponds can be successfully constructed on these soils.

In places the Genesee and Shoals soils contain thin, sandy layers, or lenses. In those soils detailed borings should be made so that sites where there are sand lenses can be avoided. In many places lenses in the material underlying a pond reservoir can be sealed by thoroughly mixing the sandy material with finer textured material, compacting it, and using suitable additives.

The Brookston, Clermont, and similar soils generally have good sites for farm ponds in areas where relief is favorable. These soils are deep and contain material that is suitable for embankments. In table 4 the soil features listed as affecting dikes, levees, and embankments

are those of soil material that is disturbed or is removed from its original location.

Little irrigation is practiced in the county at the present time, but there likely will be more in the future. Additional information about this subject is in the subsection "Irrigation."

Soils and Land Use Planning

Most of Ross County has been used for farming in the past, but an increasingly large acreage is being taken out of farming and used as residential, industrial, commercial, and recreational areas. As the present trend continues, many additional areas now in crops or pasture will be transformed into community developments, especially along the Scioto River.

This soil survey will help in planning such developments and in solving problems that arise as use of the land changes. Planning individuals and groups can find useful information on the soil maps, in the text, and in the tables of this survey. Table 4 in the subsection "Use of Soils in Engineering" gives information on the features of soils in each series that affect the location of highways, the construction of ponds, and other uses. In table 3 the soil properties important in engineering are estimated. Among these properties are permeability, depth to bedrock, and depth to a seasonally high water table.

In table 5 the limitations of the soils in the county are rated slight, moderate, or severe. If the limitations are rated moderate or severe, the chief limitation for the use specified is listed, except in the column "Agriculture." A rating of *slight* indicates that any limitation affecting use of the soil is not important. A rating of *moderate* shows that a moderate problem is recognized but can be overcome or corrected. A rating of *severe* indicates that use of the soil is seriously limited by a hazard or restriction that is difficult to overcome. A rating of severe for a particular use does not imply that a soil so rated cannot be put to that use. Also, it should be recognized that large-scale cuts or fills in an area may alter the natural soil so much that ratings given in the table no longer apply.

Following are explanations of the uses rated in table 5:

Agriculture.—Agriculture is rated in the table to help land use planners in weighing the suitability of specific tracts of land for farm crops against the suitability of those tracts for other sound uses. The ratings broadly indicate the limitations to the commercial production of general crops and specialty crops.

Disposal of sewage effluent from septic tanks.—The suitability of soils for disposing of effluent from septic tanks depends on soil depth, permeability, slope, natural drainage, and hazard of flooding. The use of a soil in the disposal of effluent is severely limited by flooding, by somewhat poor to very poor drainage, or by moderately slow or slow permeability. (See table 3 for estimates of permeability.)

If filter fields are located on slopes of more than 12 percent, erosion or seepage downslope may be a problem or the soil may be unstable when saturated. A severe limitation is imposed by a restrictive layer such as solid bedrock, a dense, compact layer, or a layer of clay that interferes with adequate filtration and the removal of effluent.

Some soils in the county have a gravelly and sandy substratum or are underlain by creviced bedrock through which effluent that is inadequately filtered can contaminate the ground water. Also, a small percentage of an area shown as a specific soil on the map may consist of a small area, or inclusion, of a wetter, more poorly drained soil. Before a septic tank system is installed, an investigation should be made at the proposed site to make certain that the filter field will not be located in such an inclusion.

Sewage lagoons.—Sewage lagoons are shallow ponds built to dispose of sewage through oxidation. They may be needed in an area if septic tanks or a sewage system is not feasible or practical. Among the features that control the degree of limitation are the hazard of flooding, degree of slope, depth to rock, and permeability.

Homesite locations.—These locations are for homes of three stories or less that have a basement, but the ratings also apply to sites for small industrial, commercial, and institutional buildings. Considered in rating the soils are depth to bedrock, degree of slope, natural drainage, hazard of flooding, and stoniness or rockiness of the soil surface. Not considered is a method for disposing of sewage.

For individual houses or small groups of houses, limitations are moderate on slopes of 6 to 18 percent and are severe on slopes exceeding 18 percent. For homesites in larger developments, limitations are severe on all slopes of more than 12 percent. Flooding is a severe hazard in areas where it occurs. In areas where drainage is less than good, the foundation should be designed to take the inadequate drainage into account. Soils that are poorly drained or very poorly drained generally are soft when wet, and material from soils having moderate or high shrink-swell potential should not be used as backfill around foundations. If material of this kind is dry, placing it next to a foundation is hazardous, because the material swells when wet and may push in the wall.

Lawns, landscaping, and golf fairways.—In most areas developed for homes and golf courses, the natural surface soil is desirable for lawns, flowers, trees, and shrubs and should be saved. It can be carefully removed from the site, stored until construction and grading are completed, and then returned. The natural surface soil from areas graded for streets also can be used for lawns and fairways. Among the soil properties that determine whether a good lawn or fairway can be established are natural drainage, degree of slope, depth to bedrock, texture of the surface soil, stoniness, and hazard of flooding.

Roads and streets.—The ratings apply to county and township roads and streets that are hard surfaced. Soil requirements and limitations for roads and streets are similar to those for highways. (See tables 3 and 4 in the subsection "Use of Soils in Engineering." Table 3 gives, for major horizons of the soils in each series, the range in permeability, the shrink-swell potential, and other properties. In table 4 are shown, for each soil, a

rating of suitability for highway fill and the soil features that affect highway location.) The degree of slope that should be designed for the sides of cuts and fills depends on the erodibility of the soil and its capacity to support close-growing vegetation.

Recreation.—Recreation is becoming increasingly important in Ross County. Potentially, all the soils of the county are suitable for one or more kinds of recreational development. Soils on flood plains are excellent for some kinds because they generally occur in long, winding areas along streams and adjacent scenic hills. However, use of these soils for homes, highways, and most other nonfarm uses is severely limited by flooding. In addition, construction in these areas may hold back the natural flow of floodwater. Among the kinds of recreational facilities that can be safely developed on flood plains are extensive play areas. Also suitable are intensive play areas, such as ball diamonds, picnic areas, and tennis courts, that are not used during normal periods of flooding and are not subject to costly damage by floodwater.

Campsites for tents should be located in areas where the landscape is attractive, the trafficability is good, and the productivity for grasses and trees is medium or high. Soils in which the natural drainage is good or moderately good have less serious limitations than wetter soils. Limitations are moderate on somewhat poorly drained soils and are severe on poorly drained and very poorly drained soils. In addition, limitations are severe on muck soils, on soils along streams where flooding is a hazard in summer, and on soils in basinlike areas that are ponded after a heavy rain. As a rule, slopes of 6 to 12 percent are less desirable than milder slopes, and slopes in excess of 12 percent have severe limitations. Soils that are firm when moist and nonsticky when wet are desirable. Among the soils most suitable for campsites are those having a surface layer of loam, silt loam, sandy loam, fine sandy loam, or very fine sandy loam. Limitations are moderate on soils with a surface layer of clay loam, sandy clay loam, silty clay loam, or loamy sand. They are moderate to severe on stony or rocky soils and are severe on loose sand and on very gravelly or very channery soils.

For trailer camping, limitations are moderate on slopes of 2 to 6 percent and are severe on slopes of more than 6 percent.

Athletic fields and other intensive play areas are fairly small tracts used for baseball, football, tennis, volleyball, badminton, and other sports. Because the areas must be nearly level, considerable shaping may be needed on sloping soils. For this reason, the limitation is moderate or severe on slopes of more than 2 percent. Also important is texture of the surface layer. Soils having a surface layer of silt loam, fine sandy loam, very fine sandy loam, or sandy loam have only a slight limitation for this use. In areas where the surface layer is clay loam, sandy clay loam, silty clay loam, or loamy sand, the limitation is moderate. It is severe in areas of loose sand, of gravelly or channery soils, and of very stony, flaggy, or rocky soils.

Picnic areas and extensive play areas can be located on many kinds of soils. Areas consisting of several different soils provide a variety of wildlife and native vegetation. Considered in rating the soils for picnicking, hiking, nature study, and similar uses are degree of slope, texture of the surface soil, natural drainage, stoniness, and hazard of flooding. Paths should be constructed and maintained in a way that controls gullying.

Cemeteries and sanitary land fills.—For use as cemeteries, soils with slopes of less than 12 percent that are deep and well drained or moderately well drained have slight or moderate limitations. Steeper soils have severe limitations, and so do soils that are somewhat poorly drained to very poorly drained and are affected by a seasonally high water table. If the water table is permanently lowered, limitations are only slight or moderate on some soils. The use of soils for cemeteries is severely limited by hard bedrock near the surface, but it is only slightly or moderately restricted if the underlying materials are soft or rippable. At all periods of the year, ease of excavation is most favorable in the sandier soils. Shoring the sides of excavations is necessary if caving is a problem. Soil material that has good bearing strength and is subject to little frost heaving is needed at the base of monuments. Preserving the original surface soil is important, and liming and fertilizing are needed for maintaining sod.

In considering the use of soils for sanitary land fills, the depth to underlying rock is especially important. The most favorable soils for the trench type of sanitary land fills are those underlain by unconsolidated material that is friable. Among features that limit use are shallowness, wetness, slow permeability, steep slopes, and stoniness.

Descriptions of the Soils

This section describes the soil series (groups of soils) and single soils (mapping units) of Ross County. The acreage and proportionate extent of each mapping unit are given in table 6.

The procedure in this section is first to describe the soil series, and then the mapping units in that series. For each soil series, a profile of a soil type representative of the series is briefly described. Thus, to get full information on any one mapping unit, it is necessary to read the description of that unit and also the description of the soil series to which it belongs. As mentioned in the section "How This Survey Was Made," not all mapping units are members of a soil series. Riverwash, for example, does not belong to a soil series, but, nevertheless, is listed in alphabetical order along with the soil series.

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

A technical description of each soil series is given in detail in the section "Formation and Classification of

TABLE 5.—*Estimated degree and kind of*

[Riverwash (Rk) and Stone quarries (Sr) generally are not

Soil series and map symbols	Agriculture (cultivated crops)	Disposal of sewage effluent from septic tanks	Sewage lagoons	Homesite locations for homes of 3 stories or less [1]	Lawns, landscaping, and golf fairways
Abscota (Ab)	Moderate	Severe: flooding	Severe: permeability, flooding.	Severe: flooding	Severe: flooding
Alexandria:					
(AdC2)	Moderate	Severe: moderately slow permeability.	Severe: slope	Moderate: slope	Moderate: slope
(AdD2)	Severe	Severe: slope	Severe: slope	Moderate: slope	Severe: slope
(AdE2, AdF2)	Severe	Severe: slope	Severe: slope	Severe: slope	Severe: slope
(AeD3)	Severe	Severe: slope	Severe: slope	Moderate: slope	Severe: slope
(AeE3)	Severe	Severe: slope	Severe: slope	Severe: slope	Severe: slope
Alford:					
(AfC2)	Moderate	Moderate: slope	Severe: slope	Moderate: slope, soft when wet.	Moderate: slope
(AfD2)	Severe	Severe: slope	Moderate: slope	Moderate: slope, soft when wet.	Severe: slope
(AfE2)	Severe	Severe: slope	Severe: slope	Severe: slope, soft when wet.	Severe: slope
Algiers (Ag)	Slight (subject to flooding)	Severe: flooding	Severe: flooding	Severe: flooding, soft when wet.	Moderate: flooding.
Alvin:					
(AlA)	Moderate	Slight	Moderate: permeability.	Slight	Slight
(AlB)	Moderate	Slight	Moderate: permeability.	Slight	Slight
(AlC2)	Moderate	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope
Avonburg:					
(AvA)	Moderate	Severe: water table, permeability.	Slight	Moderate: water table.	Moderate: water table.
(AvB)	Moderate	Severe: water table, permeability.	Moderate: slope	Moderate: water table.	Moderate: water table.
Bartle:					
(BaA)	Moderate	Severe: water table, permeability.	Slight	Moderate: water table, soft when wet.	Moderate: water table.
(BaB)	Moderate	Severe: water table, permeability.	Moderate: slope	Moderate: water table, soft when wet.	Moderate: water table.
Berks (MuE, MuG) (For limitations to use of Muskingum and Neotoma soils in mapping units MuE and MuG, see the Muskingum and Neotoma series in this table.)	Severe	Severe: slope, stoniness.	Severe: slope	Severe: slope, stoniness.	Severe: slope
Bonpas (Bo)	Slight (needs drainage).	Severe: water table, permeability, ponding.	Slight	Severe: water table.	Severe: water table.
Brookston (Br, Bs)	Slight (needs drainage).	Severe: water table, permeability, ponding.	Slight	Severe: water table.	Severe: water table.

See footnotes at end of table.

limitations for land use planning

suitable for the uses shown in this table and are not rated]

Roads and streets [2]	Recreation			Cemeteries and sanitary land fills
	Campsites (tents)	Athletic fields and other intensive play areas	Picnic areas and extensive play areas	
Severe: flooding	Severe: flooding	Moderate: flooding	Moderate: flooding	Severe: flooding.
Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: slope	Severe: slope, stickiness.	Severe: slope	Severe: slope, stickiness.	Severe: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope, stickiness.	Severe: slope.
Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: flooding, soft when wet.	Severe: flooding	Severe: flooding, water table.	Moderate: flooding, water table.	Severe: flooding, water table.
Slight	Slight	Slight	Slight	Slight.
Slight	Slight	Moderate: slope	Slight	Slight.
Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope.
Moderate: water table.	Severe: water table, permeability.	Severe: permeability, water table.	Moderate: water table.	Severe: water table, permeability.
Moderate: water table.	Severe: water table, permeability.	Severe: permeability, water table.	Moderate: water table.	Severe: water table, permeability.
Moderate: water table.	Severe: water table, permeability.	Severe: permeability, water table.	Moderate: water table.	Severe: permeability, water table.
Moderate: water table.	Severe: water table, permeability.	Severe: permeability, water table.	Moderate: water table.	Severe: permeability, water table.
Severe: slope, stoniness.	Severe: slope, stoniness.	Severe: slope, stoniness.	Severe: slope, stoniness.	Severe: stoniness, slope.
Severe: water table	Severe: water table, ponding.	Severe: water table, stickiness.	Severe: water table	Severe: water table.
Severe: water table	Severe: water table, ponding.	Severe: water table, stickiness.	Severe: water table	Severe: water table.

TABLE 5.—*Estimated degree and kind of*

Soil series and map symbols	Agriculture (cultivated crops)	Disposal of sewage effluent from septic tanks	Sewage lagoons	Homesite locations for homes of 3 stories or less [1]	Lawns, landscaping, and golf fairways
Cana:					
(CaB, CaB2)	Moderate	Severe: permeability.	Moderate: bedrock, slope.	Moderate: limited depth to bedrock.	Slight
(CaC, CaC2)	Moderate	Severe: permeability.	Severe: slope	Moderate: slope	Moderate: slope
(CaD, CaD2)	Severe	Severe: permeability, slope.	Severe: slope	Moderate: slope	Severe: slope
(CaE, CaF)	Severe	Severe: slope	Severe: slope	Severe: slope	Severe: slope
(CeC3)	Severe	Severe: permeability.	Severe: slope	Moderate: slope	Severe: slope, erosion.
(CeD3)	Severe	Severe: permeability, slope.	Severe: slope	Moderate: slope	Severe: slope, erosion.
(CeF3)	Severe	Severe: slope	Severe: slope	Severe: slope	Severe: slope, erosion.
(CfE, CfF, CgF, CsE, CsG) (For limitations to use of Colyer soil in mapping unit CgF, CsE, and CsG, see the Colyer series in this table.)	Severe	Severe: slope, stoniness.	Severe: slope, stoniness.	Severe: slope, stoniness.	Severe: slope, stoniness.
Cardington:					
(ChB)	Slight	Severe: permeability.	Moderate: slope	Slight	Slight
(ChC2)	Moderate	Severe: permeability, slope.	Severe: slope	Moderate: slope	Moderate: slope
(ChD2)	Severe	Severe: slope, permeability.	Severe: slope	Moderate: slope	Severe: slope
(CkC3)	Severe	Severe: permeability, slope.	Severe: slope	Moderate: slope, erosion.	Severe: slope, erosion.
(CkD3)	Severe	Severe: slope, permeability.	Severe: slope	Moderate: slope, erosion.	Severe: slope, erosion.
Carlisle (Cm)	Moderate	Severe: water table, ponding.	Severe: high organic content.	Severe: water table, soft and unstable.	Severe: water table.
Casco (CnE2, CnE3) (For limitations to use of Lorenzo soil in mapping units CnE2 and CnE3, see the Lorenzo series in this table.)	Severe	Severe: slope [3]	Severe: slope, permeability.	Severe: slope	Severe: slope, droughtiness.
Celina:					
(CoA)	Slight	Severe: permeability.	Slight	Slight	Slight
(CoB, CoB2)	Slight	Severe: permeability.	Moderate: slope	Slight	Slight
Clermont (Cp)	Moderate	Severe: water table, permeability.	Slight	Severe: water table.	Severe: water table.
Colyer (CgF, CrE, CrG, CsE, CsG) (For limitations to use of Cana soil in mapping units CgF, CsE, CsG, see the Cana series in this table.)	Severe	Severe: slope, bedrock.	Severe: slope	Severe: slope, bedrock.	Severe: slope

See footnotes at end of table.

limitations for land use planning—Continued

Roads and streets [2]	Recreation			Cemeteries and sanitary land fills
	Campsites (tents)	Athletic fields and other intensive play areas	Picnic areas and extensive play areas	
Slight	Slight	Severe: permeability	Slight	Severe: permeability, bedrock.
Moderate: slope	Slight	Severe: slope, permeability.	Moderate: slope	Severe: permeability, bedrock.
Severe: slope	Moderate: slope	Severe: slope	Severe: slope	Severe: bedrock, slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: bedrock, slope.
Moderate: slope	Severe: slope, stickiness.	Severe: slope, stickiness.	Moderate: slope, stickiness.	Severe: permeability, bedrock.
Severe: slope	Severe: slope, stickiness.	Severe: slope	Severe: slope, stickiness.	Severe: bedrock, slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: bedrock, slope.
Severe: slope, stoniness.	Severe: slope, stoniness.	Severe: slope, stoniness.	Severe: slope, stoniness.	Severe: bedrock, slope.
Slight	Slight	Moderate: slope, permeability.	Slight	Moderate: permeability, water table.
Moderate: slope	Moderate: slope	Severe: slope, permeability.	Moderate: slope	Moderate: permeability, slope, water table.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Moderate: slope	Severe: stickiness, slope.	Severe: slope, stickiness.	Moderate: slope, stickiness.	Moderate: stickiness, slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope, stickiness.
Severe: water table, soil very soft.	Severe: water table, ponding.	Severe: water table, soft soil.	Severe: water table, soft soil.	Severe: water table, soft soil.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Slight	Moderate: permeability.	Moderate: permeability.	Slight	Moderate: permeability, water table.
Slight	Slight	Moderate: slope, permeability.	Slight	Moderate: permeability, water table.
Severe: water table	Severe: water table, permeability.	Severe: water table, permeability.	Severe: water table	Severe: water table, permeability.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: bedrock, slope.

TABLE 5.—*Estimated degree and kind of*

Soil series and map symbols	Agriculture (cultivated crops)	Disposal of sewage effluent from septic tanks	Sewage lagoons	Homesite locations for homes of 3 stories or less [1]	Lawns, landscaping, and golf fairways
Coolville:					
(CtB, CtB2)	Slight	Severe: permeability.	Moderate: slope.	Slight	Moderate: low fertility.
(CtC2, RfC, RfC2)	Moderate	Severe: permeability, slope.	Severe: slope	Moderate: slope	Moderate: slope, low fertility.
(RgC3) (For limitations to use of Rarden soil in mapping units RfC, RfC2, and RgC3, see the Rarden series in this table.)	Severe	Severe: permeability, slope.	Severe: slope	Moderate: slope	Severe: slope, erosion.
Crosby:					
(CvA)	Slight (seasonal wetness).	Severe: water table, permeability.	Slight	Moderate: water table.	Moderate: water table.
(CvB)	Slight (seasonal wetness).	Severe: water table, permeability.	Moderate: slope	Moderate: water table.	Moderate: water table.
Cruze:					
(CwB)	Moderate	Severe: permeability.	Moderate: slope	Moderate: soft when wet, subject to slippage.	Moderate: low fertility.
(CwC2)	Moderate	Severe: permeability.	Severe: slope	Moderate: subject to slippage.	Moderate: slope, low fertility.
(CwD2)	Severe	Severe: permeability, slope.	Severe: slope	Moderate: subject to slippage.	Severe: slope
(CwE)	Severe	Severe: slope	Severe: slope	Severe: slope, subject to slippage.	Severe: slope
(CzC3)	Severe	Severe: permeability.	Severe: slope	Moderate: subject to slippage.	Severe: slope, erosion.
(CzD3)	Severe	Severe: slope, permeability.	Severe: slope	Moderate: subject to slippage.	Severe: slope, erosion.
Dekalb (DnG, DoG) (For limitations to use of Neotoma soil in mapping units DnG and DoG, see the Neotoma series in this table.)	Severe	Severe: slope	Severe: slope	Severe: slope, bedrock.	Severe: slope
Eel (Ee)	Slight (subject to flooding).	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding
Fawcett (Fa)	Moderate	Severe: water table, permeability.	Slight	Moderate: water table, limited depth to shale.	Moderate: water table, low fertility.
Fox:					
(FgA, FlA, FmA, FnA)	Slight	Slight [3]	Severe: too permeable.	Slight	Slight: droughty
(FgB, FlB, FmB, FnB, FnB2)	Slight	Slight [3]	Severe: too permeable.	Slight	Slight: droughty
(FgC2, FlC2, FnC2, FoC3)	Moderate for FgC2, FlC2, FnC2; severe for FoC3.	Moderate: slope.[3]	Severe: slope, permeability.	Moderate: slope	Moderate: slope

See footnotes at end of table.

limitations for land use planning—Continued

Roads and streets [2]	Recreation			Cemeteries and sanitary land fills
	Campsites (tents)	Athletic fields and other intensive play areas	Picnic areas and extensive play areas	
Slight	Severe: permeability	Severe: permeability	Slight	Moderate for cemeteries (permeability, water table); severe for sanitary land fills (permeability).
Moderate: slope	Severe: slope, permeability.	Severe: slope, permeability.	Moderate: slope	Moderate for cemeteries (slope, water table); severe for sanitary land fills (permeability).
Moderate: slope	Severe: slope, stickiness.	Severe: slope, permeability.	Moderate: slope, stickiness.	Severe: slope, permeability, stickiness.
Moderate: water table.	Moderate: water table, permeability.	Moderate: water table, permeability.	Moderate: water table.	Severe: water table.
Moderate: water table.	Moderate: permeability, water table.	Moderate: slope, water table, permeability.	Moderate: water table.	Severe: water table.
Slight	Moderate: permeability.	Moderate: slope, permeability.	Slight	Moderate: permeability.
Moderate: slope	Moderate: slope, permeability.	Severe: slope	Moderate: slope	Moderate: permeability, slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Moderate: slope	Severe: stickiness, slope.	Severe: slope, stickiness.	Moderate: slope, stickiness.	Severe for cemeteries (slope, permeability, stickiness); moderate for sanitary land fills (slope, permeability).
Severe: slope	Severe: slope, stickiness.	Severe: slope, stickiness.	Severe: slope, stickiness.	Severe: slope, stickiness.
Severe: slope, rockiness.	Severe: slope, rockiness.	Severe: slope, rockiness.	Severe: slope, rockiness.	Severe: slope, bedrock, rockiness.
Severe: flooding	Severe: flooding	Moderate: flooding	Moderate: flooding	Severe: flooding.
Moderate: water table.	Severe: water table, permeability.	Severe: permeability, water table.	Moderate: water table.	Severe: water table, permeability.
Slight	Slight	Slight: (moderate for FgA because of gravel).	Slight	Slight.
Slight	Slight	Moderate: slope	Slight	Slight.
Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope.

TABLE 5.—*Estimated degree and kind of*

Soil series and map symbols	Agriculture (cultivated crops)	Disposal of sewage effluent from septic tanks	Sewage lagoons	Homesite locations for homes of 3 stories or less [1]	Lawns, landscaping, and golf fairways
Fox—Continued					
(NfD2, NfD3, FwD2, FwD3)	Severe	Severe: slope [3]	Severe: slope	Moderate: slope	Severe: slope
(NfE2, NfE3, NIF)	Severe	Severe: slope [3]	Severe: slope	Severe: slope	Severe: slope
(For limitations to use of Negley soil in mapping units NfD2, NfD3, NfE2, NfE3, and NIF, see the Negley series in this table. For limitations of the Lorenzo soil in unit NIF, see the Lorenzo series. For limitations of the Warsaw soil in units FwD2, and FwD3, see the Warsaw series.)					
Genesee (Ge, Gn, Go)	Slight (subject to flooding).	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding
Henshaw (He)	Slight	Severe: water table, permeability.	Slight	Moderate: water table, soft when wet.	Moderate: water table.
Hickory:					
(HkC2)	Moderate	Moderate: slope, permeability.	Severe: slope	Moderate: slope	Moderate: slope
(HkD2)	Severe	Severe: slope	Severe: slope	Moderate: slope	Severe: slope
(HkE, HoF)	Severe	Severe: slope	Severe: slope	Severe: slope	Severe: slope
(HoD3)	Severe	Severe: slope	Severe: slope	Moderate: slope	Severe: slope, erosion.
(HoE3)	Severe	Severe: slope	Severe: slope	Severe: slope	Severe: slope, erosion.
Kendallville:					
(KeA)	Slight	Severe: permeability.	Moderate: permeability.	Slight	Slight
(KeB)	Slight	Severe: permeability.	Moderate: slope	Slight	Slight
(KeC2, KnC3)	Moderate for KeC2; severe for KnC3.	Severe: permeability.	Severe: slope	Moderate: slope	Moderate: slope
(KeD2, KnD3)	Severe	Severe: slope	Severe: slope	Moderate: slope	Severe: slope
(KeE2, KnE3, KnF2)	Severe	Severe: slope	Severe: slope	Severe: slope	Severe: slope
Latham:					
(LaC2)	Severe	Severe: permeability.	Severe: slope	Moderate: slope, limited depth to shale, subject to slippage.	Moderate: slope, low fertility.
(LaD2)	Severe	Severe: permeability, slope.	Severe: slope	Moderate: slope, subject to slippage.	Severe: slope
(LaE, LaE2, LhE3, LhF, MsE, MtG).	Severe	Severe: slope	Severe: slope	Severe: slope, subject to slippage.	Severe: slope
(LhD3)	Severe	Severe: permeability, slope.	Severe: slope	Moderate: slope, subject to slippage.	Severe: slope, erosion.
(For limitations to use of Muskingum soil in mapping units MsE and MtG, see the Muskingum series in this table.)					

See footnotes at end of table.

limitations for land use planning—Continued

Roads and streets [2]	Recreation			Cemeteries and sanitary land fills
	Campsites (tents)	Athletic fields and other intensive play areas	Picnic areas and extensive play areas	
Severe: slope Severe: slope	Severe: slope Severe: slope	Severe: slope Severe: slope	Severe: slope Severe: slope	Severe: slope. Severe: slope.
Severe: flooding	Severe: flooding	Moderate: flooding	Moderate: flooding	Severe: flooding.
Moderate: water table.	Severe: water table, permeability.	Severe: permeability, water table.	Moderate: water table.	Severe: water table, permeability.
Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope	Moderate: permeability, slope.
Severe: slope Severe: slope Severe: slope	Severe: slope Severe: slope Severe: slope	Severe: slope Severe: slope Severe: slope	Severe: slope Severe: slope Severe: slope	Severe: slope. Severe: slope. Severe: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Slight	Slight	Slight	Slight	Slight for cemeteries; moderate for sanitary land fills (permeability).
Slight	Slight	Moderate: slope	Slight	Slight for cemeteries; moderate for sanitary land fills (permeability).
Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope.
Severe: slope Severe: slope	Severe: slope Severe: slope	Severe: slope Severe: slope	Severe: slope Severe: slope	Severe: slope. Severe: slope.
Moderate: slope	Severe: slope, permeability.	Severe: slope, permeability.	Moderate: slope	Moderate for cemeteries (slope, permeability); severe for sanitary land fills (permeability).
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.

TABLE 5.—*Estimated degree and kind of*

Soil series and map symbols	Agriculture (cultivated crops)	Disposal of sewage effluent from septic tanks	Sewage lagoons	Homesite locations for homes of 3 stories or less [1]	Lawns, landscaping, and golf fairways
Lorenzo (CnE2, CnE3, NIF, RIG). (For limitations to use of Casco soil in mapping units CnE2 and CnE3, see the Casco series in this table. For limitations of Fox and Negley soils in unit NIF, see the Fox and Negley series. For limitations of Rodman soil in unit RIG, see the Rodman series.)	Severe	Severe: slope [3]	Severe: slope, permeability.	Severe: slope	Severe: slope, droughtiness.
Loudonville:					
(LoC)	Moderate	Moderate to severe: bedrock.	Severe: slope, bedrock.	Moderate: bedrock, slope.	Moderate: bedrock, slope.
(LoD2)	Severe	Severe: slope, bedrock.	Severe: slope	Moderate: bedrock, slope.	Severe: slope
(LoE2, LoF2)	Severe	Severe: slope	Severe: slope	Severe: slope, bedrock.	Severe: slope
Markland:					
(MaA)	Slight	Severe: permeability.	Slight	Slight: soft when wet.	Slight
(MaB)	Moderate	Severe: permeability.	Moderate: slope	Slight: soft when wet.	Slight
(MaC2)	Severe	Severe: permeability.	Severe: slope	Moderate: slope, soft when wet.	Moderate: slope
(MaD2)	Severe	Severe: slope, permeability.	Severe: slope	Moderate: slope, soft when wet.	Severe: slope
(MaE2, MaF2)	Severe	Severe: slope	Severe: slope	Severe: slope	Severe: slope
(MeC3)	Severe	Severe: permeability.	Severe: slope	Moderate: slope, soft when wet.	Severe: slope, erosion.
(MeD3)	Severe	Severe: slope, permeability.	Severe: slope	Moderate: slope	Severe: slope, erosion.
McGary:					
(MgA)	Moderate	Severe: water table, permeability.	Slight	Moderate: water table, soft when wet.	Moderate: water table.
(MgB)	Moderate	Severe: water table, permeability.	Moderate: slope	Moderate: water table, soft when wet.	Moderate: water table.
Mentor:					
(MkA)	Slight	Slight	Moderate: permeability.	Slight	Slight
(MkB)	Slight	Slight	Moderate: permeability, slope.	Slight	Slight
(MkC2)	Moderate	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope
(MhD3, MkD2)	Severe	Severe: slope	Severe: slope	Moderate: slope	Severe: slope
(MkE2)	Severe	Severe: slope	Severe: slope	Severe: slope	Severe: slope
Miami:					
(MlB, MlB2)	Slight	Severe: permeability.	Moderate: slope	Slight	Slight
(MlC, MlC2)	Moderate	Severe: permeability.	Severe: slope	Moderate: slope	Moderate: slope
(MlD, MlD2)	Severe	Severe: slope, permeability.	Severe: slope	Moderate: slope	Severe: slope
(MlE)	Severe	Severe: slope	Severe: slope	Severe: slope	Severe: slope
(MmB3)	Moderate	Severe: permeability.	Moderate: slope	Slight	Moderate: erosion, stickiness.

See footnotes at end of table.

limitations for land use planning—Continued

Roads and streets [2]	Recreation			Cemeteries and sanitary land fills
	Campsites (tents)	Athletic fields and other intensive play areas	Picnic areas and extensive play areas	
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Moderate: slope, bedrock.	Moderate: slope	Severe: slope, bedrock.	Moderate: slope, bedrock.	Severe: bedrock, slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: bedrock, slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: bedrock, slope.
Slight: soft when wet	Moderate: permeability.	Moderate: permeability.	Slight	Moderate for cemeteries (permeability); slight for sanitary land fills.
Slight: soft when wet	Moderate: permeability.	Moderate: permeability, slope.	Slight	Moderate for cemeteries (permeability); slight for sanitary land fills.
Moderate: slope, low bearing strength.	Moderate: permeability, slope.	Severe: slope	Moderate: slope	Moderate: slope, permeability.
Severe: slope	Severe: slope, permeability.	Severe: slope	Severe: slope	Severe: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Moderate: slope, low bearing strength.	Severe: permeability, erosion.	Severe: slope	Moderate: slope	Moderate: slope, permeability.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Moderate: water table, soft when wet.	Severe: water table, permeability.	Severe: permeability, water table.	Moderate: water table.	Severe: water table.
Moderate: water table, soft when wet.	Severe: water table, permeability.	Severe: permeability, water table.	Moderate: water table.	Severe: water table.
Slight	Slight	Slight	Slight	Slight.
Slight	Slight	Moderate: slope	Slight	Slight.
Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Slight	Moderate: permeability.	Moderate: slope, permeability.	Slight	Moderate: permeability.
Moderate: slope	Moderate: slope, permeability.	Severe: slope	Moderate: slope	Moderate: slope, permeability.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Slight	Moderate: slope, texture of surface layer.	Moderate: slope, stickiness.	Moderate: erosion	Moderate for cemeteries (stickiness); severe for sanitary land fills (stickiness).

TABLE 5.—*Estimated degree and kind of*

Soil series and map symbols	Agriculture (cultivated crops)	Disposal of sewage effluent from septic tanks	Sewage lagoons	Homesite locations for homes of 3 stories or less [1]	Lawns, landscaping, and golf fairways
Miami—Continued					
(MmC3)	Severe	Severe: permeability, slope.	Severe: slope	Moderate: slope	Severe: slope, stickiness.
(MmD3)	Severe	Severe: slope, permeability.	Severe: slope	Moderate: slope	Severe: slope, stickiness.
(MmE3)	Severe	Severe: slope	Severe: slope	Severe: slope	Severe: slope, stickiness.
(MmF)	Severe	Severe: slope	Severe: slope	Severe: slope	Severe: slope
Millsdale (Mn)	Slight (needs draining).	Severe: water table, ponding, bedrock.	Severe: bedrock	Severe: bedrock, water table.	Severe: bedrock, water table.
Milton:					
(MoB)	Moderate	Severe: bedrock, permeability [3].	Severe: bedrock	Severe: bedrock	Moderate: bedrock.
(MoC2)	Severe	Severe: bedrock, permeability [3].	Severe: bedrock, slope.	Severe: bedrock	Moderate: slope, bedrock.
(MoE2)	Severe	Severe: bedrock, slope [3]	Severe: slope	Severe: slope, bedrock.	Severe: slope
Monongahela:					
(MpA)	Slight	Severe: permeability.	Slight	Slight	Slight
(MpB)	Slight	Severe: permeability.	Moderate: slope	Slight	Slight
(MpC2)	Moderate	Severe: permeability, slope.	Severe: slope	Moderate: slope	Moderate: slope
Muskingum (Mrd, MsE, Mtg, MuE, MuG). (For limitations to use of Latham soil in mapping units MsE and MtG, see the Latham series in this table. For limitations of Berks and Neotoma soils in units MuE and MuG, see the Berks and Neotoma series.)	Severe	Severe: slope, stoniness.	Severe: slope	Severe: slope, stoniness, bedrock.	Severe: slope, stoniness.
Negley:					
(NeC2, PgC2)	Moderate	Moderate: slope [3]	Severe: slope, permeability.	Moderate: slope	Moderate: slope
(NfD2, NfD3)	Severe	Severe: slope [3]	Severe: slope	Moderate: slope	Severe: slope
(NfE2, NfE3, NIF) (For limitations to use of Fox soil in mapping units NfD2, NfD3, NfE2, NfE3, and NIF, see the Fox series in this table. For limitations of Lorenzo soil in unit NIF, see the Lorenzo series. For limitations of Parke soil in unit PgC2, see the Parke series.)	Severe	Severe: slope [3]	Severe: slope	Severe: slope	Severe: slope

See footnotes at end of table.

limitations for land use planning—Continued

Roads and streets [2]	Recreation			Cemeteries and sanitary land fills
	Campsites (tents)	Athletic fields and other intensive play areas	Picnic areas and extensive play areas	
Moderate: slope	Severe: slope, texture of surface layer.	Severe: slope, stickiness.	Moderate: slope, erosion.	Moderate for cemeteries (slope, stickiness); severe for sanitary land fills (stickiness).
Severe: slope	Severe: stickiness, slope.	Severe: slope	Severe: slope, erosion.	Severe: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: bedrock, water table.	Severe: water table, ponding.	Severe: water table, bedrock, stickiness.	Severe: water table	Severe: water table, bedrock.
Moderate: bedrock	Moderate: permeability.	Severe: bedrock, slope.	Moderate: bedrock	Severe: bedrock.
Moderate: slope, bedrock.	Moderate: slope, permeability.	Severe: slope, bedrock.	Moderate: slope	Severe: bedrock.
Severe: slope, bedrock.	Severe: slope	Severe: slope, bedrock.	Severe: slope	Severe: bedrock, slope.
Slight	Moderate: permeability.	Moderate: permeability.	Slight	Moderate for cemeteries (water table, permeability); severe for sanitary land fills (permeability).
Slight	Moderate: permeability.	Moderate: slope, permeability.	Slight	Moderate for cemeteries (water table, permeability); severe for sanitary land fills (permeability).
Moderate: slope	Moderate: permeability, slope.	Severe: slope, permeability.	Moderate: slope	Moderate for cemeteries (slope, water table); severe for sanitary land fills (permeability).
Severe: slope, stoniness.	Severe: slope, stoniness.	Severe: slope, stoniness.	Severe: slope, stoniness.	Severe: stoniness, slope
Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.

TABLE 5.—*Estimated degree and kind of*

Soil series and map symbols	Agriculture (cultivated crops)	Disposal of sewage effluent from septic tanks	Sewage lagoons	Homesite locations for homes of 3 stories or less [1]	Lawns, landscaping, and golf fairways
Neotoma (DnG, DoG, MuE, MuG). (For limitations to use of Dekalb soil in mapping units DnG and DoG, see the Dekalb series. For limitations of the Berks and Muskingum soils in units MuE and MuG, see the Berks and Muskingum series.)	Severe	Severe: slope; bedrock or stoniness.	Severe: slope	Severe: slope; bedrock or stoniness.	Severe: slope
Ockley:					
(OcA)	Slight	Slight [3]	Moderate: too permeable.	Slight	Slight
(OcB)	Slight	Slight [3]	Moderate: too permeable, sloping.	Slight	Slight
Parke:					
(PaB)	Slight	Slight	Moderate: too permeable, sloping.	Slight	Slight
(PaC2, PeC3, PgC2)	Moderate	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope
(PaD2, PeD3)	Severe	Severe: slope	Severe: slope	Moderate: slope	Severe: slope
(PaE, PeE3) (For limitations to use of Negley soil in mapping unit PgC2, see the Negley series in this table.)	Severe	Severe: slope	Severe: slope	Severe: slope	Severe: slope
Pekin:					
(PhB, PkB)	Slight	Severe: permeability.	Moderate: too permeable, sloping.	Slight: soft when wet.	Slight
(PkA)	Slight	Severe: permeability.	Moderate: too permeable.	Slight: soft when wet.	Slight
(PkC2, PmC3)	Moderate	Severe: permeability, slope.	Severe: slope	Moderate: slope, soft when wet.	Moderate: slope.
(PkD2, PlD2, PlE2)	Severe	Severe: slope, permeability.	Severe: slope	Moderate: slope, soft when wet.	Severe: slope
(PlB)	Slight	Severe: permeability.	Moderate: slope.	Slight: soft when wet.	Slight
(PlC2)	Moderate	Severe: permeability, slope.	Severe: slope	Moderate: slope, soft when wet.	Moderate: slope.
Philo:					
(Pn)	Slight (seasonally wet).	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding
(Po)	Slight	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding
Pike:					
(PpA)	Slight	Slight	Moderate: permeability.	Slight	Slight
(PpB)	Slight	Slight	Moderate: slope, permeability.	Slight	Slight
Pope:					
(Pr)	Slight	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding
(Ps)	Slight	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding

See footnotes at end of table.

limitations for land use planning—Continued

Roads and streets [2]	Recreation			Cemeteries and sanitary land fills
	Campsites (tents)	Athletic fields and other intensive play areas	Picnic areas and extensive play areas	
Severe: slope; rockiness or stoniness.	Severe: slope; rockiness or stoniness.	Severe: slope; rockiness or stoniness.	Severe: slope; rockiness or stoniness.	Severe: rockiness or stoniness; slope.
Slight	Slight	Slight	Slight	Slight.
Slight	Slight	Moderate: slope	Slight	Slight.
Slight	Slight	Moderate: slope	Slight	Slight.
Moderate: slope Severe: slope Severe: slope	Moderate: slope Severe: slope Severe: slope	Severe: slope Severe: slope Severe: slope	Moderate: slope Severe: slope Severe: slope	Moderate: slope. Severe: slope. Severe: slope.
Slight	Slight	Moderate: slope	Slight	Moderate: water table.
Slight Moderate: slope	Moderate: water table. Moderate: slope	Moderate: permeability. Severe: slope	Slight Moderate: slope	Moderate: water table. Moderate: water table, slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope, permeability.
Slight Moderate: slope	Moderate: permeability. Moderate: slope, permeability.	Moderate: slope, permeability. Severe: slope	Slight Moderate: slope	Moderate for cemeteries (permeability, water table); severe for sanitary land fills (permeability). Moderate for cemeteries (slope, water table); severe for sanitary land fills (permeability).
Severe: flooding	Severe: flooding	Moderate: flooding	Moderate: flooding	Severe: flooding.
Severe: flooding	Severe: flooding	Moderate: flooding, channery fragments.	Moderate: flooding	Severe: flooding.
Slight	Slight	Slight	Slight	Slight.
Slight	Slight	Slight	Slight	Slight.
Severe: flooding Severe: flooding	Moderate: flooding Moderate: flooding	Moderate: flooding Moderate: flooding, channery fragments.	Moderate: flooding Moderate: flooding	Severe: flooding. Severe: flooding.

TABLE 5.—*Estimated degree and kind of*

Soil series and map symbols	Agriculture (cultivated crops)	Disposal of sewage effluent from septic tanks	Sewage lagoons	Homesite locations for homes of 3 stories or less [1]	Lawns, landscaping, and golf fairways
Rainsboro:					
(RaA)	Slight	Severe: permeability.	Slight	Slight	Slight
(RaB)	Slight	Severe: permeability.	Moderate: slope	Slight	Slight
(RaC2, RbC3)	Moderate	Severe: permeability, slope.	Severe: slope	Moderate: slope	Moderate: slope
(RaD2, RbD3)	Severe	Severe: slope, permeability.	Severe: slope	Moderate: slope	Severe: slope
Rarden:					
(RdD, RdD2)	Severe	Severe: permeability, slope.	Severe: slope	Moderate: slope, soft when wet.	Severe: slope, low fertility.
(RdE2)	Severe	Severe: slope, permeability.	Severe: slope	Severe: slope	Severe: slope
(ReD3)	Severe	Severe: permeability, slope.	Severe: slope	Moderate: slope, soft when wet.	Severe: erosion, slope.
(RfC, RfC2)	Moderate	Severe: permeability.	Severe: slope	Moderate: slope, soft when wet.	Moderate: low fertility, slope.
(RgC3) (For limitations to use of Coolville soil in mapping units RfC, RfC2, and RgC3, see the Coolville series in this table.)	Severe	Severe: permeability.	Severe: slope	Moderate: slope, soft when wet.	Severe: slope, erosion, low fertility.
Ritchey (RhF2)	Severe	Severe: bedrock, slope.	Severe: slope, bedrock.	Severe: slope, bedrock.	Severe: slope, bedrock.
Rodman (RlG) (For limitations to use of Lorenzo soil in mapping unit RlG, see the Lorenzo series in this table.)	Severe	Severe: slope [3]	Severe: slope, permeability.	Severe: slope	Severe: slope, droughty.
Ross (Rm, Rn, Ro)	Slight	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding
Rossmoyne:					
(RpA)	Slight	Severe: permeability.	Slight	Slight	Slight
(RpB, RpB2)	Slight	Severe: permeability.	Moderate: slope	Slight	Slight
(RpC2, RsC3)	Moderate	Severe: permeability.	Severe: slope	Moderate: slope	Moderate: slope
(RpD2, RsD3)	Severe	Severe: slope, permeability.	Severe: slope	Moderate: slope	Severe: slope
(RpE2)	Severe	Severe: slope	Severe: slope	Severe: slope	Severe: slope
Shoals (Sh)	Slight (needs drainage).	Severe: water table, flooding.	Severe: flooding	Severe: flooding	Severe: flooding
Sleeth (Sl)	Slight (seasonally wet).	Severe: water table, permeability.	Severe: permeable substratum.	Moderate: water table.	Moderate: water table.
Stendal (Sn)	Slight (subject to flooding).	Severe: water table, flooding.	Severe: flooding	Severe: flooding	Severe: flooding

See footnotes at end of table.

limitations for land use planning—Continued

Roads and streets [2]	Recreation			Cemeteries and sanitary land fills
	Campsites (tents)	Athletic fields and other intensive play areas	Picnic areas and extensive play areas	
Slight	Moderate: permeability.	Moderate: permeability.	Slight	Moderate: permeability, water table.
Slight	Moderate: permeability	Moderate: slope, permeability.	Slight	Moderate: permeability, water table.
Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope	Moderate: permeability, slope, water table.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: slope	Severe: slope, permeability.	Severe: slope	Severe: slope	Severe: permeability, slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: permeability, slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: permeability, slope
Moderate: slope	Severe: permeability	Severe: slope	Moderate: slope	Severe: permeability, slope.
Moderate: slope	Severe: permeability	Severe: slope	Moderate: slope	Severe: permeability, slope.
Severe: slope, bedrock.	Severe: slope, bedrock.	Severe: slope, bedrock.	Severe: slope, bedrock.	Severe: slope, bedrock.
Severe: slope	Severe: slope	Severe: slope, gravel	Severe: slope	Severe: slope.
Severe: flooding	Moderate: flooding	Moderate: flooding	Moderate: flooding	Severe: flooding.
Slight	Severe: permeability, water table.	Severe: permeability	Slight	Moderate for cemeteries (water table, permeability); severe for sanitary land fills (permeability).
Slight	Severe: permeability	Severe: permeability	Slight	Moderate for cemeteries (water table, permeability); severe for sanitary land fills (permeability).
Moderate: slope	Severe: permeability	Severe: slope, permeability.	Moderate: slope	Moderate for cemeteries (slope, water table); severe for sanitary land fills (permeability).
Severe: slope	Severe: slope, permeability.	Severe: slope	Severe: slope	Severe: permeability, slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: permeability, slope.
Severe: flooding	Severe: flooding	Severe: flooding, water table.	Moderate: flooding, water table.	Severe: flooding.
Moderate: water table.	Moderate: water table, permeability.	Moderate: water table, permeability.	Moderate: water table.	Severe: water table.
Severe: flooding	Severe: flooding	Severe: flooding, water table.	Moderate: flooding, water table.	Severe: flooding.

TABLE 5.—*Estimated degree and kind of*

Soil series and map symbols	Agriculture (cultivated crops)	Disposal of sewage effluent from septic tanks	Sewage lagoons	Homesite locations for homes of 3 stories or less [1]	Lawns, landscaping, and golf fairways
Taggart:					
(TaA)	Slight	Severe: water table, permeability.	Slight	Moderate: water table.	Moderate: water table.
(TaB)	Slight	Severe: water table, permeability.	Moderate: slope.	Moderate: water table.	Moderate: water table.
(Te)	Moderate	Severe: water table, ponding.	Slight	Severe: water table.	Severe: water table.
Thackery:					
(ThA)	Slight (seasonally wet).	Slight [3]	Severe: permeable substratum.	Slight	Slight
(ThB)	Slight (seasonally wet).	Slight	Severe: permeable substratum.	Slight	Slight
Tyler (Ty)	Moderate	Severe: water table, permeability.	Slight	Moderate: water table.	Moderate: water table, low fertility.
Uniontown:					
(UnA)	Slight	Moderate: permeability.	Moderate: permeability.	Slight	Slight
(UnB)	Slight	Moderate: permeability.	Moderate: slope	Slight	Slight
(UnC2)	Moderate	Moderate: permeability, slope.	Severe: slope	Moderate: slope, soft when wet.	Moderate: slope
Wallkill (Wa)	Slight (needs draining).	Severe: water table, ponding.	Severe: organic material.	Severe: water table, ponding.	Severe: water table, ponding.
Warners (We)	Moderate	Severe: water table, ponding.	Severe: organic soil.	Severe: water table.	Severe: water table, ponding.
Warsaw:					
(Wl)	Slight	Slight [3]	Severe: permeability.	Slight	Slight
(FwD2, FwD3) (For limitations to use of Fox soil in mapping units FwD2 and FwD3, see the Fox series in this table.)	Severe	Severe: slope [3]	Severe: slope	Moderate: slope	Severe: slope
Wea:					
(WsA)	Slight	Slight [3]	Severe: permeability.	Slight	Slight
(WsB)	Slight	Slight [3]	Severe: permeability.	Slight	Slight
Wellston (WtC)	Moderate	Moderate: bedrock, slope.	Severe: slope, bedrock.	Moderate: slope, bedrock.	Moderate: slope, low fertility.
Westland (Wu)	Slight (needs draining).	Severe: water table, ponding.	Severe: permeable substratum.	Severe: water table, ponding.	Severe: water table, ponding.
Willette (Wv)	Moderate (needs draining).	Severe: water table, ponding.	Severe: organic soil.	Severe: water table.	Severe: water table, ponding.

[1] In subdivisions the limitation to use of soils as sites for homes of 3 stories or less is moderate on slopes of 6 to 12 percent and is severe on slopes of more than 12 percent.

[2] In subdivisions the limitation to use of soils for parking lots, roads, and streets is moderate on slopes of 2 to 6 percent and is severe on slopes of more than 6 percent.

limitations for land use planning—Continued

Roads and streets [2]	Recreation			Cemeteries and sanitary land fills
	Campsites (tents)	Athletic fields and other intensive playing areas	Picnic areas and extensive play areas	
Moderate: water table.	Severe: water table, permeability.	Severe: permeability, water table.	Moderate: water table.	Severe: water table.
Moderate: water table.	Severe: water table, permeability.	Severe: permeability, water table.	Moderate: water table.	Severe: water table.
Severe: water table	Severe: water table, ponding.	Severe: water table, permeability.	Severe: water table	Severe: water table.
Slight	Slight	Slight	Slight	Slight for cemeteries; moderate for sanitary land fills (permeability).
Slight	Slight	Moderate: slope	Slight	Slight for cemeteries; moderate for sanitary land fills (permeability).
Moderate: water table.	Severe: water table, permeability.	Severe: permeability, water table.	Moderate: water table.	Severe: water table.
Slight	Moderate: seasonally wet.	Moderate: permeability.	Slight	Slight for cemeteries; moderate for sanitary land fills (permeability).
Slight	Moderate: seasonally wet.	Moderate: slope, permeability.	Slight	Slight for cemeteries; moderate for sanitary land fills (permeability).
Moderate: slope, soft when wet.	Moderate: slope	Severe: slope	Moderate: slope	Moderate: permeability, slope.
Severe: water table, organic material.	Severe: water table, ponding.	Severe: water table, ponding.	Severe: water table, ponding.	Severe: water table, ponding.
Severe: water table, ponding.	Severe: water table, ponding.	Severe: water table, ponding.	Severe: water table, ponding.	Severe: water table, ponding.
Slight	Slight	Slight	Slight	Slight.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Slight	Slight	Slight	Slight	Slight.
Slight	Slight	Moderate: slope	Slight	Slight.
Moderate: slope	Moderate: slope	Severe: slope, bedrock.	Moderate: slope	Moderate: slope, bedrock.
Severe: water table	Severe: water table, ponding.	Severe: water table, ponding.	Severe: water table, ponding.	Severe: water table, ponding.
Severe: water table, soil very soft.	Severe: water table, ponding.	Severe: water table, ponding.	Severe: water table, ponding.	Severe: water table, ponding.

[2] Nearby wells, springs, or ponds may be contaminated by seepage of waste liquid because the lower layers in these soils are rapidly permeable.

Soils." Many terms used in the soil descriptions and other sections of the survey are defined in the Glossary.

Abscota Series, Calcareous Variants

Deep, dark-colored, limy soils make up the calcareous variants of the Abscota series. These soils are well drained and have a moderately coarse textured surface layer and subsoil. They occupy nearly level bottom land along the Scioto River and North Fork Paint Creek. They are subject to flooding.

Typical profile (Abscota sandy loam, calcareous variant, in a cultivated field):

0 to 4 inches, very dark grayish-brown, limy, friable sandy loam.
4 to 13 inches, very dark brown, limy, friable sandy loam.
13 to 44 inches +, brown, limy, loose sand.

The very dark surface and subsurface layers range from 10 to 16 inches in total thickness. Their gravel content ranges from 0 to more than 30 percent.

Permeability to water is moderately rapid, productivity is moderately low, and the available moisture capacity is very low. Additions of lime and fertilizer are needed if crops are grown. Many areas of these soils are infested with johnsongrass.

Abscota sandy loam, calcareous variant (Ab).—This is the only Abscota soil mapped in the county. It lies on flood plains, generally in nearly level, somewhat irregularly shaped areas that are about 150 feet wide and range from 10 to 25 acres in size. It also occurs in gently undulating areas that are dissected by many shallow flood channels and sloughs, and it is in small sandy areas within areas of other soils. In most places it lies next to a stream on one side and adjoins Genesee or Ross soils on the other.

Included with this soil are small areas that have a gravelly surface layer. These areas, indicated by symbol on the soil map, are generally on the downstream side of large bends in the Scioto River, and the gravelly layer is overwash from rather recent flooding. Also included are a few areas of uneroded Genesee loam, chiefly near the outer edge of areas mapped as this Abscota soil.

This soil is droughty, and it is subject to flooding, especially late in winter and early in spring. The floods usually occur before crops are planted. Infestations of johnsongrass are extensive, particularly in the Paint Creek valley and in the Scioto River valley below Chillicothe. Most of this soil is used for cultivated crops. (Capability unit IIw–5; woodland suitability group 3)

Alexandria Series

The Alexandria series consists of deep, well-drained soils that have a medium-textured surface layer and a moderately fine textured or fine textured subsoil. These soils are on sloping to steep uplands.

Typical profile (Alexandria silt loam in a cultivated field):

0 to 6 inches, dark grayish-brown, medium acid, friable silt loam.
6 to 16 inches, dark yellowish-brown to dark-brown, very strongly acid, firm silty clay loam to light silty clay.
16 to 28 inches, dark yellowish-brown, slightly acid, firm light clay.
28 to 60 inches, yellowish-brown, firm, limy glacial till of silty clay loam texture.

Some areas are sufficiently flaggy with sandstone fragments that use is restricted. The subsoil ranges from heavy silty clay loam to silty clay or clay. Underlying the subsoil, at a depth of 27 to 40 inches, is limy glacial till ranging from silty clay loam to loam in texture.

Alexandria soils have moderately slow permeability. In areas that are not severely eroded, they are moderately high in productivity and have moderate available moisture capacity in the root zone. Most crops common in the county are suited to these soils. Needed in cultivated areas are additions of lime, fertilizer, and organic matter, as well as practices that control erosion on slopes.

Alexandria silt loam, 6 to 12 percent slopes, moderately eroded (AdC2).—This soil has lost about half of its original surface layer through erosion. Most areas have been cleared and farmed, and in these the plow layer is made up partly of subsoil material. Included in areas mapped as this soil are wooded areas, commonly on short and irregular slopes, that are not eroded; and some areas, generally on the steeper slopes, that are severely eroded. In addition, there are small, more nearly level areas of Cardington soils included, particularly along drainageways. (Capability unit IIIe–1; woodland suitability group 4)

Alexandria silt loam, 12 to 18 percent slopes, moderately eroded (AdD2).—About half of the original surface layer has been lost from this moderately eroded soil. In areas cleared and farmed, the plow layer contains material brought up from the subsoil. Some included areas are uneroded or only slightly eroded; these generally occupy the milder slopes and, in most places, are forested. Also included are a few areas of stony soils, which are indicated by spot symbols on the soil map. (Capability unit IVe–1; woodland suitability group 4)

Alexandria silt loam, 18 to 25 percent slopes, moderately eroded (AdE2).—More than 80 percent of this soil has been cleared and cultivated, but now the soil is mainly in permanent pasture. Erosion has removed about half of the original surface layer, and the present surface layer includes material from the subsoil. Slopes generally are short, steep, and irregular. Included in areas mapped as this soil are forested areas that are largely uneroded; small, less strongly sloping areas of Cardington soils, most commonly along drainageways; and a few small areas of stony soils, indicated by symbol on the soil map. (Capability unit VIe–1; woodland suitability group 4)

Alexandria silt loam, 25 to 40 percent slopes, moderately eroded (AdF2).—About 75 percent of this soil has been used for cultivated crops, but now the soil is mainly in permanent pasture or reverting to trees. In most areas not wooded, about half of the original surface layer has been lost through erosion, and the present surface layer contains some of the subsoil. Slopes generally are short, very steep, and irregular. Included are small areas that generally are wooded and uneroded. Also included are small areas of stony soils, indicated by symbol on the soil map. (Capability unit VIIe–1; woodland suitability group 4)

Alexandria soils, 12 to 18 percent slopes, severely eroded (AeD3).—These soils formerly were cultivated but now are largely in permanent pasture or idle and reverting to woodland. Nearly all of the original surface layer has been removed by erosion. The plow layer consists al-

TABLE 6.—*Approximate acreage and proportionate extent of the soils*

Mapping unit	Acres	Percent
Abscota sandy loam, calcareous variant	590	0. 1
Alexandria silt loam, 6 to 12 percent slopes, moderately eroded	271	(1)
Alexandria silt loam, 12 to 18 percent slopes, moderately eroded	490	. 1
Alexandria silt loam, 18 to 25 percent slopes, moderately eroded	1, 151	. 3
Alexandria silt loam, 25 to 40 percent slopes, moderately eroded	782	. 2
Alexandria soils, 12 to 18 percent slopes, severely eroded	316	. 1
Alexandria soils, 18 to 25 percent slopes, severely eroded	859	. 2
Alford silt loam, 6 to 12 percent slopes, moderately eroded	54	(1)
Alford silt loam, 12 to 18 percent slopes, moderately eroded	40	(1)
Alford silt loam, 18 to 25 percent slopes, moderately eroded	62	(1)
Algiers silt loam	4, 695	1. 1
Alvin fine sandy loam, 0 to 2 percent slopes	92	(1)
Alvin fine sandy loam, 2 to 6 percent slopes	264	. 1
Alvin fine sandy loam, 6 to 12 percent slopes, moderately eroded	189	(1)
Avonburg silt loam, 0 to 2 percent slopes	1, 947	. 4
Avonburg silt loam, 2 to 6 percent slopes	472	. 1
Bartle silt loam, 0 to 2 percent slopes	2, 340	. 5
Bartle silt loam, 2 to 6 percent slopes	727	. 2
Bonpas silty clay loam	3, 163	. 7
Brookston silt loam	615	. 1
Brookston silty clay loam	16, 137	3. 7
Cana silt loam, 2 to 6 percent slopes	667	. 1
Cana silt loam, 2 to 6 percent slopes, moderately eroded	458	. 1
Cana silt loam, 6 to 12 percent slopes	639	. 1
Cana silt loam, 6 to 12 percent slopes, moderately eroded	4, 880	1. 1
Cana silt loam, 12 to 18 percent slopes	1, 189	. 3
Cana silt loam, 12 to 18 percent slopes, moderately eroded	4, 445	1. 0
Cana silt loam, 18 to 25 percent slopes	5, 684	1. 3
Cana silt loam, 25 to 45 percent slopes	6, 243	1. 4
Cana soils, 6 to 12 percent slopes, severely eroded	1, 720	. 4
Cana soils, 12 to 18 percent slopes, severely eroded	3, 434	. 8
Cana soils, 18 to 35 percent slopes, severely eroded	1, 857	. 4
Cana very flaggy silt loam, 18 to 25 percent slopes	500	. 1
Cana very flaggy silt loam, 25 to 35 percent slopes	2, 079	. 5
Cana-Colyer very flaggy silt loams, 25 to 35 percent slopes	424	. 1
Cardington silt loam, 2 to 6 percent slopes	115	(1)
Cardington silt loam, 6 to 12 percent slopes, moderately eroded	362	. 1
Cardington silt loam, 12 to 18 percent slopes, moderately eroded	312	. 1
Cardington soils, 6 to 12 percent slopes, severely eroded	64	(1)
Cardington soils, 12 to 18 percent slopes, severely eroded	145	(1)
Carlisle muck	119	(1)
Casco and Lorenzo soils, 18 to 25 percent slopes, moderately eroded	1, 192	. 3
Casco and Lorenzo soils, 18 to 25 percent slopes, severely eroded	294	. 1
Celina silt loam, 0 to 2 percent slopes	285	. 1
Celina silt loam, 2 to 6 percent slopes	16, 628	3. 8
Celina silt loam, 2 to 6 percent slopes, moderately eroded	1, 528	. 3
Clermont silt loam	265	. 1
Colyer shaly silt loam, 12 to 25 percent slopes	362	0. 1
Colyer shaly silt loam, 25 to 75 percent slopes	7, 773	1. 8
Colyer-Cana complex, 18 to 25 percent slopes	382	. 1
Colyer-Cana complex, 25 to 75 percent slopes	833	. 2
Coolville silt loam, 2 to 6 percent slopes	2, 599	. 6
Coolville silt loam, 2 to 6 percent slopes, moderately eroded	661	. 1
Coolville silt loam, 6 to 12 percent slopes, moderately eroded	504	. 1
Crosby silt loam, 0 to 2 percent slopes	17, 585	4. 0
Crosby silt loam, 2 to 6 percent slopes	5, 257	1. 2
Cruze silt loam, 2 to 6 percent slopes	104	(1)
Cruze silt loam, 6 to 12 percent slopes, moderately eroded	1, 096	. 2
Cruze silt loam, 12 to 18 percent slopes, moderately eroded	562	. 1
Cruze silt loam, 18 to 25 percent slopes	472	. 1
Cruze soils, 6 to 12 percent slopes, severely eroded	646	. 1
Cruze soils, 12 to 18 percent slopes, severely eroded	135	(1)
Dekalb and Neotoma extremely rocky fine sandy loams, 25 to 70 percent slopes	303	. 1
Dekalb and Neotoma fine sandy loams, 35 to 70 percent slopes	292	. 1
Eel silt loam	2, 835	. 6
Fawcett silt loam	302	. 1
Fox gravelly loam, 0 to 2 percent slopes	1, 009	. 2
Fox gravelly loam, 2 to 6 percent slopes	1, 498	. 3
Fox gravelly loam, 6 to 12 percent slopes, moderately eroded	574	. 1
Fox loam, 0 to 2 percent slopes	2, 980	. 7
Fox loam, 2 to 6 percent slopes	2, 606	. 6
Fox loam, 6 to 12 percent slopes, moderately eroded	919	. 2
Fox sandy loam, 0 to 2 percent slopes	1, 957	. 4
Fox sandy loam, 2 to 6 percent slopes	1, 494	. 3
Fox silt loam, 0 to 2 percent slopes	5, 338	1. 2
Fox silt loam, 2 to 6 percent slopes	2, 923	. 7
Fox silt loam, 2 to 6 percent slopes, moderately eroded	722	. 2
Fox silt loam, 6 to 12 percent slopes, moderately eroded	1, 362	. 3
Fox soils, 6 to 12 percent slopes, severely eroded	790	. 2
Fox and Warsaw soils, 12 to 18 percent slopes, moderately eroded	1, 675	. 4
Fox and Warsaw soils, 12 to 18 percent slopes, severely eroded	1, 052	. 2
Genesee fine sandy loam	7, 559	1. 7
Genesee silt loam	19, 015	4. 3
Genesee silty clay loam	576	. 1
Gravel pits	418	.1
Henshaw silt loam	397	.1
Hickory silt loam, 6 to 12 percent slopes, moderately eroded	684	.1
Hickory silt loam, 12 to 18 percent slopes, moderately eroded	246	.1
Hickory silt loam, 18 to 25 percent slopes	532	.1
Hickory soils, 12 to 18 percent slopes, severely eroded	658	.1
Hickory soils, 18 to 25 percent slopes, severely eroded	346	.1
Hickory soils, 25 to 45 percent slopes	382	.1
Kendallville silt loam, 0 to 2 percent slopes	509	.1
Kendallville silt loam, 2 to 6 percent slopes	3, 146	.7
Kendallville silt loam, 6 to 12 percent slopes, moderately eroded	2, 093	.5
Kendallville silt loam, 12 to 18 percent slopes, moderately eroded	787	.2
Kendallville silt loam, 18 to 25 percent slopes, moderately eroded	858	.2

See footnote at end of table.

TABLE 6.—*Approximate acreage and proportionate extent of the soils*—Continued

Mapping unit	Acres	Percent
Kendallville soils, 6 to 12 percent slopes, severely eroded	1, 191	0.3
Kendallville soils, 12 to 18 percent slopes, severely eroded	1, 233	.3
Kendallville soils, 18 to 25 percent slopes, severely eroded	451	.1
Kendallville soils, 25 to 40 percent slopes, moderately eroded	840	.2
Latham silt loam, 6 to 12 percent slopes, moderately eroded	416	.1
Latham silt loam, 12 to 18 percent slopes, moderately eroded	2, 910	.7
Latham silt loam, 18 to 25 percent slopes	3, 870	.9
Latham silt loam, 18 to 25 percent slopes, moderately eroded	8, 838	2.0
Latham soils, 12 to 18 percent slopes, severely eroded	1, 043	.2
Latham soils, 18 to 25 percent slopes, severely eroded	1, 190	.3
Latham soils, 25 to 40 percent slopes	30, 088	6.8
Loudonville silt loam, 6 to 12 percent slopes	452	.1
Loudonville silt loam, 12 to 18 percent slopes, moderately eroded	368	.1
Loudonville silt loam, 18 to 25 percent slopes, moderately eroded	385	.1
Loudonville silt loam, 25 to 45 percent slopes, moderately eroded	225	.1
Made land	641	.1
Markland silt loam, 0 to 2 percent slopes	92	(1)
Markland silt loam, 2 to 6 percent slopes	749	.2
Markland silt loam, 6 to 12 percent slopes, moderately eroded	533	.1
Markland silt loam, 12 to 18 percent slopes, moderately eroded	291	.1
Markland silt loam, 18 to 25 percent slopes, moderately eroded	372	.1
Markland silt loam, 25 to 35 percent slopes, moderately eroded	198	(1)
Markland soils, 6 to 12 percent slopes, severely eroded	190	(1)
Markland soils, 12 to 18 percent slopes, severely eroded	246	.1
McGary silt loam, 0 to 2 percent slopes	295	.1
McGary silt loam, 2 to 6 percent slopes	335	.1
Mentor soils, 12 to 18 percent slopes, severely eroded	205	(1)
Mentor very fine sandy loam, 0 to 2 percent slopes	172	(1)
Mentor very fine sandy loam, 2 to 6 percent slopes	603	.1
Mentor very fine sandy loam, 6 to 12 percent slopes, moderately eroded	180	(1)
Mentor very fine sandy loam, 12 to 18 percent slopes, moderately eroded	106	(1)
Mentor very fine sandy loam, 18 to 25 percent slopes, moderately eroded	221	.1
Miami silt loam, 2 to 6 percent slopes	8, 804	2.0
Miami silt loam, 2 to 6 percent slopes, moderately eroded	12, 330	2.8
Miami silt loam, 6 to 12 percent slopes	350	.1
Miami silt loam, 6 to 12 percent slopes, moderately eroded	18, 029	4.1
Miami silt loam, 12 to 18 percent slopes	661	.2
Miami silt loam, 12 to 18 percent slopes, moderately eroded	4, 517	1.0
Miami silt loam, 18 to 25 percent slopes	3, 843	.9
Miami soils, 2 to 6 percent slopes, severely eroded	164	(1)
Miami soils, 6 to 12 percent slopes, severely eroded	4, 683	1.1
Miami soils, 12 to 18 percent slopes, severely eroded	3, 919	.9
Miami soils, 18 to 25 percent slopes, severely eroded	1, 330	.3
Miami soils, 25 to 40 percent slopes	2, 416	0.5
Millsdale silty clay loam	124	(1)
Milton silt loam, 2 to 6 percent slopes	69	(1)
Milton silt loam, 6 to 12 percent slopes, moderately eroded	44	(1)
Milton silt loam, 18 to 25 percent slopes, moderately eroded	146	(1)
Monongahela silt loam, 0 to 2 percent slopes	71	(1)
Monongahela silt loam, 2 to 6 percent slopes	1, 304	.3
Monongahela silt loam, 6 to 12 percent slopes, moderately eroded	146	(1)
Muskingum very stony silt loam, 6 to 18 percent slopes	731	.2
Muskingum and Latham stony silt loams, 12 to 25 percent slopes	618	.1
Muskingum and Latham very stony silt loams, 25 to 70 percent slopes	2, 258	.5
Muskingum, Berks, and Neotoma very stony silt loams, 18 to 25 percent slopes	212	(1)
Muskingum, Berks, and Neotoma very stony silt loams, 25 to 70 percent slopes	21, 989	5.0
Negley soils, 6 to 12 percent slopes, moderately eroded	161	(1)
Negley and Fox soils, 12 to 18 percent slopes, moderately eroded	695	.1
Negley and Fox soils, 12 to 18 percent slopes, severely eroded	613	.1
Negley and Fox soils, 18 to 25 percent slopes, moderately eroded	1, 825	.4
Negley and Fox soils, 18 to 25 percent slopes, severely eroded	862	.2
Negley, Fox and Lorenzo soils, 25 to 40 percent slopes	3, 706	.8
Ockley silt loam, 0 to 2 percent slopes	3, 797	.9
Ockley silt loam, 2 to 6 percent slopes	683	.1
Parke silt loam, 2 to 6 percent slopes	318	.1
Parke silt loam, 6 to 12 percent slopes, moderately eroded	1, 451	.3
Parke silt loam, 12 to 18 percent slopes, moderately eroded	631	.1
Parke silt loam, 18 to 25 percent slopes	1, 331	.3
Parke soils, 6 to 12 percent slopes, severely eroded	177	(1)
Parke soils, 12 to 18 percent slopes, severely eroded	797	.2
Parke soils, 18 to 25 percent slopes, severely eroded	429	.1
Parke-Negley complex, 6 to 12 percent slopes, moderately eroded	332	.1
Pekin fine sandy loam, 2 to 6 percent slopes	140	(1)
Pekin silt loam, 0 to 2 percent slopes	534	.1
Pekin silt loam, 2 to 6 percent slopes	791	.2
Pekin silt loam, 6 to 12 percent slopes, moderately eroded	440	.1
Pekin silt loam, 12 to 18 percent slopes, moderately eroded	237	.1
Pekin silt loam, over clay, 2 to 6 percent slopes	443	.1
Pekin silt loam, over clay, 6 to 12 percent slopes, moderately eroded	614	.1
Pekin silt loam, over clay, 12 to 18 percent slopes, moderately eroded	327	.1
Pekin silt loam, over clay, 18 to 25 percent slopes, moderately eroded	270	.1
Pekin soils, 6 to 12 percent slopes, severely eroded	105	(1)
Philo silt loam	3, 057	.7
Philo soils, channery variant	2, 521	.6
Pike silt loam, 0 to 2 percent slopes	1, 933	.4
Pike silt loam, 2 to 6 percent slopes	1, 488	.3
Pope silt loam	2, 342	.5
Pope soils, channery variant	3, 906	.9
Rainsboro silt loam, 0 to 2 percent slopes	880	.2
Rainsboro silt loam, 2 to 6 percent slopes	2, 501	.6

See footnote at end of table.

TABLE 6.—*Approximate acreage and proportionate extent of the soils*—Continued

Mapping unit	Acres	Percent	Mapping unit	Acres	Percent
Rainsboro silt loam, 6 to 12 percent slopes, moderately eroded	1, 185	0. 3	Rossmoyne silt loam, 6 to 12 percent slopes, moderately eroded	4, 487	1. 0
Rainsboro silt loam, 12 to 18 percent slopes, moderately eroded	132	(1)	Rossmoyne silt loam, 12 to 18 percent slopes, moderately eroded	640	. 1
Rainsboro soils, 6 to 12 percent slopes, severely eroded	283	. 1	Rossmoyne silt loam, 18 to 25 percent slopes, moderately eroded	352	. 1
Rainsboro soils, 12 to 18 percent slopes, severely eroded	135	(1)	Rossmoyne soils, 6 to 12 percent slopes, severely eroded	1, 211	. 3
Rarden silt loam, 12 to 18 percent slopes	324	. 1	Rossmoyne soils, 12 to 18 percent slopes, severely eroded	291	. 1
Rarden silt loam, 12 to 18 percent slopes, moderately eroded	2, 295	. 5	Shoals silt loam	398	. 1
Rarden silt loam, 18 to 25 percent slopes, moderately eroded	186	(1)	Sleeth silt loam	657	. 1
Rarden soils, 12 to 18 percent slopes, severely eroded	1, 196	. 3	Stendal silt loam	428	. 1
Rarden and Coolville silt loams, 6 to 12 percent slopes	834	. 2	Stone quarries	15	(1)
Rarden and Coolville silt loams, 6 to 12 percent slopes, moderately eroded	2, 885	. 7	Taggart silt loam, 0 to 2 percent slopes	1, 499	. 3
Rarden and Coolville soils, 6 to 12 percent slopes, severely eroded	949	. 2	Taggart silt loam, 2 to 6 percent slopes	165	(1)
Ritchey silt loam, 25 to 35 percent slopes, moderately eroded	175	(1)	Taggart silt loam, wet	622	. 1
Riverwash	369	. 1	Thackery silt loam, 0 to 2 percent slopes	994	. 2
Rodman-Lorenzo complex, 25 to 50 percent slopes	979	. 2	Thackery silt loam, 2 to 6 percent slopes	262	. 1
Ross fine sandy loam	559	. 1	Tyler silt loam	792	. 2
Ross silt loam	6, 357	1. 4	Uniontown silt loam, 0 to 2 percent slopes	224	. 1
Ross silty clay loam	1, 381	. 3	Uniontown silt loam, 2 to 6 percent slopes	156	(1)
Rossmoyne silt loam, 0 to 2 percent slopes	193	(1)	Uniontown silt loam, 6 to 12 percent slopes, moderately eroded	61	(1)
Rossmoyne silt loam, 2 to 6 percent slopes	6, 138	1. 4	Wallkill silt loam	81	(1)
Rossmoyne silt loam, 2 to 6 percent slopes, moderately eroded	1, 564	. 3	Warners mucky silt loam	255	. 1
			Warsaw loam	721	. 2
			Wea silt loam, 0 to 2 percent slopes	1, 718	. 4
			Wea silt loam, 2 to 6 percent slopes	473	. 1
			Wellston silt loam, 6 to 12 percent slopes	3, 325	. 7
			Westland silty clay loam	4, 983	1. 1
			Willette muck	135	(1)
			Total	439, 680	100. 0

[1] Less than 0.05 percent.

most entirely of subsoil material and ranges from silt loam to silty clay loam. Shallow gullies are common. Included in mapped areas is a small acreage of stony soil, which is indicated by stone symbols on the soil map. (Capability unit VIe–1; woodland suitability group 4)

Alexandria soils, 18 to 25 percent slopes, severely eroded (AeE3).—These soils have lost practically all of their original surface layer through erosion, and the plow layer consists entirely or almost entirely of material brought up from the subsoil. The texture of the plow layer ranges from silt loam to silty clay loam. Shallow gullies are common. All the acreage of these soils has been cleared and cultivated, but most of it now is pastured or lying idle as it reverts to woodland. Included are areas of stony soil, indicated by stone symbols on the soil map. (Capability unit VIe–1; woodland suitability group 4)

Alford Series

In the Alford series are deep, well-drained soils that have a silty surface layer and a moderately fine textured subsoil. These soils occupy sloping to steep uplands in the southeastern part of the county.

Typical profile (Alford silt loam in a cultivated field):

0 to 9 inches, brown, medium acid, friable silt loam.
9 to 13 inches, yellowish-brown, strongly acid, friable silt loam.
13 to 48 inches, brown, strongly acid, firm silty clay loam to silt loam.
48 to 85 inches, yellowish-brown, slightly acid, firm silt loam.
85 inches +, pale-brown and yellowish-brown, slightly acid, firm silty clay.

The texture of the subsoil is heavy silt loam or light silty clay loam. The depth to firm silty clay ranges from 48 to 96 inches.

In areas that are not severely eroded, the Alford soils are moderately high in productivity and have high available moisture capacity. Their permeability is moderate. These soils are suited to most of the common crops, but lime, fertilizer, and erosion control practices are needed in fields used for crops. Severely eroded areas are commonly used for permanent pasture or woodland.

Alford silt loam, 6 to 12 percent slopes, moderately eroded (AfC2).—All of this soil has been cleared and cultivated. Erosion has removed about half of the original surface layer, and the plow layer contains material brought up from the subsoil. In most places the slopes are relatively long. Included is a small acreage of gently sloping Alford soils. (Capability unit IIIe–3; woodland suitability group 4)

Alford silt loam, 12 to 18 percent slopes, moderately eroded (AfD2).—All of this soil has been cleared and used for crops. Nearly half of the original surface layer has been lost through erosion, and the plow layer consists partly of subsoil material. Included are some severely eroded areas, generally on the stronger slopes. (Capability unit IVe–1; woodland suitability group 4)

Alford silt loam, 18 to 25 percent slopes, moderately eroded (AfE2).—This soil, which generally occupies short, steep slopes, has the thinnest silt capping of all the Alford soils. All the acreage has been cleared, and most of it is now used for permanent pasture. Nearly half of the original surface layer has been lost through erosion, and the plow layer contains some of the subsoil. (Capability unit VIe–1; woodland suitability group 4)

Algiers Series

Soils of the Algiers series are somewhat poorly drained. They have a silty surface layer underlain by older soil material that is black, moderately fine textured or fine textured, and very poorly drained. These soils occupy narrow to medium-sized stream bottoms in the northern part of the county.

Typical profile (Algiers silt loam in a cultivated field):

0 to 18 inches, dark grayish-brown to grayish-brown, slightly acid, friable silt loam.
18 to 28 inches, black, slightly acid, firm silty clay loam.
28 to 37 inches, olive-gray, slightly acid, very firm silty clay mottled with reddish yellow.

The depth to buried dark-colored soil material ranges from 14 to 24 inches. These soils are slightly acid or neutral throughout.

The Algiers soils have high available moisture capacity and are highly productive. They have moderately slow permeability, however, and are subject to flooding from streams and nearby uplands. Their root zone is moderately thick. If the soils are drained, they respond well to lime and fertilizer.

Algiers silt loam (Ag).—This is the only Algiers soil in the county. It generally occurs in strips 50 to 100 feet wide on the flood plains along small streams and waterways. Some areas lie on alluvial fans of small side branches and adjacent to larger areas of Westland silty clay loam. In most places slopes are less than 2 percent, but on alluvial fans they range from 2 to 6 percent. Small areas of Shoals silt loam are included, most commonly as narrow strips close to streams and waterways. (Capability unit IIw–1; woodland suitability group 1)

Alvin Series

Soils of the Alvin series are nearly level to sloping, deep, and well drained. They have a moderately coarse textured surface layer underlain by a moderately fine textured subsoil. These soils lie on second bottoms along streams, but they formed in material deposited by wind. They occur in the southeastern part of the county.

Typical profile (Alvin fine sandy loam in a cultivated field):

0 to 8 inches, dark grayish-brown, slightly acid, friable fine sandy loam.
8 to 16 inches, brown, strongly acid, friable fine sandy loam.
16 to 44 inches, dark-brown, strongly acid, firm sandy clay loam.
44 to 60 inches, dark-brown, strongly acid, friable fine sandy loam.
60 to 108 inches +, brown and yellowish-brown, medium acid, loose fine sand.

These soils are strongly acid or very strongly acid throughout the profile. The depth to loose fine sand ranges from 5 to 7 feet.

The Alvin soils are moderately permeable, have medium available moisture capacity, and are medium in productivity. They are suited to most crops grown in the area. Needed in cultivated fields are additions of lime and fertilizer, as well as practices for controlling erosion.

Alvin fine sandy loam, 0 to 2 percent slopes (AlA).—This nearly level soil occurs in small, irregularly shaped areas on stream terraces. Adjoining it are sloping Alvin soils and nearly level or sloping Fox, Pike, and Rainsboro soils.

The surface layer of this soil consists mostly of original surface soil. The soil is suited to crops but is somewhat droughty. It is suitable for irrigation. (Capability unit IIs–1; woodland suitability group 4)

Alvin fine sandy loam, 2 to 6 percent slopes (AlB).—This gently sloping soil occupies small, irregularly shaped areas that resemble dunes. It is next to steeper or nearly level Alvin soils and to Fox, Pike, and Rainsboro soils.

This soil has lost only a little of its original surface layer through erosion. It is suited to cultivated crops but is droughty. It is suitable for irrigation. Erosion is a hazard and can be controlled by cultivating on the contour. (Capability unit IIe–1; woodland suitability group 4)

Alvin fine sandy loam, 6 to 12 percent slopes, moderately eroded (AlC2).—This sloping soil occupies small, irregularly shaped tracts and is in areas that resemble dunes. It is adjoined by more mildly sloping Alvin soils and by Fox, Parke, and Pike soils. A few included areas are only slightly eroded.

The present surface layer of this soil is a mixture of the original surface layer and some of the brown, strongly acid subsoil. The soil is droughty and is moderately susceptible to erosion, but it is suited to crops that are grown in a rotation. Erosion can be controlled by contour cultivation and grassed waterways. (Capability unit IIIe–2; woodland suitability group 4)

Avonburg Series

The Avonburg series consists of deep, somewhat poorly drained soils that have a silty surface layer and a moderately fine textured subsoil. These soils are on nearly level or gently sloping ridgetops in the central part of the county.

Typical profile (Avonburg silt loam in a cultivated area):

0 to 8 inches, dark grayish-brown, strongly acid, friable silt loam.
8 to 16 inches, yellowish-brown to pale-brown, very strongly acid, friable silt loam.
16 to 32 inches, strong-brown and light brownish-gray, firm silty clay loam.
32 to 54 inches, mottled strong-brown, light yellowish-brown, and light brownish-gray silty clay loam (fragipan) that is firm, brittle, and very strongly acid.
54 inches +, mottled strong-brown and gray, medium acid, firm clay loam.

The profile is nearly free of stones to a depth of 24 to 48 inches. The lower soil material is derived from glacial till and contains a small amount of stones. The depth to the firm, brittle layer ranges from 24 to 36

inches. Below the plow layer, to a depth of 48 inches or more, the soil is strongly acid or very strongly acid. The depth to limy glacial till ranges from 7 to 11 feet in uneroded areas but is slightly less in eroded spots.

The Avonburg soils are moderately low in productivity and have moderate available moisture capacity in the root zone. These soils are very slowly permeable and have a high water table in wet seasons. They respond rather well to surface drainage but, even if drained, are slow to dry out and warm up in spring. For this reason, they are commonly used for producing soybeans. Additions of lime and fertilizer are needed in cultivated areas. If management is good, favorable yields can be expected from most crops suited to the county.

Avonburg silt loam, 0 to 2 percent slopes (AvA).—This soil generally occupies long slopes of about 1 percent. Runoff is slow, and in most places erosion is a slight hazard. Included with this soil are small areas of Clermont soil. (Capability unit IIIw–2; woodland suitability group 2)

Avonburg silt loam, 2 to 6 percent slopes (AvB).—This soil occupies long, regular slopes and has lost little of its original surface layer through erosion. In many places it is adjacent to moderately well drained Rossmoyne soils. Some moderately eroded tracts, most of them in the more sloping areas, are included with this soil. Runoff is medium, and erosion is a hazard. (Capability unit IIIw–2; woodland suitability group 2)

Bartle Series

The Bartle series consists of deep, light-colored, somewhat poorly drained soils that have a medium-textured to moderately fine textured subsoil. These soils developed in stratified, silty lacustrine or alluvial material. They lie on nearly level or gently sloping second bottoms in medium-sized valleys, mainly in the northeastern part of the county.

Typical profile (Bartle silt loam in a cultivated field):

0 to 7 inches, grayish-brown, slightly acid, friable smooth silt loam.
7 to 27 inches, light brownish-gray to grayish-brown, mottled with yellowish-brown, strongly acid, firm to friable fine silt loam to silty clay loam.
27 to 60 inches, mottled gray and strong-brown, strongly acid, friable to firm silt loam.
60 to 68 inches +, gray, friable silt loam and thin layers of loam, very fine sandy loam, and sandy loam.

The surface layer ranges from silt loam to fine sandy loam, and the subsoil ranges from heavy silt loam to light silty clay loam. The profile is very strongly acid or strongly acid to a depth of 50 inches or more, but it ranges to slightly acid below a depth of 60 inches. The depth to gray, friable silt loam is 60 to 80 inches.

The Bartle soils are medium in productivity, are slowly permeable, and have high available moisture capacity. Unless drained, they have a high water table in wet periods. They respond fairly well to management that improves surface drainage but, even if drained, are slow to dry out and warm up in spring. Additions of lime and fertilizer are needed in fields used for crops.

Bartle silt loam, 0 to 2 percent slopes (BaA).—This soil generally has a deep, silty profile like the one described as typical, but in some areas there is clay below a depth of 2 to 4 feet. These areas normally are next to areas of Pekin silt loams that overlie clay. Included with this soil are small areas that have a fine sandy loam surface layer. Also included, generally at the base of slopes, are areas covered with an overwash of light-colored silty colluvium. Here, diversion ditches may be needed to protect crops from overflow. (Capability unit IIIw–2; woodland suitability group 2)

Bartle silt loam, 2 to 6 percent slopes (BaB).—In most areas this soil shows little erosion. In some places, generally next to Pekin silt loams, over clay, it is underlain by clay at a depth of 2 to 4 feet. In a few areas, ditches are used to protect crops from water that runs off adjacent slopes. Included are small areas that have a fine sandy loam surface layer, and spots that are moderately eroded. (Capability unit IIIw–2; woodland suitability group 2)

Berks Series

The Berks series consists of channery soils that are moderately deep and well drained. These soils have a subsoil that is more than 50 percent coarse fragments, mostly pieces of sandstone and siltstone 1 to 5 inches across. They occur on sloping to steep hills in the eastern and southeastern parts of the county.

Typical profile (Berks very stony silt loam in a wooded area):

0 to 1 inch, dark grayish-brown, very strongly acid, friable very stony silt loam.
1 to 15 inches, pale-brown, very strongly acid, friable very stony silt loam.
15 to 34 inches, strong-brown, strongly acid, friable very channery silt loam that grades to loam in the lower part.
34 inches +, fine-grained sandstone bedrock that is fractured and has sandy material in cracks.

The content of stones in the 15- to 34-inch layer ranges from 50 to 80 percent. The depth to bedrock ranges from 24 to 40 inches.

The Berks soils have moderately rapid permeability and are low in fertility and in available moisture capacity. They are very stony and are poorly suited to cultivated crops. Many areas are so stony that they cannot be plowed. If the soils are cleared in areas that are not too steep, they are fairly well suited to permanent pasture. They are most commonly used as woodland.

In this county the Berks soils occur closely with the Muskingum and Neotoma soils and are mapped only in undifferentiated groups of Muskingum, Berks, and Neotoma very stony silt loams. These mapping units are described under the heading "Muskingum Series."

Bonpas Series

Soils of the Bonpas series are dark colored and very poorly drained. They have a moderately fine textured surface layer and subsoil and are underlain by thin layers of sand and silt. The Bonpas soils lie in nearly level and depressional areas on second bottoms in the northeastern part of the county.

Typical profile (Bonpas silty clay loam in a cultivated field):

0 to 7 inches, very dark gray, medium acid, friable to firm silty clay loam.

7 to 18 inches, black, slightly acid, firm silty clay loam.
18 to 66 inches, dark-gray, mottled with yellowish-brown, neutral, firm silty clay loam.
66 inches +, mottled yellowish- and grayish-brown layers of limy silt loam and thin layers of sand.

The depth to layers of limy silt loam and sand ranges from 60 to 80 inches.

Bonpas soils are highly productive and have high available moisture capacity. Their root zone is thick in drained areas. Permeability is slow, and artificial drainage is needed if crops are grown, but the response to tiling is good. These soils have a high content of organic matter. Applications of lime and fertilizer should be made in amounts indicated by soil tests. Under good management, all crops suited to the county produce favorable yields.

Bonpas silty clay loam (0 to 2 percent slopes) (Bo).—Little or no erosion has occurred on this soil, but the plow layer gets cloddy if it is worked when too wet. About 40 percent of the total acreage lies at the base of steeper slopes or along drainageways and is covered with 6 to 12 inches of light-colored silty overwash. (Capability unit IIw–3; woodland suitability group 1)

Brookston Series

The Brookston series consists of dark-colored, very poorly drained soils that have a moderately fine textured surface layer over a moderately fine textured subsoil. These soils are in nearly level and depressional areas on uplands in the northwestern part of the county.

Typical profile (Brookston silty clay loam in a cultivated field):

0 to 12 inches, black to very dark gray, friable silty clay loam.
12 to 50 inches, dark-gray mottled with yellowish-brown and light-gray, firm clay loam.
50 to 62 inches +, mottled gray and yellowish-brown, firm, limy silt loam glacial till.

The dark-colored surface layer ranges from 10 to 17 inches in thickness. The depth to glacial till ranges from 36 to 65 inches.

Brookston soils are high in productivity and in available moisture capacity. Permeability is moderately slow, however, and artificial drainage must be provided before crops can be successfully grown. If the soils are drained and well managed, they produce favorable yields of most crops common in the county. Their root zone is thick in areas that are adequately drained. These soils have a high content of organic matter and seldom need lime. Fertilizer and lime should be applied according to needs indicated by soil tests.

Brookston silt loam (Br).—This soil is nearly level, dark colored, and very poorly drained. It occurs in irregularly shaped depressional areas, generally less than 10 acres in size, that commonly lie in narrow bands along upland drainageways.

The surface layer of this soil consists of silt loam that washed in from adjoining areas. Most of these adjoining areas are occupied by grayish-brown, somewhat poorly drained Crosby soils and by moderately well drained Celina soils. Small areas of Crosby soils and small areas of Celina soils on 2 to 6 percent slopes are included with this Brookston soil. (Capability unit IIw–3; woodland suitability group 1)

Brookston silty clay loam (Bs).—The surface layer of this soil is likely to be cloddy if plowed when too wet, but it has not been much affected by erosion. Included in mapped areas are a few areas with a surface layer that is thicker and darker than the one in the typical profile. Also included are a few areas having slopes of 2 to 6 percent. (Capability unit IIw–3; woodland suitability group 1)

Cana Series

Soils of the Cana series are deep and moderately well drained or well drained. They have a medium-textured surface layer underlain by a moderately fine textured and fine textured, very strongly acid to extremely acid subsoil derived from shale bedrock. The Cana soils occur on gently sloping to sloping ridgetops and moderately sloping hillsides in the central and southeastern parts of the county.

Typical profile (Cana silt loam in a cultivated field):

0 to 7 inches, dark-brown, medium acid, friable silt loam.
7 to 18 inches, dark-brown to yellowish-brown, strongly acid, slightly firm silty clay loam.
18 to 40 inches, mottled dark yellowish-brown and light brownish-gray, very strongly acid, firm silty clay loam to clay.
40 to 47 inches, highly mottled, very strongly acid clay.
47 inches +, extremely acid shale bedrock.

The depth to acid shale bedrock ranges from 36 to 50 inches.

These soils are slowly permeable. In areas that are not severely eroded, they are medium in productivity and have moderate available moisture capacity. If they are well managed, they produce adequate yields of most of the common crops, but additions of lime and fertilizer are needed, as well as measures for controlling erosion. Severely eroded areas commonly are used for permanent pasture.

Cana silt loam, 2 to 6 percent slopes (CaB).—This soil occurs on long, regular slopes. Little erosion is evident. In areas where the soil is near areas of Celina, Crosby, or Miami soils, it is slightly less acid than it is in areas where Hickory and Rossmoyne soils are nearby.

Included with this Cana soil are small, nearly level areas of Avonburg soils, particularly at the heads of drainageways. These soils generally are not eroded. Also included are small areas of Rossmoyne soils, especially on the stronger slopes, and small areas of Miami soils. (Capability unit IIe–2; woodland suitability group 6)

Cana silt loam, 2 to 6 percent slopes, moderately eroded (CaB2).—This soil has lost nearly half of its original surface layer through erosion, and the plow layer is made up partly of subsoil material. Slopes are commonly short and irregular. Where the soil is near the Crosby, Celina, or Miami soils, it is slightly less acid than it is near the Hickory and Rossmoyne soils.

Included in areas mapped as this soil, particularly on the stronger slopes, are small areas that are severely eroded and small areas of Rossmoyne soils. Also included are spots of Miami soils. (Capability unit IIe–2; woodland suitability group 6)

Cana silt loam, 6 to 12 percent slopes (CaC).—This soil shows little or no erosion, and most of the acreage is wooded. In places where the soil occurs near the Celina, Crosby, or Miami soils, it is slightly less acid than in places where the Hickory and Rossmoyne soils are nearby.

Included in mapped areas are small areas of more mildly sloping Avonburg soils, most commonly along drainageways. In some places small areas of Miami soils also are included. (Capability unit IIIe–4; woodland suitability group 6)

Cana silt loam, 6 to 12 percent slopes, moderately eroded (CaC2).—Most of this soil has been cleared and is used for crops. Nearly half of the original surface layer has been lost through erosion, and the plow layer contains material brought up from the subsoil. The soil is slightly less acid in areas near the Celina and Miami soils than it is in areas near the Hickory and Rossmoyne soils.

Included with this Cana soil, especially along waterways, are small areas of more mildly sloping Avonburg soils. Also included are small areas of Miami soils, in places where this soil is adjacent to those soils, and small areas of stony soils, indicated by symbol on the soil map. (Capability unit IIIe–4; woodland suitability group 6)

Cana silt loam, 12 to 18 percent slopes (CaD).—Little or no erosion is evident on this soil, and most of the acreage is wooded.

Near the Celina and Miami soils, this soil is slightly less acid than it is near the Hickory and Rossmoyne soils. Small areas of Celina and Miami soils are included. Also included, most commonly along waterways, are small areas of less sloping Rossmoyne soils, and there are small included areas of stony soils that are indicated by symbol on the soil map. (Capability unit IVe–3; woodland suitability group 6)

Cana silt loam, 12 to 18 percent slopes, moderately eroded (CaD2).—Most of this soil has been cleared and cultivated, but a large part of the cleared acreage is reverting to woodland. Erosion has removed about half of the original surface layer, and the plow layer is a mixture of surface soil and subsoil.

Included in areas mapped as this soil are small areas of Miami soils; a few small areas of stony soil, indicated by symbol on the soil map; and, particularly on the steeper slopes, small areas of moderately eroded Colyer and Rarden soils. (Capability unit IVe–3; woodland suitability group 6)

Cana silt loam, 18 to 25 percent slopes (CaE).—Nearly half of this soil is wooded. The rest has been cleared and cultivated but now is reverting to trees or to weeds and grass. The soil generally is not seriously eroded, but in some areas as much as half of the original surface layer has been washed away.

Included in mapped areas are small areas of Colyer and Latham soils, ordinarily on the steeper slopes, and spots of Miami soils. (Capability unit VIe–2; woodland suitability group 6)

Cana silt loam, 25 to 45 percent slopes (CaF).—About half the acreage of this soil is wooded, and the rest is used for pasture or is reverting to woodland. Although erosion is a severe hazard, the soil generally is uneroded. Included in areas mapped as this soil are small areas that are moderately eroded; a few areas that are severely eroded and gullied; and small areas of Colyer, Latham, and Miami soils. (Capability unit VIIe–2; woodland suitability group 6)

Cana soils, 6 to 12 percent slopes, severely eroded (CeC3).—These soils have lost practically all of their original surface layer through erosion. The plow layer consists almost entirely of subsoil material and ranges from silt loam to silty clay loam. In places there are many shallow gullies.

Included with these soils are small areas of Celina and Miami soils. Also, a few included areas of stony soils are indicated by symbol on the soil map. (Capability unit IVe–4; woodland suitability group 6)

Cana soils, 12 to 18 percent slopes, severely eroded (CeD3).—These soils have been cleared, but much of the acreage is lying idle as it reverts to forest. The plow layer ranges from silt loam to silty clay loam. In most places the soils have much thinner upper layers and are shallower to underlying material than the soil described in the typical profile. Small areas of Miami soils are included. (Capability unit VIe–2; woodland suitability group 6)

Cana soils, 18 to 35 percent slopes, severely eroded (CeF3).—These soils have lost nearly all of their original surface layer through erosion, and the plow layer is mostly material from the subsoil. In places there are many shallow gullies. Some areas are so deeply and generally gullied that the original soils have been destroyed, except for patches between the gullies. Most of the acreage is reverting to woodland. Small areas of Miami soils are included. (Capability unit VIIe–2; woodland suitability group 6)

Cana very flaggy silt loam, 18 to 25 percent slopes (CfE).—The surface layer of this slightly eroded soil contains so many flat pieces of shale and sandstone that the use of modern tillage equipment is not practical. Included with this soil are small areas that are moderately eroded; a few areas that are severely eroded; and small areas of Colyer, Latham, and Rarden soils. (Capability unit VIs–1; woodland suitability group 6)

Cana very flaggy silt loam, 25 to 35 percent slopes (CfF).—In most places this soil has been little affected by erosion. However, many pieces of shale and sandstone are strewn on the surface, and only pasture of poor quality can be grown in cleared areas. For this reason, less than 1 percent of the acreage has been cleared. Most of the soil is covered with trees, some of which are cut for pulpwood. Areas that have been clear cut generally revert to woodland.

Included in areas mapped as this soil are a few areas that are moderately eroded, and small included areas that consist of Colyer and Latham soils. (Capability unit VIIs–1; woodland suitability group 6)

Cana-Colyer very flaggy silt loams, 25 to 35 percent slopes (CgF).—The soils that make up this complex occur in such an intricate pattern that they could not be mapped separately. Generally, the Cana soil is in areas between waterways and in areas that are less strongly sloping. The Colyer soil normally occupies the steeper slopes.

These soils have pieces of shale and sandstone scattered over their surface. Pasture can be grown in cleared areas, but it is of poor quality. Most of the acreage is wooded, and in many areas the stands are clear cut for pulpwood. These cleared areas are then allowed to revert to woodland. (Capability unit VIIs–1; woodland suitability group 6)

Cardington Series

The Cardington series consists of deep, moderately well drained soils that have a medium-textured surface layer underlain by a moderately fine textured subsoil. These soils were derived from slightly limy, moderately fine textured glacial till. They occur on gently sloping to moderately sloping uplands in the southwestern part of the county.

Typical profile (Cardington silt loam in a cultivated field):

0 to 10 inches, dark grayish-brown to yellowish-brown, strongly acid, friable silt loam.
10 to 21 inches, dark yellowish-brown, faintly mottled, very strongly acid, firm silty clay loam.
21 to 29 inches, yellowish-brown, slightly acid, firm clay loam mottled with light brownish gray.
29 to 50 inches, yellowish-brown, compact, limy clay loam glacial till.

The subsoil ranges from heavy silty clay loam to light silty clay in texture. The surface layer is medium acid or strongly acid, the upper subsoil is strongly or very strongly acid, and the lower subsoil is slightly acid or neutral. The depth to limy glacial till ranges from 27 to 40 inches.

Cardington soils are medium in productivity and have moderate available moisture capacity in the root zone. Permeability is moderately slow, and the drainage must be improved in some areas if crops are to be grown. Most crops common in the county are suited to these soils, but erosion control practices and additions of lime and fertilizer are needed in cultivated areas.

Cardington silt loam, 2 to 6 percent slopes (ChB).—On this soil there has been little erosion. Slopes commonly are irregular and of medium length. Included in mapped areas, especially along waterways, are small, nearly level, mostly uneroded areas that are somewhat poorly drained. Also included are some moderately eroded areas, generally on the stronger slopes. (Capability unit IIe–1; woodland suitability group 4)

Cardington silt loam, 6 to 12 percent slopes, moderately eroded (ChC2).—This soil has lost about half of its original surface layer through erosion, and it has a plow layer that is partly subsoil material. Slopes commonly are short and irregular.

Included in areas mapped as this soil are a few slightly eroded areas, generally on the more gentle slopes, and a few areas of stony soils that make up about 1 percent of the total acreage and are indicated by symbol on the soil map. Also included, mostly along waterways and at the heads of drainageways, are small, nearly level, generally uneroded areas that are somewhat poorly drained. (Capability unit IIIe–1; woodland suitability group 4)

Cardington silt loam, 12 to 18 percent slopes, moderately eroded (ChD2).—Except for its stronger slopes, this soil is much like Cardington silt loam, 6 to 12 percent slopes, moderately eroded. Small tracts of Alexandria soils are included, especially in the more strongly sloping areas. Most of these tracts are moderately eroded. (Capability unit IVe–1; woodland suitability group 4)

Cardington soils, 6 to 12 percent slopes, severely eroded (CkC3).—Erosion has removed almost all of the original surface layer from these soils, and the plow layer consists chiefly of material from the subsoil. The plow layer ranges from silt loam to silty clay loam. Slopes generally are short and irregular. Small areas of severely eroded Alexandria soils are included. (Capability unit IVe–2; woodland suitability group 4)

Cardington soils, 12 to 18 percent slopes, severely eroded (CkD3).—These soils are steeper than Cardington soils, 6 to 12 percent slopes, severely eroded, but in other respects they are like those soils. Included are a few areas of stony soils, indicated by symbol on the soil map. (Capability unit VIe–1; woodland suitability group 4)

Carlisle Series

In the Carlisle series are dark-colored, very poorly drained organic soils that consist of organic material underlain by clay, sand, and gravel. These soils lie in nearly level and depressional areas along a few of the major streams in the county.

Typical profile (Carlisle muck in a cultivated field):

0 to 30 inches, black, nonacid, very friable muck.
30 to 50 inches, dark grayish-brown, medium acid, fibrous muck and plant remains.
50 to 63 inches, gray, firm, limy clay.
63 inches +, limy sand and gravel.

The thickness of the muck ranges from 40 to 60 or more inches.

Carlisle soils are highly productive and have high available moisture capacity. Permeability is moderate but often is restricted by a high water table. Needed before the soils can be used for crops is artificial drainage that controls the level of the water table. After drainage is improved, most of the common field crops are suitable, and specialty crops can be grown in large areas.

Carlisle muck (Cm).—Some areas of this soil are covered by 6 to 12 inches of silty material that washed from surrounding areas of mineral soils.

Carlisle muck responds well to tile drainage. Once the soil is drained, however, it tends to subside because the organic material oxidizes. The subsidence can be kept to a minimum by maintaining the water table at the highest practical level. The depth to the controlled water table depends on the crop grown. (Capability unit IIIw–1; woodland suitability group 8)

Casco Series

The Casco series consists of steep, well-drained soils that are shallow to gravel and sand. These soils have a medium-textured surface layer underlain by a moderately fine textured subsoil. They occur on gravelly terraces along the major streams of the county and on other gravelly and sandy glacial material.

Typical profile (Casco loam in a wooded area):

0 to 6 inches, dark-brown, neutral, friable loam.
6 to 15 inches, dark-brown, neutral, firm clay loam.
15 inches +, loose, limy gravel and sand.

The depth to limy gravel and sand ranges from 12 to 24 inches.

These soils are low in productivity and in available moisture capacity. They have moderately rapid permeability and are very droughty. Areas now covered with trees should remain wooded. Cleared areas should be kept in permanent pasture.

In Ross County the Casco soils occur closely with the Lorenzo soils and are mapped only in undifferentiated groups with those soils. A typical profile of a Lorenzo soil is described under the heading "Lorenzo Series."

Casco and Lorenzo soils, 18 to 25 percent slopes, moderately eroded (CnE2).—The soils in this undifferentiated group are similar in most respects, but the Lorenzo soils have a thicker and darker surface layer than the Casco soils. Generally, slopes are short and the surface layer is gravelly loam. Some included areas are uneroded; these are mostly wooded. (Capability unit VIe–1; woodland suitability group 5)

Casco and Lorenzo soils, 18 to 25 percent slopes, severely eroded (CnE3).—This mapping unit consists mainly of Casco and Lorenzo loams. The present surface layer is finer textured than the original one, but in many areas it is gravelly. About 65 percent of the total acreage is on glacial eskers, kames, and moraines on uplands. The rest is on the escarpments of stream terraces. Included in areas mapped as these soils are areas of Fox clay loam and Rodman gravelly loam. (Capability unit VIIe–1; woodland suitability group 5)

Celina Series

In the Celina series are deep, moderately well drained soils that have a silty surface layer and a moderately fine textured to fine textured subsoil. These soils occupy nearly level and gently sloping uplands in the northwestern part of the county.

Typical profile (Celina silt loam in a cultivated field):

0 to 6 inches, dark-brown, slightly acid, friable silt loam.
6 to 21 inches, yellowish-brown, medium acid, firm silt loam to silty clay loam.
21 to 28 inches, yellowish-brown, slightly acid, firm clay loam mottled with pale brown.
28 to 36 inches, yellowish-brown, firm, compact, limy glacial till of loam texture.

In texture the subsoil ranges from heavy clay loam or silty clay loam to light silty clay. The depth to limy glacial till ranges from 18 to 36 inches.

These soils have moderately slow permeability, are moderately high in productivity, and have moderate available moisture capacity in the root zone. They are suited to most crops common in the county, but lime and fertilizer are needed for favorable yields. Sloping areas that are cultivated can be kept from eroding by use of suitable practices. In nearly level areas a few wet spots may need improved drainage.

Celina silt loam, 0 to 2 percent slopes (CoA).—The surface layer of this soil consists almost entirely of original surface soil. In some areas it is thicker than the one described as typical because of inwash from surrounding soils. Small areas of level Crosby soils are included, particularly along waterways and at the heads of drainageways. Also included are small areas of Brookston soils, which occur in positions similar to those of the Crosby soils or in depressions too small to be mapped separately. (Capability unit I–1; woodland suitability group 4)

Celina silt loam, 2 to 6 percent slopes (CoB).—This soil has lost only a little of its original surface layer through erosion. In a few areas the surface layer is thicker than the typical one because it is covered by an inwash of silty material from surrounding soils. Included in areas mapped as this soil are small areas of gently sloping Miami soils; and, particularly along waterways, small areas of nearly level Crosby soils. (Capability unit IIe–1; woodland suitability group 4)

Celina silt loam, 2 to 6 percent slopes, moderately eroded (CoB2).—This soil has lost nearly half of its original surface layer through erosion, and it has a plow layer that is a mixture of surface soil and subsoil. In other respects it is like Celina silt loam, 2 to 6 percent slopes. (Capability unit IIe–1; woodland suitability group 4)

Clermont Series

The Clermont series consists of light-colored, poorly drained soils that have a silty surface layer and a moderately fine textured subsoil. These soils are on nearly level ridgetops in the central part of the county.

Typical profile (Clermont silt loam in a cultivated field):

0 to 6 inches, mottled grayish-brown and dark grayish-brown, strongly acid, friable silt loam.
6 to 14 inches, pale-brown, mottled with yellowish-brown, strongly acid, friable silt loam.
14 to 54 inches, mottled grayish-brown, yellowish-brown, and brown, strongly acid, firm silty clay loam; between the depths of 29 and 54 inches is a compact layer (fragipan).
54 inches +, mottled yellowish-brown and light brownish-gray, firm clay loam.

The depth to limy loam glacial till ranges from 8 to 10 feet.

These soils are very slowly permeable and are low in productivity, but they have moderate to high available moisture capacity. The water table is high in wet periods. Clermont soils respond rather well to surface drainage but, even if drained, are slow to dry out and warm up in spring. They have a moderately thick root zone. They are commonly planted to soybeans. Additions of lime and fertilizer are needed. Under good management, medium yields can be expected of most crops suited to the area.

Clermont silt loam (Cp).—This soil has lost little of its original surface layer through erosion. In most places it is level, but in some it occupies long, even slopes of about 1 percent. Small areas along waterways and in slight depressions have a darker surface layer containing more organic matter than that described in the typical profile. Small areas of gently sloping Avonburg soils are included. (Capability unit IIIw–2; woodland suitability group 1)

Colyer Series

The Colyer series is made up of well-drained soils that have a shaly, medium-textured surface layer underlain by a very shaly, fine-textured subsoil. The depth to shale bedrock is less than 20 inches. Colyer soils occur on sloping to moderately steep, narrow ridgetops and steep or very steep hillsides in the east-central part of the county. The original vegetation was oak forest.

Typical profile (Colyer shaly silt loam in a forested area):

0 to 1 inch, very dark brown, very strongly acid, friable shaly silt loam.
1 to 10 inches, dark grayish-brown, extremely acid, friable to firm shaly silty clay loam.

10 to 17 inches, brown, extremely acid, firm shaly silty clay and weathered shale.
17 inches +, black clay shale.

The content of shale fragments in the subsoil is more than 50 percent. The depth to black shale ranges from 10 to 20 inches. Colyer soils are very strongly acid or extremely acid throughout.

These soils are very low in productivity and low in available moisture capacity. They have moderately slow permeability and a thin root zone. The soils are not suited to field crops and produce medium to low yields of wood products.

Colyer shaly silt loam, 12 to 25 percent slopes (CrE).—Most areas of this soil lie on steep hillsides in the southwestern part of the county. Slopes are generally long and irregular and are dissected by many streams.

In most places this soil has lost much of its original surface layer through erosion, and the present surface layer is a mixture of subsoil material, shale fragments, and some of the original surface layer. Included in mapped areas are a few severely eroded areas that are marked by many shallow gullies. Also included, adjacent to the streams, are very steep areas of Colyer soil that generally are too narrow to be mapped separately.

Practically all of this soil was cleared for crops or pasture, but most of it has reverted to trees, which are cut for pulpwood. (Capability unit VIs–1; woodland suitability group 6)

Colyer shaly silt loam, 25 to 75 percent slopes (CrG).—This soil occupies steep or very steep hillsides. In most places it shows little or no erosion, but about 10 percent of the acreage is eroded. Included in areas mapped as this soil are some areas of Latham soils, mainly on narrow benches; a few exposed areas of unweathered shale, mostly on very steep, upper side slopes; and some areas of stony soils, generally below areas of Muskingum, Berks, and Neotoma soils. (Capability unit VIIs–1; woodland suitability group 6)

Colyer-Cana complex, 18 to 25 percent slopes (CsE) This complex consists mainly of Colyer soils and Cana soils in about equal acreages. These soils occur in such an intricate pattern that they could not be mapped separately. The Colyer soils generally occur on the steep slopes and in areas adjoining waterways, whereas the Cana soils normally are on the milder slopes and in areas between waterways.

Included with these soils are moderately eroded areas in which the surface layer is a mixture of original surface soil and subsoil; a few severely eroded areas in which there are many shallow gullies; and a few areas of Cruze soils, mainly along waterways, that generally are not eroded. (Capability unit VIs–1; woodland suitability group 6)

Colyer-Cana complex, 25 to 75 percent slopes (CsG).—This complex is about 60 percent Colyer soil and about 40 percent Cana soil. Most of the acreage is woodland. Included are some moderately eroded areas that were cleared for crops or pasture but have reverted to trees. Also included are a few severely eroded areas that are cut by many shallow gullies. (Capability unit VIIs–1; woodland suitability group 6)

Coolville Series

Soils of the Coolville series are deep, light colored, and moderately well drained. They have a silty surface layer that is underlain by a fine-textured subsoil derived from acid shale. Coolville soils occur on broad, gently sloping ridgetops in the south-central part of the county.

Typical profile (Coolville silt loam in a cultivated field):

0 to 7 inches, brown, strongly acid, friable silt loam.
7 to 21 inches, strong-brown, very strongly acid, firm silty clay loam; a few yellowish-brown mottles in the lower part.
21 to 36 inches, yellowish-red, mottled with pinkish-gray, very strongly acid, very firm clay.
36 inches +, clay shale and thin beds of sandstone.

The depth to very firm clay ranges from 18 to 30 inches. The depth to underlying shale is 36 to 48 inches. Reaction throughout the profile is very strongly acid or extremely acid.

In areas that are not severely eroded, the Coolville soils are moderately low in productivity and have moderate available moisture capacity. They are slowly permeable to water. In the more mildly sloping areas, a few wet spots may need surface drainage. Erosion control practices are needed in cultivated fields, and so are additions of lime and fertilizer. Under good management, adequate yields can be expected of all crops suited to the county.

Coolville silt loam, 2 to 6 percent slopes (CtB).—Although this soil is mostly cleared and cultivated, little erosion is evident on it. Slopes generally are long and regular. Included in mapped areas are small areas of nearly level Fawcett soil, most commonly in low depressions at the heads of drainageways. In most places the Fawcett soil is not eroded. (Capability unit IIe–2; woodland suitability group 6)

Coolville silt loam, 2 to 6 percent slopes, moderately eroded (CtB2).—In places this soil has lost as much as one-half of its original surface layer through erosion. The plow layer consists partly of material from the subsoil. (Capability unit IIe–2; woodland suitability group 6)

Coolville silt loam, 6 to 12 percent slopes, moderately eroded (CtC2).—Most of this soil is cleared and under cultivation. The plow layer contains material brought up from the subsoil. Slopes commonly are short and rather irregular. Included are small areas of moderately eroded Rarden soils, particularly on the stronger slopes. Also included are small areas of Fawcett soils, which generally lie in narrow strips along waterways and, in most places, are only slightly eroded. (Capability unit IIIe–4; woodland suitability group 6)

Crosby Series

The Crosby series consists of level to gently sloping, somewhat poorly drained soils that have a silty surface layer and a moderately fine textured subsoil. These soils developed in silt-mantled, highly calcareous, medium-textured till. They occupy uplands in the northwestern one-fourth of the county.

Typical profile (Crosby silt loam in a cultivated field):

0 to 8 inches, dark grayish-brown, slightly acid, friable silt loam.

8 to 12 inches, grayish-brown, medium acid, friable silt loam.
12 to 32 inches, grayish-brown to yellowish-brown, strongly acid to slightly acid, firm silty clay loam mottled with dark gray in lower part.
32 to 38 inches, mottled grayish-brown and yellowish-brown, firm clay loam; mildly alkaline; glacial till.
38 inches +, mottled yellowish-brown and dark yellowish-brown, firm, limy loam glacial till.

The texture of the subsoil ranges from heavy clay loam or silty clay loam to light silty clay. The depth to limy glacial till ranges from 18 to 36 inches.

Crosby soils are medium in productivity, have moderately slow permeability, and are moderate to high in available moisture capacity. Unless drained, they have a high water table in wet periods and are slow to dry out and warm up in spring. They respond well to tiling. If fertilizer and lime are used in adequate amounts, most of the common crops are suitable.

Crosby silt loam, 0 to 2 percent slopes (CvA).—Nearly all of this soil is cultivated. The surface layer is in good tilth but tends to crust over. In a few areas, which make up about 1 percent of the total acreage, the surface layer is thickened because it has been covered by silty material that washed in from surrounding soils. Included are a few areas of Brookston soils that generally are uneroded and commonly occur in small depressions or along drainageways. (Capability unit IIw–2; woodland suitability group 2)

Crosby silt loam, 2 to 6 percent slopes (CvB).—Most of this soil has slopes of 2 to 4 percent. Sizable areas having slopes of less than 2 percent are included. Also included are a few small areas of slightly eroded Celina soils, most of which occur on the stronger slopes or as small humps. (Capability unit IIw–2; woodland suitability group 2)

Cruze Series

The Cruze series consists of light-colored, well drained and moderately well drained soils that have a medium-textured surface layer and a fine-textured subsoil. These soils lie on stream fans and at the base of steep slopes in the east-central part of the county.

Typical profile (Cruze silt loam in a pastured area):

0 to 6 inches, yellowish-brown, very strongly acid, friable silt loam.
6 to 17 inches, strong-brown to light yellowish-brown, very strongly acid, firm shaly silty clay loam.
17 to 31 inches, brown, very strongly acid, firm shaly silty clay.
31 to 60 inches, gray and light yellowish-brown, extremely acid, firm silty clay that contains fragments of shale and sandstone.

In some places the surface layer contains many fragments of sandstone.

These soils are low in productivity but have high available moisture capacity. They are moderately slow in permeability and have a moderately thick root zone. Because large amounts of lime and fertilizer are needed if cultivated crops are grown, Cruze soils generally are used for hay or pasture.

Cruze silt loam, 2 to 6 percent slopes (CwB).—This soil lies at the base of steeper slopes or on alluvial fans. Slopes generally are short and, in most places, are cultivated. Erosion is a hazard in cultivated fields. Included in areas mapped as this soil are some areas that are moderately eroded; a few areas of moderately well drained Philo soils; and a few areas that are wet and seepy. (Capability unit IIe–2; woodland suitability group 6)

Cruze silt loam, 6 to 12 percent slopes, moderately eroded (CwC2).—This soil occurs on alluvial fans and in narrow bands adjacent to steeper slopes. It has lost as much as one-half of its original surface layer through erosion, and the present surface layer contains subsoil material and some shale fragments. Slopes commonly are short and regular. Included are a few areas of Pope soils, mainly in narrow strips along drainageways, and a few stony areas, indicated by symbol on the soil map. (Capability unit IIIe–4; woodland suitability group 6)

Cruze silt loam, 12 to 18 percent slopes, moderately eroded (CwD2).—In most places this soil has lost about half of its original surface layer through erosion. It generally occurs in narrow bands at the base of steeper slopes, but a few areas are on alluvial fans. Most of the acreage is wooded.

Included with this soil are a few areas of Latham and Colyer soils, particularly in areas adjacent to steeper slopes, and a few stony areas, indicated by symbol on the soil map. (Capability unit IVe–4; woodland suitability group 6)

Cruze silt loam, 18 to 25 percent slopes (CwE).—This steep soil occupies narrow strips adjoining steeper slopes and side slopes bordering drainageways. Slopes generally are short and irregular, but erosion is the main hazard. Included are areas that are moderately eroded; areas of Latham and Colyer soils; and a few stony areas, indicated by symbols on the soil map. (Capability unit VIe–2; woodland suitability group 6)

Cruze soils, 6 to 12 percent slopes, severely eroded (CzC3).—These soils have lost most of their original surface soil through erosion, and their present surface layer consists of silty clay loam that is mostly subsoil material. Because erosion has been severe, the surface layer is in poor tilth and tends to get cloddy if cultivated. In some places there are many shallow gullies. Most of the acreage is covered with brush or with trees of poor quality.

Included in areas mapped as these soils are a few severely gullied areas. Here, so many deep gullies have formed that the original soils have been completely destroyed except for small tracts between the gullies. Also included are a few areas of moderately eroded Rarden soils, most commonly along the steeper adjacent slopes, and a few areas having a stony surface layer, indicated by symbol on the soil map. (Capability unit IVe–4; woodland suitability group 6)

Cruze soils, 12 to 18 percent slopes, severely eroded (CzD3).—Except for their steeper slopes, these soils are similar to Cruze soils, 6 to 12 percent slopes, severely eroded. A few areas of Latham soils are included. (Capability unit VIe–2; woodland suitability group 6)

Dekalb Series

The Dekalb series consists of light-colored, well-drained soils that are moderately deep to deep over sandstone. These soils occupy sloping to steep hillsides in the east-central and southeastern parts of the county. They range from fine sandy loam to loam in texture and are sandier than the Muskingum soils.

Typical profile (Dekalb fine sandy loam in a wooded area):

0 to 1 inch, dark-gray, extremely acid, friable fine sandy loam.
1 to 21 inches, light yellowish-brown, very strongly acid, friable channery fine sandy loam.
21 to 36 inches, light yellowish-brown, strongly acid channery fine sandy loam.
36 to 44 inches, yellowish red, strongly acid channery loam.
44 inches +, coarse fragments of weathered sandstone; sandy loam material between the fragments.

The content of stones in the subsoil ranges from 10 to 50 percent. The depth to fractured, coarse-grained sandstone ranges from 24 to 50 inches.

These soils are low in productivity and in available moisture capacity. They have rapid permeability. Their stone content is variable, and some areas are too stony for cultivation. In most other areas, cultivation is severely limited because of slope. The soils are productive of most kinds of trees suited to the county, and most areas are used as woodland.

In Ross County the Dekalb soils occur closely with the Neotoma soils and are mapped only in undifferentiated groups with those soils. A typical profile of a Neotoma soil is described under the heading "Neotoma Series."

Dekalb and Neotoma fine sandy loams, 35 to 70 percent slopes (DoG).—This group of undifferentiated soils occurs on steep hillsides. About 75 percent of the mapping unit is Dekalb fine sandy loam, and the rest is Neotoma fine sandy loam. The Neotoma soil is on northeast-facing slopes and in coves; it has a thicker and darker surface layer than the Dekalb soil. In some places there are fragments of loosely bonded sandstone on the surface and throughout the profile.

Nearly all the acreage of these soils is wooded and has never been cleared for crops or pasture. Most of it is covered by State-owned forest. (Capability unit VIIe–2; woodland suitability group 7)

Dekalb and Neotoma extremely rocky fine sandy loams, 25 to 70 percent slopes (DnG).—The soils in this undifferentiated group lie on steep hillsides. They contain loose fragments of Sharon conglomerate that range from 10 to 15 inches in size and make up as much as 30 percent of the surface layer. In addition, Sharon conglomerate occurs as solid outcrops that are distributed somewhat haphazardly and range from small, discontinuous ledges to large, high cliffs. The cliffs are indicated by an escarpment symbol on the soil map. Practically all the acreage of these soils is forested. (Capability unit VIIs–1; woodland suitability group 7)

Eel Series

Soils of the Eel series are deep, nearly level, medium textured, and moderately well drained. They occur on bottom land in the northwestern part of the county and along the Scioto River.

Typical profile (Eel silt loam in a cultivated field):

0 to 7 inches, dark-brown, neutral, friable silt loam.
7 to 24 inches, dark grayish-brown, neutral, friable silt loam.
24 to 42 inches, dark grayish-brown, neutral, firm silt loam mottled with olive brown.
42 inches +, limy gravel and sand.

The surface layer ranges from silt loam and loam to fine sandy loam. Underlying the surface layer is stratified silt loam, loam, and light silty clay loam. In reaction the Eel soils range from slightly acid to moderately alkaline.

These soils are highly productive, moderately permeable, and high in available moisture capacity. If they are well managed, they produce favorable yields of all the common crops, but lime and fertilizer are needed in amounts indicated by soil tests. The Eel soils are subject to flooding and, in many areas, are infested with johnsongrass.

Eel silt loam (Ee).—This nearly level soil is the only Eel soil mapped in Ross County. It lies in long strips about 200 feet wide on bottom land and in narrower bands along smaller streams. In most places it adjoins the Genesee or Shoals soils. Most of the soil is cultivated, but it is wooded in a few areas, mainly along smaller streams and branches. A few included areas have a loam surface layer. Also included, particularly in flood channels and in areas adjacent to uplands, are a few areas of the wetter, grayer Shoals soils. (Capability unit IIw–5; woodland suitability group 3)

Fawcett Series

The Fawcett series consists of deep, light-colored, somewhat poorly drained soils that have a silty surface layer underlain by a moderately fine textured or fine textured subsoil derived from acid clay shale. These soils are on broad, gently sloping ridgetops in the south-central part of the county.

Typical profile (Fawcett silt loam in a pastured area):

0 to 4 inches, grayish-brown, medium acid, friable silt loam.
4 to 8 inches, yellowish-brown, very strongly acid, friable silt loam.
8 to 22 inches, mottled light-gray and yellowish-brown, very strongly acid, firm silty clay loam.
22 to 39 inches, mottled grayish-brown, yellowish-brown, and light brownish-gray, very strongly acid, firm channery silty clay or silty clay loam.
39 inches +, weathered clay shale; very strongly acid; contains thin beds of sandstone.

The silty mantle in which the upper part of these soils developed ranges from 12 to 24 inches in thickness. Silty clay is within 22 to 38 inches of the surface and is 10 to 40 percent channery fragments of shale and sandstone. Below the surface layer the profile ranges from strongly acid to extremely acid.

Fawcett soils are slowly permeable and have moderate available moisture capacity.

Fawcett silt loam (Fa).—This nearly level soil is in low depressional areas on broad ridgetops and in fan-shaped areas at the heads of drainageways. It has lost only a little of its original surface layer through erosion. The soil is naturally wet and, if cultivated before it is thoroughly dry, tends to harden and to get cloddy. Most of the acreage is under cultivation, but a few areas are used as pastured woodlots.

Included are a few areas having slopes of 2 to 6 percent slopes, nearly all of which adjoin areas of lighter colored Coolville soils. A few areas of Coolville soil are included with this soil. (Capability unit IIIw–2; woodland suitability group 2)

Fox Series

In the Fox series are nearly level to moderately steep, well-drained soils that are moderately deep to gravel and sand. These soils have a medium-textured or moderately coarse textured surface layer and a moderately fine textured subsoil that is underlain by calcareous, loose sand and gravel. They are mainly on terraces along the major streams in the county.

Typical profile (Fox silt loam in a cultivated field):

0 to 12 inches, dark-brown to brown, slightly acid, friable silt loam.
12 to 17 inches, dark-brown, strongly acid, friable loam.
17 to 38 inches, dark-brown, strongly acid to medium acid, firm sandy clay loam.
38 inches +, brownish-gray, limy gravel and sand.

Texture of the subsoil is clay loam, sandy clay loam, sandy clay, fine gravelly clay, or light clay. In color the subsoil ranges from brown to reddish brown or dark reddish brown. Fox soils are neutral to medium acid in the surface layer, medium acid or strongly acid in the upper subsoil, and neutral in the lower subsoil. The depth to limy gravel and sand ranges from 24 to 42 inches.

These soils are moderately rapidly permeable, have moderate available moisture capacity, and are medium in productivity. In addition to practices that control erosion, applications of lime and fertilizer are needed in fields used for crops. Under good management, medium yields are obtained from most crops common in the county.

Fox gravelly loam, 0 to 2 percent slopes (FgA).—This soil occupies low slopes of about 1 percent that generally are long and regular. It is in good tilth but tends to be droughty. The gravelly loam surface layer is likely to wear away plow points faster than that of nongravelly soils. Small areas of Fox loam are included. (Capability unit IIs–1; woodland suitability group 5)

Fox gravelly loam, 2 to 6 percent slopes (FgB).—This soil is in good tilth but has lost part of its original surface layer through erosion. In some areas, where as much as half of the surface layer has been washed away, the soil tends to be droughty. Slopes are rather long and regular.

Most of this soil is under cultivation, though a few areas are wooded, particularly those along waterways that are adjacent to steeper slopes. A few areas of Fox loam are included. (Capability unit IIe–1; woodland suitability group 5)

Fox gravelly loam, 6 to 12 percent slopes, moderately eroded (FgC2).—In some places this soil has had as much as half of its original surface layer washed away. It is highly erodible, is naturally droughty, and is likely to get more droughty if erosion continues. Also, further erosion will thin the root zone. Small areas of Lorenzo and Rodman soils are included, mainly on the stronger slopes. (Capability unit IIIe–2; woodland suitability group 5)

Fox loam, 0 to 2 percent slopes (FlA).—This soil has lost only a little of its original surface layer through erosion. It generally occupies uniform, nearly level areas on second bottoms. The surface layer is in good tilth, but the soil tends to be droughty for some cultivated crops. Included are small areas of darker colored Warsaw soils. (Capability unit IIs–1; woodland suitability group 5)

Fox loam, 2 to 6 percent slopes (FlB).—This soil generally shows little erosion, but in some areas as much as half of the original surface layer has been lost. The soil is in good tilth, normally has long and regular slopes, and, in most places, is under cultivation. If further erosion occurs, however, the root zone will be thinned and the available moisture capacity reduced.

Included in areas mapped as this soil are a few areas of darker colored Warsaw soils. These are too small to be mapped separately and are mostly less than 2 acres in size. Also included are some areas that have a sandy surface layer; and a few areas that are gravelly, indicated by symbol on the soil map. (Capability unit IIe–1; woodland suitability group 5)

Fox loam, 6 to 12 percent slopes, moderately eroded (FlC2).—This soil occupies rather short but regular slopes, and most of it is cultivated. The present surface layer is a mixture of original surface soil and brown subsoil. It is in fair tilth and tends to get cloddy if cultivated. Any additional loss of soil will result in reduced available moisture capacity and a thinner root zone.

Some wooded, uneroded areas are included with this soil, particularly along waterways on the stronger slopes. Also included are some areas having a sandy, gravelly surface layer, indicated by symbol on the soil map, and a few severely eroded areas. (Capability unit IIIe–2; woodland suitability group 5)

Fox sandy loam, 0 to 2 percent slopes (FmA).—In most places little erosion is evident on this soil. Near slope breaks toward waterways and stronger slopes, however, a few areas have a plow layer that contains material brought up from the subsoil. This soil is more droughty than Fox loams and silt loams. Most of the acreage is cultivated, but a few areas are pastured or wooded, most commonly those adjacent to steeper slopes. A few small areas of Fox loam are included. (Capability unit IIs–1; woodland suitability group 5)

Fox sandy loam, 2 to 6 percent slopes (FmB).—This soil is droughty and, in cultivated areas, has lost part of its original surface layer through erosion. Included are areas having a gravelly surface layer, indicated by symbol on the soil map. (Capability unit IIe–1; woodland suitability group 5)

Fox silt loam, 0 to 2 percent slopes (FnA).—The surface layer of this soil contains some gravel. Although most areas have slopes of about 1 percent, there is little runoff because the soil is so permeable. Small areas of level Thackery soils are included. (Capability unit IIs–1; woodland suitability group 5)

Fox silt loam, 2 to 6 percent slopes (FnB).—This soil occupies rather long, regular slopes that show little or no evidence of erosion. Some moderately eroded areas are included on the stronger slopes. Also included, most commonly along waterways, are small areas of Thackery soils. (Capability unit IIe–1; woodland suitability group 5)

Fox silt loam, 2 to 6 percent slopes, moderately eroded (FnB2).—In places this soil has lost as much as one-half of its original surface layer through erosion, and its plow layer is partly subsoil material. Consequently, tillage is more difficult on this soil than on uneroded Fox soils. (Capability unit IIe–1; woodland suitability group 5)

Fox silt loam, 6 to 12 percent slopes, moderately eroded (FnC2).—More than half of this soil is on eskers, kames, and moraines on uplands, and the rest is on stream terraces. In most places the soil has lost about half of its original surface layer through erosion. For this reason it is more droughty than less eroded Fox silt loams. It is susceptible to erosion and needs the protection of practices that control runoff. Slopes are moderately long and somewhat irregular. A few areas of Casco soils are included, as are a few gravelly areas, indicated by symbol on the soil map. (Capability unit IIIe–2; woodland suitability group 5)

Fox soils, 6 to 12 percent slopes, severely eroded (FoC3).—These soils have lost nearly all of their original surface layer through erosion, and their present surface layer consists mostly of subsoil material. Some areas are gullied, and in some places the original soils have been destroyed except for small patches between the gullies. Most of the acreage is in pasture or in woodland of poor quality, but a few areas are still used for crops. The soils are in poor tilth and generally get cloddy when cultivated. A few areas of Lorenzo and Rodman soils are included.

These soils should be kept covered by permanent pasture or trees. Native hardwoods grow well on them, and Austrian pine is well suited because the soils are limy. (Capability IVe–2; woodland suitability group 5)

Fox and Warsaw soils, 12 to 18 percent slopes, moderately eroded (FwD2).—The soils in this undifferentiated group generally occur on glacial eskers, kames, and moraines on the uplands, but about one-fourth of their total area is on stream terraces. Most of the acreage is farmed, though about a fourth of it is wooded.

Erosion has removed nearly half of the original surface layer from these droughty soils. If further erosion occurs, the root zone will be thinned and the available moisture capacity reduced. Included in areas mapped as these soils are areas of dark-colored Warsaw soil, chiefly on the milder slopes; a few areas of Casco soils; and a few gravelly areas, indicated by symbol on the soil map. (Capability unit IVe–1; woodland suitability group 5)

Fox and Warsaw soils, 12 to 18 percent slopes, severely eroded (FwD3).—These soils have lost most of their original surface layer through erosion, and their plow layer is principally material brought up from the subsoil. In most areas the plow layer is clay loam, but in some it is silty clay loam or sandy clay loam. The soils are droughty, are in poor tilth, and generally get cloddy if cultivated. Because they are severely eroded, their root zone is thin and their available moisture capacity is low. A few areas of Casco soils are included, particularly on the steeper slopes.

These soils can produce good stands of sweetclover and fairly good stands of alfalfa. Most of the acreage is in permanent pasture. (Capability unit VIe–1; woodland suitability group 5)

Genesee Series

The Genesee series consists of deep, well-drained soils that are medium textured in the surface layer and subsoil. These soils lie on nearly level bottom land.

Typical profile (Genesee silt loam in a cultivated field):

0 to 8 inches, dark grayish-brown, neutral, friable silt loam.
8 to 48 inches +, dark grayish-brown to dark-brown, neutral, friable silt loam.

The texture of the surface layer is silt loam, loam, fine sandy loam, or silty clay loam.

The Genesee soils are subject to flooding and, in many areas, are infested with johnsongrass. Nevertheless, they are highly productive, moderately permeable, and high in available moisture capacity. If the soils are limed, fertilized, and otherwise well managed, they produce favorable yields of most crops suited to the county.

Genesee fine sandy loam (Ge).—This soil is sandier than the one described in the typical profile. It occurs on flood plains, generally in nearly level areas that are about 250 feet wide and range from 10 to 100 acres in size. Some areas, however, are gently undulating and are dissected by many floodwater channels and sloughs. In most places the soil is adjacent to Genesee silt loam, Eel soils, and Abscota soils.

Some areas having a gravelly surface layer are included in areas mapped as this soil, mainly on the downstream side of large bends in the Scioto River. These areas are indicated by gravel symbols on the soil map. Also included are areas of uneroded Abscota soils, which generally occur with the gravelly areas or as long, narrow, convex bands along the floodwater channels.

Genesee fine sandy loam tends to be droughty but generally produces satisfactory yields of all crops suited to the county. Most of the acreage is cultivated. The soil is subject to flooding, particularly in areas dissected by channels and sloughs. The floods generally occur late in winter, or early in spring before crops are planted. Large areas are infested with johnsongrass, chiefly in the Paint Creek valley and in the Scioto River valley south of Chillicothe. (Capability unit IIw–5; woodland suitability group 3)

Genesee silt loam (Gn).—This soil occurs on nearly level flood plains, generally in areas that are about 500 feet wide and that range from 25 to 150 acres in size. These areas are adjoined by a stream on one side and, on the other, by areas of wetter, grayer Eel and Shoals soils. Normally, the surface layer contains few or no pebbles or stones.

Some included areas are covered by gravelly overwash; these generally lie on the flood plain of the Scioto River south of Chillicothe and are on the downstream side of the larger meanders. Also included are areas of Eel soils, most of which are in narrow strips along drainageways; small areas of Shoals soils, mainly in the bottoms of old sloughs; and a few areas of Abscota soils that lie in convex bands, 25 or more feet wide and as much as 500 feet long, that are too narrow to be mapped separately.

This soil is well suited to most crops, but large areas are infested with johnsongrass. These areas are mainly in the valley of Paint Creek and in the valley of the Scioto River south of Chillicothe. (Capability unit IIw–5; woodland suitability group 3)

Genesee silty clay loam (Go).—This soil occupies bands about 100 feet wide on flood plains. These bands are shallow, concave flood channels that generally have slopes of about 2 percent. They adjoin areas of other Genesee soils and of the grayer Eel soils. Some included areas have slopes of up to 12 percent, and there are included areas of Shoals soils that occur as strips in the bottom of narrow flood channels.

Although this soil is in good tilth, it tends to get cloddy if cultivated when wet. Nearly all of the soil is cropped, but a few areas adjacent to streams are wooded. (Capability unit IIw–5; woodland suitability group 3)

Gravel Pits

Gravel pits are areas in which the soil has been removed or pushed aside and the underlying sand and gravel have been taken for road construction, concrete materials, molding sand, and other uses. These pits are generally in Fox, Negley, and Parke soils, all of which have a substratum of relatively clean, well-sorted gravel and sand. Pits used only as a source of molding sand are in Pike, Rainsboro, and Taggart soils, where sand of high quality occurs in the lower subsoil in some places.

Gravel pits vary considerably in size. The smaller ones, generally used by individual landowners, are indicated by symbol on the soil map. The larger pits, operated by commercial producers, are outlined on the map. Most of the larger pits contain water, and some are used as fish ponds. Gravel pits have not been placed in a capability unit or a woodland suitability group.

Henshaw Series

The Henshaw series consists of deep, somewhat poorly drained soils that have a silty surface layer underlain by a moderately fine textured subsoil. These soils occupy nearly level and gently sloping second bottoms, principally along the Scioto River.

Typical profile (Henshaw silt loam in a cultivated field):

0 to 13 inches, dark-brown to brown, strongly acid, friable silt loam.
13 to 36 inches, grayish-brown, very strongly acid, firm silty clay loam.
36 to 43 inches, mottled gray and strong-brown, slightly acid, very firm silty clay loam.
43 to 60 inches, mottled gray and olive-brown, compact, limy silt loam.

In texture the subsoil ranges from fine silt loam to silty clay loam or clay loam. The depth to mottled, compact, limy silt loam ranges from 30 to 50 inches.

Productivity is medium, and the available moisture capacity is high, but permeability is moderately slow. Unless drained, the Henshaw soils have a high water table in wet periods and are slow to dry out and warm up in spring. They respond fairly well to tile drainage and, if adequately limed and fertilized, produce satisfactory yields of crops.

Henshaw silt loam (He).—Most of this soil shows little or no erosion, but in places the soil has slopes of as much as 3 percent that are erodible if cultivated. It is adjacent to the better drained Uniontown soils. Included with it are areas in which the surface layer is thicker and lighter colored than the typical one because it has been covered by silty material that washed from adjacent higher slopes. These areas occur as irregularly shaped strips along waterways and as broad, level areas at the base of steeper slopes. Also included are small areas of wetter, dark-colored Bonpas soils, which lie in narrow strips along waterways and in small depressions less than 5 acres in size.

This soil generally is in good tilth but tends to puddle and to crust over if cultivated when wet. Most of the acreage is under cultivation. (Capability unit IIw–2; woodland suitability group 2)

Hickory Series

In the Hickory series are well-drained soils that have a silty surface layer and a moderately fine textured subsoil. These soils were derived from Illinoian glacial till. They occur on sloping to steep ridgetops and on very steep hillsides in the southwestern and central parts of the county.

Typical profile (Hickory silt loam in a cultivated field):

0 to 11 inches, dark grayish-brown to brownish-yellow, slightly acid, friable silt loam.
11 to 41 inches, yellowish-brown, strongly acid, firm silty clay loam.
41 to 72 inches, yellowish-brown, mottled with pale-brown, strongly acid, firm loam.
72 to 90 inches +, yellowish-brown, limy glacial till.

The depth to limy glacial till ranges from 6 to 10 feet.

The Hickory soils are moderately permeable and have a moderately thick root zone. In areas that are not severely eroded, they are medium in productivity and have high available moisture capacity. In addition to measures for controlling erosion, additions of lime and fertilizer are needed in cultivated areas. If the soils are well managed, they produce favorable yields of hay, pasture, and some field crops and medium yields of other field crops. They are well suited to trees.

Hickory silt loam, 6 to 12 percent slopes, moderately eroded (HkC2).—This soil occurs on narrow, gently rolling ridgetops, where it is surrounded by the Cana, Colyer, Latham, or Muskingum soils. Its surface layer consists partly of subsoil material and is likely to erode unless protected. Because fertility is low, many areas have been abandoned and are lying idle or have reverted to woodland. Included are a few slightly eroded areas that remain wooded, and a few areas of Rossmoyne soils, mainly in the more mildly sloping areas near the center of ridges. (Capability unit IIIe–1; woodland suitability group 4)

Hickory silt loam, 12 to 18 percent slopes, moderately eroded (HkD2).—This soil lies at the base of very steep hills, which are occupied by the Berks, Latham, and Muskingum soils, or on narrow and hilly ridgetops. Most of the acreage has been cleared for cultivation, but now it is mainly pastured or covered with brush. The soil is highly erodible and, if cultivated, requires management that controls erosion.

Some areas included with this soil are only slightly eroded. These areas generally are on the steeper slopes adjacent to waterways and presumably have never been cleared for cultivation. Also included, particularly in areas adjoining steeper slopes, are tracts of Latham soils. (Capability unit IVe–1; woodland suitability group 4)

Hickory silt loam, 18 to 25 percent slopes (HkE).—This steep soil commonly lies near the base of steeper hillsides. Most cleared areas are eroded, but some of the acreage remains wooded and is practically uneroded. The surface layer is about 30 percent stones in the higher part of areas adjacent to steeper slopes, whereas it con-

tains only a few stones in the middle and lower parts of these areas. The stony places are indicated by symbol on the soil map.

Included with this soil are some areas of slightly eroded Latham soils. These are next to the steeper slopes and on lower side slopes along the larger streams cutting through areas of Hickory soils. (Capability unit VIe–1; woodland suitability group 4)

Hickory soils, 12 to 18 percent slopes, severely eroded (HoD3).—These soils have a plow layer of silt loam or silty clay loam that consists almost entirely of subsoil material. Some included areas are severely gullied, and there are small included areas of Cruze soils, chiefly in narrow strips along waterways.

These soils are well suited to use as woodland or for wildlife. They also are suited to pasture. Sweetclover and alfalfa grow well in places where the underlying limy glacial till is near the surface. (Capability unit VIe–1; woodland suitability group 4)

Hickory soils, 18 to 25 percent slopes, severely eroded (HoE3).—Except for their steeper slopes, these soils are similar to Hickory soils, 12 to 18 percent slopes, severely eroded. Included in mapped areas are some areas of moderately eroded Colyer soils, most commonly on side slopes along some of the larger streams, and small areas of moderately eroded Cana soils, which occupy upper slopes where the glacial till is thin and completely weathered. (Capability unit VIe–1; woodland suitability group 4)

Hickory soils, 25 to 45 percent slopes (HoF).—These soils occur on very steep hillsides that are dissected by many streams and branches. Most cleared areas are eroded, but about half the acreage remains wooded and shows little erosion. Many areas of woodland are clear cut for pulpwood and then commonly revert to trees.

Included in areas mapped as these soils are areas of moderately eroded Latham and Colyer soils. The Latham soils occupy the upper slopes, and the Colyer soils are on slopes adjacent to streams and branches. (Capability unit VIIe–1; woodland suitability group 4)

Kendallville Series

Soils of the Kendallville series are nearly level to very steep, light colored, and well drained. They have a medium-textured surface layer and a moderately fine textured subsoil. Kendallville soils occupy uplands in the extreme southwestern, the central, and the north-central parts of the county.

Typical profile (Kendallville silt loam in a cultivated field):

0 to 13 inches, brown, slightly acid, friable silt loam.
13 to 42 inches, dark-brown, strongly acid, firm gravelly clay loam.
42 inches +, light olive-brown, firm, limy glacial till of loam texture.

In the subsoil the texture is clay loam, gravelly clay loam, clay, and gravelly clay. The color of the subsoil ranges from dark brown to reddish brown. The Kendallville soils are neutral to medium acid in the surface layer, medium acid to very strongly acid in the upper subsoil, and neutral in the lower subsoil. The depth to limy glacial till ranges from 24 to 42 inches.

These soils are medium in productivity and available moisture capacity. They have moderately slow permeability and a moderately thick root zone. Most crops common in the county are suited to these soils, but lime and fertilizer are needed, as well as practices that control erosion. If cleared, severely eroded areas and steep slopes generally are kept in permanent pasture. Limitations on use of the soils as woodland are slight.

Kendallville silt loam, 0 to 2 percent slopes (KeA).—This soil has lost little of its original surface layer through erosion. It is in good tilth, and most of it is cultivated. Slopes are moderately long and uniform. Small areas of dark-colored Westland soils are included, commonly as narrow strips along drainageways and in small depressions. (Capability unit I–1; woodland suitability group 4)

Kendallville silt loam, 2 to 6 percent slopes (KeB).—This soil has long, gentle, uniform slopes and, in most areas, is cultivated. It shows little erosion and is in good tilth, but contour cultivation and other practices are needed for controlling soil losses. Included are small areas of uneroded Westland soil, which generally occur as narrow strips adjacent to drainageways. Also included are a few areas of Fox soil, mainly on the stronger slopes and on breaks next to waterways. (Capability unit IIe–1; woodland suitability group 4)

Kendallville silt loam, 6 to 12 percent slopes, moderately eroded (KeC2).—This sloping soil has a plow layer that is a mixture of original surface soil and subsoil. Slopes are rather long and somewhat irregular, and they are dissected by waterways and small branches of streams. Most of the acreage is cropped. A few areas of moderately eroded Casco soils are included, generally on the steeper side slopes along drainageways. (Capability unit IIIe–1; woodland suitability group 4)

Kendallville silt loam, 12 to 18 percent slopes, moderately eroded (KeD2).—This soil occurs on moderately steep, rather short, irregular slopes that are dissected by many streams and drainageways. Erosion has removed nearly half of the original surface layer, but most of the acreage now is farmed in long rotations or is kept in pasture. If the soil is cultivated, further erosion can be controlled by use of such practices as diversion ditches and grassed waterways. A few areas of moderately eroded Miami and Casco soils are included on the steeper slopes and on escarpments adjacent to streams. (Capability unit IVe–1; woodland suitability group 4)

Kendallville silt loam, 18 to 25 percent slopes, moderately eroded (KeE2).—This soil lies on short, steep, irregular slopes that generally are adjacent to the larger streams and branches. About half of the original surface layer has been washed away, and a cover of perennial plants is needed to control erosion. Less than 10 percent of the acreage is wooded, and the rest is used for pasture or is lying idle.

Included in areas mapped as this soil are some very steep areas that are shown by an escarpment symbol on the soil map. Also included are some areas of slightly eroded Casco and Miami soils, generally on the steeper slopes and on escarpments. (Capability unit VIe–1; woodland suitability group 4)

Kendallville soils, 6 to 12 percent slopes, severely eroded (KnC3).—These soils have lost nearly all of their original surface layer through erosion. Their present

surface layer is clay loam that is in rather poor tilth and tends to get cloddy if cultivated when wet. Slopes are uniform and rather short. A few included areas have a gravelly surface layer; these are indicated by symbol on the soil map. Also included are areas of Algiers soils, which lie in narrow strips along waterways. (Capability unit IVe–2; woodland suitability group 4)

Kendallville soils, 12 to 18 percent slopes, severely eroded (KnD3).—Erosion has removed most of the original surface layer from these moderately steep soils. The present surface layer is silty clay loam or clay loam that is difficult to till. Slopes are short and rather irregular, but they need the protection of growing plants. Most of the acreage is cleared and used for pasture or lying idle. The soils are well suited to use as woodland or for wildlife. Native hardwood trees and shrubs do well on them. A few areas of moderately eroded Casco soil are included, generally on steeper slopes and escarpments. (Capability unit VIe–1; woodland suitability group 4)

Kendallville soils, 18 to 25 percent slopes, severely eroded (KnE3).—These soils have short, steep, irregular slopes that are dissected by many streams and drainageways. Most of their original surface layer is gone, and their present surface layer consists of silty clay loam or clay loam that is largely subsoil material. The soils are suitable as woodland or for wildlife. In most places they are pastured, lying idle, or reverting to trees. A protective cover of plants is needed to control soil losses.

A few included areas are marked by many gullies. Also included are a few areas of slightly eroded Casco and Miami soils, commonly on the face of escarpments, and a few gravelly areas, indicated by symbol on the soil map. (Capability unit VIe–1; woodland suitability group 4)

Kendallville soils, 25 to 40 percent slopes, moderately eroded (KnF2).—These soils are on short, very steep, irregular side slopes and escarpments that are chiefly used for pasture or are reverting to trees. Their surface layer is silty clay loam, or clay loam but a few gravelly areas are included. Also included are areas of slightly eroded Casco and Miami soils, generally on the face of escarpments. A cover of growing plants is needed to control erosion. (Capability unit VIIe–1; woodland suitability group 4)

Latham Series

In the Latham series are well-drained soils that have a silty surface layer underlain by a fine-textured subsoil derived from acid clay shale. These soils occupy sloping ridgetops and steep to very steep hillsides in the southeastern one-fourth of the county. The original vegetation was oak forest.

Typical profile (Latham silt loam in a forested area):

0 to 3 inches, dark-brown, very strongly acid, friable silt loam.
3 to 11 inches, yellowish-brown, very strongly acid, friable silt loam to silty clay loam.
11 to 25 inches, yellowish-brown and strong-brown, very strongly acid, firm silty clay and weathered clay shale.
25 inches +, very strongly acid clay shale and thin beds of sandstone.

The depth to firm silty clay and weathered shale ranges from 10 to 18 inches. The depth to shale bedrock ranges from 18 to 40 inches. These soils are strongly acid to extremely acid.

Latham soils have very slow permeability and a thin root zone. In areas not severely eroded, they are low in productivity but have moderate available moisture capacity. They are well suited to trees and can be used for crops if erosion is controlled and if large amounts of lime and fertilizer are applied.

Latham silt loam, 6 to 12 percent slopes, moderately eroded (LaC2).—This soil generally occurs on gently rolling or rolling ridgetops and, in most places, has been cleared for crops. In places it has lost as much as half of its original surface layer through erosion, and its present surface layer contains material brought up from the finer textured subsoil during tillage. The soil is in fairly good tilth but tends to get cloddy if cultivated when wet, and it needs the protection of practices that control erosion. Much of the acreage is farmed in long rotations or is used for pasture.

Included in areas mapped as this soil are areas of slightly eroded, generally mildly sloping Coolville soil; a few small areas of wetter, slightly eroded Fawcett soil, chiefly in narrow strips along waterways and in small depressions at the heads of drainageways; and some stony areas, indicated by symbol on the soil map. (Capability unit IVe–3; woodland suitability group 6)

Latham silt loam, 12 to 18 percent slopes, moderately eroded (LaD2).—This soil occupies moderately steep hillsides. The present surface layer is a mixture of the original surface layer and part of the finer textured subsoil. Most of the acreage is used for pasture or hay, but some areas are wooded. Unless the soil is limed and fertilized, it produces low yields of pasture and hay. Practices are needed for erosion control.

In small, scattered areas there are flat fragments of sandstone on the surface. These areas are identified by a stone symbol on the soil map. In addition, there are some included areas of slightly eroded Cruze soils, commonly at the base of slopes. (Capability unit VIe–2; woodland suitability group 6)

Latham silt loam, 18 to 25 percent slopes (LaE).—This steep soil is on moderately long, wooded hillsides in the southern part of the county. In places its surface layer and subsoil contain as much as 15 percent coarse fragments, most of which are flat pieces of fine-grained sandstone 1 to 6 inches across. On some north-facing slopes and in coves, the surface layer is dark colored and is 4 to 8 inches thick. These areas are much better sites for trees than other areas of Latham soils.

Most of this soil has never been cleared for crops or pasture, but in many areas the trees are clear cut for pulpwood. Ordinarily, these areas then revert to woodland. Included with this soil are a few areas of uneroded, generally very stony Muskingum soil near the base of slopes. (Capability unit VIe–2; woodland suitability group 6)

Latham silt loam, 18 to 25 percent slopes, moderately eroded (LaE2).—The surface layer of this soil is a little finer textured than that of uneroded Latham silt loams because it is a mixture of original surface soil and subsoil. Consequently, it is more likely to get cloudy and is more difficult to work in preparing a seedbed. In some areas there are many chunks of sandstone throughout the soil. These areas are identified by stone symbol on the soil map.

Most of this soil has been cleared for crops and pasture, but many areas are idle, covered with brush, or reverting to woodland. The soil is naturally very strongly acid or

extremely acid, and unless lime and fertilizer are used in adequate amounts, the yield and quality of pasture are poor. Under good management tall fescue does well and makes hay or pasture of fair quality. (Capability unit VIe–2; woodland suitability group 6)

Latham soils, 12 to 18 percent slopes, severely eroded (LhD3).—Although the original surface layer of these hilly soils was silt loam, in most places the present one is silty clay loam. In local areas the soils are gullied. Practically all the acreage has been cleared, but some areas are idle as they revert to woodland. Further erosion can be controlled by maintaining a permanent cover of plants.

A few areas included with these soils are stony. Also included are a few small areas of less sloping, moderately eroded Cruze soils, most commonly near the base of slopes. These areas of Cruze soils, in which there are many channery fragments of sandstone on and in the surface layer, are indicated by stone symbol on the soil map. (Capability unit VIIe–2; woodland suitability group 6)

Latham soils, 18 to 25 percent slopes, severely eroded (LhE3).—These steep soils occupy moderately long, uniform side slopes that are marked by many shallow gullies and, in a few areas, are cut by many deep ones. Because of erosion, the surface layer consists of subsoil material that is extremely acid. The deep gullies generally are bare, and exposed in their bottom is raw shale.

On these soils the native vegetation commonly is broomsedge, povertygrass, greenbrier, and sumac. These plants occur in stands of poor quality, but little else will grow unless lime and fertilizer are applied. If the soils are well managed, they can produce fair emergency pasture, though heavy or continuous use is likely to thin the stands and to result in further erosion. (Capability unit VIIe–2; woodland suitability group 6)

Latham soils, 25 to 40 percent slopes (LhF).—These soils occur on very steep hillsides. In coves and on some north-facing slopes, their surface layer is 4 to 8 inches thick and is dark colored. These areas are better suited to trees than areas having a southerly aspect. Included are moderately eroded areas, some of which are gullied.

These soils are of limited use as pasture, but intensive management is needed in moderately eroded and gullied areas. (Capability unit VIIe–2; woodland suitability group 6)

Lorenzo Series

The Lorenzo series consists of dark-colored, well-drained soils that have a medium-textured surface layer and a moderately fine textured subsoil. Underlying the subsoil is calcareous, loose sand and gravel. Lorenzo soils are on sloping to very steep second bottoms along the major streams of the county.

Typical profile (Lorenzo loam in a wooded area):

0 to 6 inches, very dark brown, slightly acid, friable loam.
6 to 21 inches, dark-brown, slightly acid to neutral, friable clay loam.
21 inches +, loose, limy gravel and sand.

The dark-colored surface layer ranges from 5 to 9 inches in thickness. The depth to loose, limy gravel and sand ranges from 15 to 24 inches. The solum is neutral or slightly acid.

These soils are moderately low in productivity and in available moisture capacity. They have moderately rapid permeability and a thin root zone, and they are very droughty. They are suited to pasture and trees.

In Ross County the Lorenzo soils occur closely with the Casco, Fox, Negley, and Rodman soils. They are mapped only in undifferentiated groups of Casco and Lorenzo soils; in undifferentiated groups of Negley, Fox, and Lorenzo soils; and in a Rodman-Lorenzo complex. These mapping units are described under the headings "Casco Series," "Negley Series," and "Rodman Series."

Loudonville Series

The Loudonville series consists of moderately deep, well-drained soils that have a silty surface layer and a moderately fine textured subsoil. These soils are underlain by sandstone bedrock within a depth of 20 to 40 inches. They occur on sloping to very steep uplands in the north-central part of the county.

Typical profile (Loudonville silt loam in a cultivated field):

0 to 11 inches, dark grayish-brown to dark-brown, medium acid, friable silt loam.
11 to 21 inches, dark-brown, strongly acid, firm clay loam.
21 to 40 inches, yellowish-brown, strongly acid, firm cobbly clay loam.
40 inches +, massive, fine-grained sandstone bedrock.

The subsoil is loam, clay loam, or silty clay loam. The depth to cobbly clay loam ranges from 20 to 30 inches. The depth to sandstone bedrock ranges from 20 to 40 inches. Loudonville soils are very strongly acid to medium acid throughout.

Productivity is medium. Permeability and the available moisture capacity are moderate. Needed in cultivated areas are additions of lime and fertilizer, as well as practices that control erosion. Under good management, satisfactory yields can be obtained from most crops common in the county. Severely eroded or steep areas are suited to permanent pasture and trees.

Loudonville silt loam, 6 to 12 percent slopes (LoC).—This sloping soil lies in small, irregularly shaped areas on hillsides and in narrow bands along waterways. Generally, it is next to steeper Loudonville soils and to shallower Muskingum soils. In about 20 percent of the acreage, there are flat fragments of sandstone on the surface. These areas are indicated by symbol on the soil map. Some included areas have slopes of slightly less than 6 percent. Also included are small areas of Muskingum soil and a few areas of steeper Loudonville soils.

Erosion is a severe hazard if this soil is used for crops, and most cleared areas are slightly eroded. Soil losses can be controlled by using contour strips, grassed waterways, and, on the longer slopes, diversion ditches. Some areas of the soil remain wooded. (Capability unit IIIe–3; woodland suitability group 7)

Loudonville silt loam, 12 to 18 percent slopes, moderately eroded (LoD2).—This moderately steep soil is in small, irregularly shaped areas on hillsides and in narrow bands on side slopes along drainageways. It generally lies next to other Loudonville soils and to shallower Muskingum soil. In wooded areas the surface layer consists mainly of original surface soil, but in most cleared areas it has been seriously damaged by erosion. Flat fragments of sandstone cover 15 to 30 percent of the surface in places; these are indicated by symbol on the soil map.

Included are small areas of Muskingum soil, particularly on the steeper hillsides.

This soil is well suited to hay, pasture, and trees, though most of it is still wooded. It can be farmed in long rotations if it is protected from erosion and otherwise is well managed. (Capability unit IVe–1; woodland suitability group 7)

Loudonville silt loam, 18 to 25 percent slopes, moderately eroded (LoE2).—This steep soil occurs on hillsides and in narrow bands on the side slopes of drainageways. It is adjacent to less strongly sloping Loudonville soils and to shallower Muskingum soil. The surface layer is stony and is a mixture of original surface soil and subsoil in about equal amounts. Flat fragments of sandstone cover 15 to 30 percent of the surface in places; these are indicated by symbol on the soil map. Included in areas mapped as this soil are a few severely eroded areas that have a surface layer of stony clay loam. Also included are a few areas of moderately eroded Muskingum soil.

A permanent cover of plants is needed to control erosion on this Loudonville soil. (Capability unit IVe–1; woodland suitability group 7)

Loudonville silt loam, 25 to 45 percent slopes, moderately eroded (LoF2).—This very steep soil of the uplands lies in narrow bands on the side slopes of drainageways and on the faces of escarpments. Normally, the areas are less than 20 acres in size. In most places they are adjoined by areas of less steep Loudonville soils and of shallower Muskingum soils. Tracts of generally slightly eroded Muskingum soils were included in mapping, mostly in the steeper areas.

This Loudonville soil is better suited to trees than to other crops. It produces low yields of pasture, even if it is well managed. (Capability unit VIIe–2; woodland suitability group 7)

Made Land

Made land consists of areas in which the soil material is mostly fill. In the glaciated uplands of the county, the material generally is calcareous clay loam or loam that is a mixture of subsoil and a small amount of the original surface layer. In the unglaciated part of the county, the material is chiefly acid sandstone and shale mixed with a varying amount of fine earth. A few areas have been topdressed with several inches of original surface soil that helps in establishing and maintaining a good vegetative cover.

Made land has a low organic-matter content and, in many places, is in poor condition for plant growth. Graded areas are bare and are easily eroded, but grass can be established by mulching, fertilizing, and seeding. Trees are suitable for planting in most areas. Made land has not been placed in a capability unit or a woodland suitability group.

Markland Series

Soils of the Markland series are deep, nearly level to very steep, and well drained or moderately well drained. They have a medium-textured surface layer and a fine-textured subsoil that is underlain by calcareous lacustrine clay. These soils occupy dissected terraces along major streams in the county.

Typical profile (Markland silt loam in a cultivated field):

0 to 3 inches, dark grayish-brown, medium acid, friable silt loam.
3 to 7 inches, light yellowish-brown, strongly acid, friable silt loam.
7 to 14 inches, yellowish-brown, very strongly acid, firm silty clay loam.
14 to 34 inches, yellowish-brown, very firm silty clay mottled with grayish brown; very strongly acid in upper part, neutral in lower part.
34 to 44 inches +, mottled light brownish-gray and yellowish-brown, very firm, limy clay.

The depth to very firm silty clay ranges from 8 to 18 inches. The depth to limy lacustrine clay ranges from 20 to 40 inches. The subsoil is medium acid to very strongly acid.

These soils have moderately slow permeability. In areas that are not severely eroded, they are medium in productivity and have high available moisture capacity. If cultivated crops are grown, additions of lime and fertilizer are needed, as well as practices for controlling erosion. Nevertheless, the soils produce adequate yields of most crops common in the county if they are well managed, though use of severely eroded areas and steep areas is limited to permanent pasture or woodland.

Markland silt loam, 0 to 2 percent slopes (MaA).—This nearly level soil occupies somewhat irregularly shaped areas on second bottoms. Generally, it is next to more sloping Markland soils or to McGary soils. It is in good tilth and is easily managed, but shallow ditches are needed to remove excess surface water in some places. A few areas of grayer McGary soils are included with this soil. Most of these areas are small and fan shaped at the heads of drainageways or are long and narrow along waterways. (Capability unit IIw–4; woodland suitability group 4)

Markland silt loam, 2 to 6 percent slopes (MaB).—This gently sloping soil lies in broad areas on second bottoms. These areas generally are less than 25 acres in size and are adjoined by areas of more strongly sloping Markland soils. In a few places the surface layer is thicker than the typical one because it has been covered by silty overwash from surrounding soils. A few included areas have a loam surface layer, and there are small included areas of uneroded McGary soil, particularly at the heads of drainageways and in strips along waterways.

Except in eroded spots that tend to be cloddy, this soil is in good tilth and is easily managed. It is moderately susceptible to erosion, however, and needs to be protected by contour cultivation and other suitable practices. (Capability unit IIIe–4; woodland suitability group 4)

Markland silt loam, 6 to 12 percent slopes, moderately eroded (MaC2).—This soil occurs in irregularly shaped areas of moderate size on second bottoms, where it is adjacent to steeper Markland soils. Its surface layer consists about equally of original surface soil and material from the subsoil. Included in mapped areas are a few small areas that are uneroded; a few areas that have a loam surface layer; and a few small areas of wetter, grayer, uneroded McGary soil, chiefly in narrow strips along drainageways.

Erosion is a severe hazard if crops are grown on this Markland soil, and such practices as stripcropping on the contour and grassing the waterways are important in man-

agement. (Capability unit IVe–3; woodland suitability group 4)

Markland silt loam, 12 to 18 percent slopes, moderately eroded (MaD2).—This soil is in small, irregularly shaped areas along moderately steep banks on second bottoms. Here, it is adjoined by other Markland soils. The present surface layer consists of the remaining part of the original surface layer mixed with finer textured, yellowish-brown material from the subsoil. Included are a few areas with a loam surface layer; a few areas, chiefly small and wooded, that are practically uneroded; and a few areas of Shoals soil or Eel soil, most commonly in places where this Markland soil is adjacent to bottom land.

This soil can be protected from further erosion by maintaining a dense cover of plants through intensive management. It is well suited to sweetclover because the underlying limy clay is near the surface and, in some places, is just beneath the surface layer. (Capability unit VIe–2; woodland suitability group 4)

Markland silt loam, 18 to 25 percent slopes, moderately eroded (MaE2).—This soil occupies narrow bands on steep escarpments along second bottoms. It is adjoined by gently sloping Markland soils and by Shoals and Eel soils, which lie below the escarpments. Although the surface layer is silt loam, it is a little finer textured than that of uneroded Markland soils, for it contains material that formerly was yellowish-brown subsoil. Included in areas mapped as this soil are a few slightly eroded areas, most of which are wooded, and a few areas of Shoals and Eel soils.

This soil should be kept covered by plants. Sweetclover and other legumes do well on it because the underlying limy clay is near the surface layer. (Capability unit VIe–2; woodland suitability group 4)

Markland silt loam, 25 to 35 percent slopes, moderately eroded (MaF2).—This soil is on very steep escarpments. (Capability unit VIIe–1; woodland suitability group 4)

Markland soils, 6 to 12 percent slopes, severely eroded (MeC3).—These soils are in small, irregularly shaped areas along waterways on second bottoms. They have a plow layer that consists mostly of subsoil material and ranges from heavy silt loam to silty clay. In places there are many shallow gullies and a few deep ones. Included with these soils, principally on the milder slopes, are a few areas of Markland silt loam, 6 to 12 percent slopes, moderately eroded.

These soils are highly erodible if they are not protected by permanent vegetation. Sweetclover and other legumes grow well on them because the underlying limy clay is at or near the surface. (Capability unit VIe–2; woodland suitability group 4)

Markland soils, 12 to 18 percent slopes, severely eroded (MeD3).—These soils lie in narrow bands on escarpments along second bottoms. Their plow layer ranges from silty clay loam to silty clay and is made up chiefly of subsoil material. In places there are many shallow gullies and a few deep ones. A few included areas consist of less eroded Markland soils. Also included, most commonly at the base of escarpments, are a few areas that have a loam surface layer.

Erosion is a severe hazard unless a cover of plants is maintained. Because the underlying limy clay is at or near the surface, the soils are well suited to sweetclover and other legumes. (Capability unit VIIe–1; woodland suitability group 4)

McGary Series

The McGary series consists of deep, light-colored, somewhat poorly drained soils that have a medium-textured surface layer and a fine-textured subsoil underlain by lacustrine clay. These soils are on nearly level and gently sloping terraces along major streams in the county.

Typical profile (McGary silt loam in a cultivated field):

0 to 3 inches, dark grayish-brown, slightly acid, friable silt loam.
3 to 9 inches, light yellowish-brown to light brownish-gray, strongly acid, friable silt loam mottled with grayish brown.
9 to 13 inches, mottled light brownish-gray, gray, and yellowish-brown, very strongly acid, firm silty clay loam.
13 to 37 inches, mottled grayish-brown and yellowish-brown, strongly acid, very firm silty clay.
37 to 60 inches, grayish-brown, firm, limy clay mottled with yellowish brown.

The depth to very firm silty clay ranges from 8 to 18 inches. The depth to limy lacustrine clay ranges from 20 to 40 inches. These soils are medium acid to very strongly acid in the upper part of the subsoil and are neutral in the lower part.

McGary soils are medium in productivity and have high available moisture capacity. They are slowly permeable and, unless drained, have a high water table in wet periods. They respond fairly well to surface drainage, but even if drained, they are slow to dry out and to warm up in Spring. Except where limed, the soils are medium acid or strongly acid. Additions of lime and fertilizer are needed if crops are grown.

McGary silt loam, 0 to 2 percent slopes (MgA).—This soil is in small, irregularly shaped, nearly level or slightly depressional areas on second bottoms. It also occurs in narrow strips along waterways. In all these places it is adjacent to areas of sloping McGary soils and Markland soils. Little of the surface layer has been lost through erosion, but a few areas are covered with 6 to 12 inches of lighter colored silty overwash from nearby steeper slopes. A few areas of dark-colored, fine-textured soil are included, particularly in small depressions at the heads of drainageways and in narrow strips along them.

This soil is suited to the common crops. The principal hazard is excess water, which can be removed in surface ditches. Tile drainage generally is slow because the underlying silty clay keeps the tile lines from working properly. In some places diversion ditches are needed to protect crops from floodwater that runs off adjacent hillhides. (Capability unit IIIw–2; woodland suitability group 2)

McGary silt loam, 2 to 6 percent slopes (MgB).—This soil occurs in small, irregularly shaped areas adjoining and near the heads of drainageways. It lies next to nearly level McGary silt loam and to browner, more strongly sloping Markland soil. Its present surface layer consists mostly of original surface soil. A few included areas are covered with 6 to 12 inches of light-colored silty material that washed from adjacent slopes. Also included are a few

moderately eroded areas, and a few areas of Markland soil, especially on the stronger slopes.

This soil is suitable for cropping and is only slightly susceptible to erosion, which can be controlled by contour cultivation and grassed waterways. (Capability unit IIIw–2; woodland suitability group 2)

Mentor Series

The Mentor series consists of deep, nearly level and gently sloping, light-colored soils that are medium textured in the surface layer and are medium textured or moderately fine textured in the subsoil. These soils occupy well-drained glacial terraces in medium-sized valleys in the southwestern and southeastern parts of the county.

Typical profile (Mentor very fine sandy loam in a cultivated field):

0 to 8 inches, brown, slightly acid, friable very fine sandy loam.
8 to 22 inches, yellowish-brown, strongly acid, friable very fine sandy loam in upper part to silt loam in lower part.
22 to 32 inches, yellowish-brown, strongly acid, firm silty clay loam.
32 to 58 inches, yellowish-brown, strongly acid, firm silt loam.
58 inches +, stratified yellowish-brown silt loam and very fine sandy loam.

The depth to stratified silt loam and very fine sandy loam ranges from 48 to 96 inches. Unless they are limed, the Mentor soils are strongly acid or very strongly acid.

Productivity is high, permeability is moderate, and the available moisture capacity is high. If the soils are cropped, they should be limed and fertilized in adequate amounts. Erosion control practices are needed in sloping areas, and diversion ditches may be needed in nearly level areas to control runoff from adjacent hillsides.

Mentor very fine sandy loam, 0 to 2 percent slopes (MkA).—This soil is in long, narrow areas on second bottoms, where it adjoins the Pekin soils and other Mentor soils. A few included areas have a fine sandy loam surface layer, and some areas along waterways are covered with 6 to 12 inches of brown silty inwash from surrounding soils on uplands. Also included are a few areas of wetter, grayer Pekin and Bartle soils.

This soil is in good tilth and is easily managed. In some places diversion terraces having suitable outlets are needed for protecting crops from excess water that runs off adjacent stronger slopes. (Capability unit I–1; woodland suitability group 4)

Mentor very fine sandy loam, 2 to 6 percent slopes (MkB).—This gently sloping soil lies in fairly broad, uniformly shaped areas on second bottoms. It adjoins areas of more sloping Mentor soils. Its present surface layer consists mostly of original surface soil and, in some places, is silty. Included in areas mapped as this soil are a few moderately eroded areas in which about half of the original surface layer has been lost. Also included are a few areas of gently sloping, moderately well drained Pekin fine sandy loam, most commonly in narrow strips along waterways.

This Mentor soil is in good tilth and is easily managed, but in the most sandy areas it tends to be droughty. It is well suited to irrigated crops. Contour cultivation and grassed waterways are needed to control erosion in cultivated fields. (Capability unit IIe–1; woodland suitability group 4)

Mentor very fine sandy loam, 6 to 12 percent slopes, moderately eroded (MkC2).—This sloping soil occupies small, somewhat irregularly shaped areas on second bottoms. Here, it adjoins areas of other Mentor soils. Its present surface layer is a mixture of the original surface layer and material from the subsoil. Included are areas having a silt loam surface layer; some severely eroded areas in which the surface layer is made up entirely of subsoil material; and, most commonly in narrow strips adjacent to waterways, a few areas of sloping, moderately well drained Pekin fine sandy loam.

This soil is in good tilth, is easily managed, and is well suited to crops, including those that are irrigated. In some of the most sandy areas, however, the soil tends to be droughty. For controlling erosion, such practices as diversion terraces and grassed waterways are needed in cultivated fields. (Capability unit IIIe–3; woodland suitability group 4)

Mentor very fine sandy loam, 12 to 18 percent slopes, moderately eroded (MkD2).—This moderately steep soil is in small, irregularly shaped areas on second bottoms. It is close to areas of less strongly sloping Mentor soils and to areas of uneroded Eel and Shoals soils, which occupy first bottoms. The surface layer of this soil is a mixture of original surface soil and subsoil material in about equal amounts. Included are some severely eroded areas; some areas that have a surface layer of silt loam; and a few areas of Shoals soils, chiefly at the base of slopes.

This soil is highly erodible if it is used for cultivated crops. Further erosion is controlled most effectively by maintaining a thick vegetative cover. Some of the most sandy areas are slightly droughty. (Capability unit IVe–1; woodland suitability group 4)

Mentor very fine sandy loam, 18 to 25 percent slopes, moderately eroded (MkE2).—This soil is in narrow, irregularly shaped bands on steep escarpments along second bottoms. It is adjoined by areas of less steep Mentor soils and by areas of Shoals soils on first bottoms. The present surface layer consists partly of material that formerly was subsoil. A few included areas are covered with trees and are only slightly eroded, and a few small ones are severely eroded. Also included are a few areas of Shoals soils, most commonly at the extreme base of escarpments.

If this soil is used for pasture or hay, it needs to be well managed so that overgrazing and erosion are controlled. The soil is well suited to trees. (Capability unit VIe–1; woodland suitability group 4)

Mentor soils, 12 to 18 percent slopes, severely eroded (MhD3).—These soils occupy rather narrow, irregularly shaped bands on moderately steep escarpments along second bottoms. They adjoin areas of less eroded Mentor soils and areas of Shoals and Eel soils on first bottoms. The present surface layer consists mainly of subsoil material and, in most places, is loam. In some areas, however, it is heavy silt loam, and in others it is fine sandy loam. Included in mapped areas are a few small areas that are moderately eroded, and a few small areas of Shoals soil, particularly at the extreme base of escarpments.

These soils should have a permanent cover of vegetation that controls further erosion. They are suitable for pas-

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ture, as woodland, or for wildlife. (Capability unit VIe–1; woodland suitability group 4)

Miami Series

In the Miami series are deep, well-drained soils that have a silty surface layer underlain by a moderately fine textured to fine textured subsoil. These soils developed from highly calcareous, medium-textured glacial till. They occupy gently sloping to very steep uplands in the northwestern fourth of the county.

Typical profile (Miami silt loam in a cultivated field):

0 to 7 inches, dark grayish-brown, slightly acid, friable silt loam.
7 to 11 inches, light yellowish-brown, slightly acid, friable silt loam.
11 to 33 inches, dark-brown, firm clay loam to clay; strongly acid in upper part, neutral in lower part.
33 to 48 inches, light yellowish-brown, firm, limy glacial till.

In texture the subsoil ranges from clay loam and silty clay loam to light clay. The depth to limy glacial till ranges from 18 to 36 inches.

The Miami soils have moderately slow permeability. Except in severely eroded areas, they have moderate available moisture capacity in the root zone, and they are moderately high in productivity. Most crops common in the county are suited to these soils (fig. 6). Needed in cultivated areas are additions of lime and fertilizer, as well as practices that control erosion on slopes.

Miami silt loam, 2 to 6 percent slopes (MIB).—This gently sloping soil is in medium-sized to large areas on the glacial till plain. It adjoins the dark-colored Brookston soil and the grayer Celina and Crosby soils. Its present surface layer consists mainly of original surface soil. In a few places the lower subsoil is stony. Included with this soil are a few nearly level areas and a few areas of Celina, Crosby, and Brookston soils.

This soil is easily managed and is in good tilth. Contour cultivation and grassed waterways are effective in controlling erosion, and terracing is useful in areas where slopes are long and uniform and where outlets are adequate for removing excess water. (Capability unit IIe–1; woodland suitability group 4)

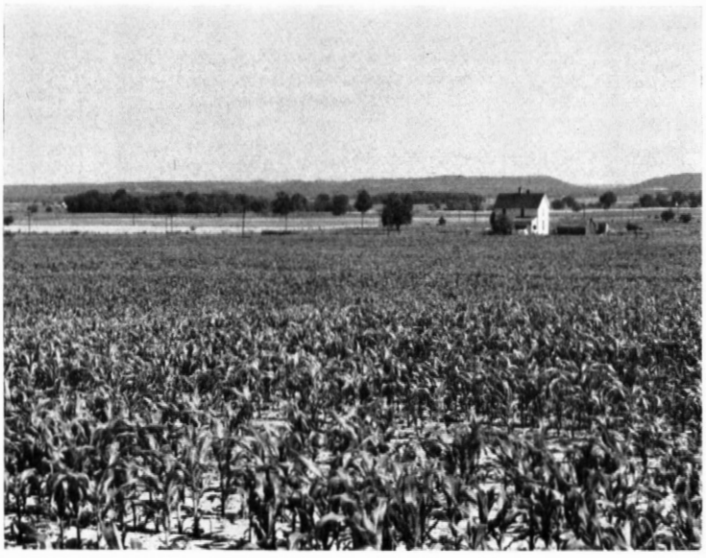

Figure 6.—Corn growing on Miami silt loam.

Miami silt loam, 2 to 6 percent slopes, moderately eroded (MIB2).—The plow layer of this soil is a mixture of original surface soil and subsoil, and it is a little finer textured than that of uneroded Miami silt loams. Consequently, this soil is more likely to get cloddy and, in the preparation of a seedbed, is more difficult to work. Runoff is slow to medium, and erosion is a moderate hazard. (Capability unit IIe–1; woodland suitability group 4)

Miami silt loam, 6 to 12 percent slopes (MIC).—This sloping soil occupies medium-sized areas on the glacial till plain. It adjoins more strongly sloping Miami soils and nearly level or gently sloping Celina soils. It has lost only a little of its original surface layer through erosion. In a few small areas the lower subsoil is stony. Small areas of other Miami soils and of Celina soils are included.

This soil is in good tilth and is fairly easy to manage. In cultivated fields contour stripcropping and grassed waterways are needed for controlling erosion. In addition, diversion terraces are useful if slopes are long and if outlets for disposing of excess water are adequate. (Capability unit IIIe–1; woodland suitability group 4)

Miami silt loam, 6 to 12 percent slopes, moderately eroded (MIC2).—The plow layer of this soil consists about equally of original surface soil and subsoil, and it is a little finer textured than that of uneroded Miami silt loams. For this reason, it is in poorer tilth, is somewhat more difficult to work, and tends to get cloddy. (Capability unit IIIe–1; woodland suitability group 4)

Miami silt loam, 12 to 18 percent slopes (MID).—Although this soil is moderately steep, it shows little evidence steep soil occurs in small, irregularly shaped areas on the glacial till plain and is adjoined by other Miami soils. In a few small areas the lower subsoil is stony. Included with this soil, chiefly adjacent to steeper slopes, are a few areas that have a stony surface layer, indicated by symbol on the soil map. Also included, particularly on the steeper side slopes, are a few areas of a moderately eroded soil that is very shallow to calcareous glacial till.

If this soil is used for crops, it needs to be well managed and protected by suitable practices. Contour stripcropping and improved natural waterways are effective in fields where slopes are long and uniform and where outlets for the disposal of excess water are adequate. (Capability unit IVe–1; woodland suitability group 4)

Miami silt loam, 12 to 18 percent slopes, moderately eroded (MID2).—The plow layer of this soil is about half subsoil material. It is finer textured and more difficult to till than the plow layer of uneroded Miami soils, and it tends to be cloddy. The erosion hazard is very severe. (Capability unit IVe–1; woodland suitability group 4)

Miami silt loam, 18 to 25 percent slopes (MIE).—This steep soil occurs in small, irregularly shaped areas on hillsides and in narrow bands along streams and drainageways. It is adjacent to less steep Miami soils and, on the lower part of hillsides, to the Cana soils. Included are small moderately eroded areas; small stony areas, shown by symbol on the soil map; and, in places where this soil is in narrow bands along streams, a few areas that are shallow to calcareous glacial till.

Although this soil is highly susceptible to erosion, it is well suited to hay or pasture if management is good. (Capability unit VIe–1; woodland suitability group 4)

Miami soils, 2 to 6 percent slopes, severely eroded (MmB3).—These gently sloping soils are in small, irregularly shaped areas on the glacial till plain. Here, they are surrounded by less eroded Miami soils. The plow layer is silty clay loam, clay loam, or loam. It consists mainly of subsoil material, and it tends to get cloddy and is difficult to plow (fig. 7). A few small areas of Celina soil are included, most commonly as narrow strips adjacent to waterways.

These soils are suited to trees, and they can be used for crops or pasture if they are well managed and are protected from erosion. (Capability unit IIIe–1; woodland suitability group 4)

Miami soils, 6 to 12 percent slopes, severely eroded (MmC3).—These sloping soils occur in somewhat irregularly shaped areas of small to medium size that are adjacent to streams and waterways on the glacial till plain. Their plow layer is silty clay loam, clay loam, or loam and consists mostly of subsoil material; it is difficult to plow and tends to be cloddy. Adjoining these soils are less eroded Miami soils. A few included areas on the stronger side slopes are occupied by a moderately eroded soil that is very shallow to calcareous glacial till.

Pasture, woodland, or wildlife is a suitable use for these soils, but practices are needed that control erosion. Cultivation should be limited to those times when grass is reseeded. (Capability unit IVe–2; woodland suitability group 4)

Miami soils, 12 to 18 percent slopes, severely eroded (MmD3).—These moderately steep soils are in small, irregularly shaped areas on hillsides and in narrow bands along drainageways on the glacial till plain. They adjoin areas of less eroded Miami soils. Their surface layer of silty clay loam, loam, or clay loam is mostly subsoil material and is cloddy and difficult to plow. Included with these severely eroded soils, in the steeper areas and on the faces of short escarpments, are a few small areas of a moderately eroded soil that is very shallow to calcareous glacial till.

These soils can be used for pasture or hay if the plant cover is dense and well managed. The soils are well suited to use as woodland or for wildlife. (Capability unit VIe–1; woodland suitability group 4)

Miami soils, 18 to 25 percent slopes, severely eroded (MmE3).—These steep soils occur in small, irregularly shaped areas on hillsides and in narrow bands on escarpments. Here, they are surrounded by less eroded Miami soils. They have a clay loam or silty clay loam surface layer consisting mostly of material that formerly was subsoil. This layer is cloddy and hard to plow. In a few areas the soils are stony in the surface layer or just beneath it.

A few tracts of moderately eroded Cana soils are included in areas underlain by black shale. Also included, chiefly on slightly eroded escarpments, are a few small tracts of a soil that is very shallow to calcareous glacial till.

By maintaining a thick cover of plants on these soils, further erosion can be controlled. Woodland and wildlife are among the suitable uses, and pasture or hay can be grown if management is intensive. (Capability unit VIe–1; woodland suitability group 4)

Miami soils, 25 to 40 percent slopes (MmF).—These very steep soils are on the glacial till plain. They occur in medium-sized, somewhat irregularly shaped areas on hillsides and in narrow bands on the side slopes along streams and on escarpments. These areas adjoin areas of less strongly sloping Miami soils. The surface layer is silt loam or loam, and generally it consists mainly of original surface soil, but in some places it has been thinned by erosion. In a few areas, indicated by symbol on the soil map, the surface layer is stony. A few tracts of Cana soils are included, commonly in areas where Cana soils occur with Miami soils in the north- and west-central parts of the county.

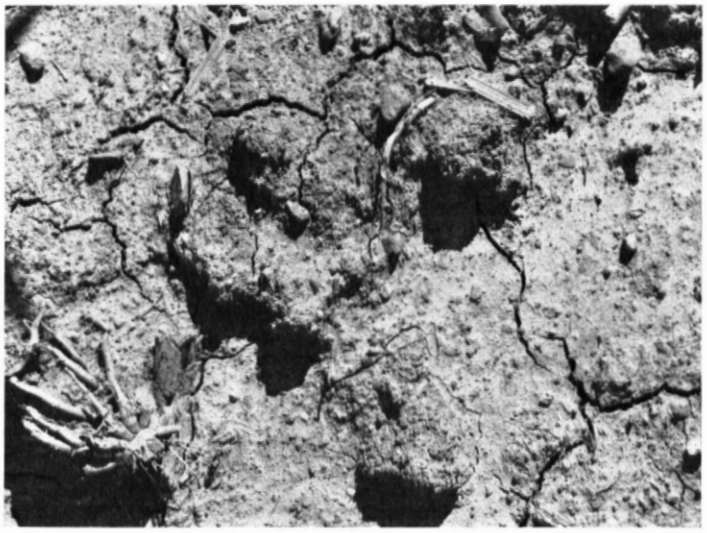

Figure 7.—**Puddling and cracking on the surface of Miami soils, 2 to 6 percent slopes, severely eroded.**

These soils are highly erodible if cultivated. They can be used for pasture but require a thick vegetative cover that controls erosion. They are well suited to trees. (Capability unit VIIe–1; woodland suitability group 4)

Millsdale Series

Soils of the Millsdale series are dark colored, moderately deep, and very poorly drained. They are moderately fine textured in the surface layer, have a moderately fine textured or fine textured subsoil, and are underlain by limestone bedrock. Millsdale soils occur in nearly level and depressional areas on uplands and terraces in the northwestern part of the county.

Typical profile (Millsdale silty clay loam in a cultivated field):

0 to 9 inches, black, neutral, friable silty clay loam.
9 to 17 inches, very dark gray, neutral, firm silty clay loam.
17 to 32 inches, dark-gray, neutral, firm silty clay or silty clay loam mottled with light yellowish brown and olive.
32 inches +, limestone bedrock.

The total thickness of the black surface layer and the very dark gray upper subsoil ranges from 10 to 18 inches. The subsoil is fine silty clay loam or silty clay. These soils are neutral to medium acid in the surface layer and are neutral or slightly acid below it. The depth to limestone bedrock ranges from 20 to 40 inches.

The Millsdale soils are moderately slowly permeable, have moderate available moisture capacity, and are productive if adequately drained. Their content of organic

grayer Tyler soils. It shows little erosion but, in a few used for crops, though tiling may be impractical because the underlying bedrock is too near the surface. Lime and fertilizer should be applied in adequate amounts. Under good management, favorable yields can be obtained from most of the common crops.

Millsdale silty clay loam (Mn).—This nearly level, dark-colored soil lies in small depressions, in fan-shaped areas at the heads of drainageways, and in narrow strips along waterways. It is surrounded by browner, better drained Milton and Celina soils and by gray Crosby soils. Covering the surface of small areas are 6 to 12 inches of silty material that washed from the adjoining soils. A few areas of Crosby soil are included, particularly near the edges of areas mapped as this Millsdale soil. Also included are a few small areas in which the underlying limestone bedrock is less than 20 inches beneath the surface.

Excess water and shallowness to bedrock are the principal problems in the management of this soil. In most places tiling is not feasible for removing excess water, but shallow ditches with adequate outlets are suitable. (Capability unit IIw–3; woodland suitability group 1)

Milton Series

The Milton series consists of moderately deep, well-drained soils that have a medium-textured surface layer and a moderately fine textured and fine textured subsoil underlain by limestone bedrock. These soils occupy gently sloping to steep uplands in the northwestern part of the county.

Typical profile (Milton silt loam in a cultivated field):

0 to 8 inches, brown, neutral, friable silt loam.
8 to 24 inches, yellowish-brown, strongly acid, firm clay loam.
24 to 34 inches, dark-brown, slightly acid to calcareous, very firm clay.
34 inches +, limestone bedrock.

The subsoil is clay loam, silty clay loam, and clay in various parts. In color the subsoil ranges from brown and dark brown to reddish brown. These soils are neutral to medium acid in the surface layer, medium acid to very strongly acid in the upper subsoil, and neutral or calcareous in the lower subsoil. The depth to limestone ranges from 20 to 40 inches.

The Milton soils have moderately slow permeability, are medium in productivity, and have low to moderate available moisture capacity. Most of the common crops can be grown on these soils, but sufficient lime and fertilizer are needed, as well as practices that control erosion on slopes.

Milton silt loam, 2 to 6 percent slopes (MoB).—This gently sloping soil is in small, uniform areas on the glacial till plain. In these areas it adjoins areas of Celina and Miami soils and of more sloping Milton soils. Its surface layer shows little erosion. Included in mapped areas are a few moderately eroded areas in which the surface layer is about half subsoil material. Also included are a few small areas of Miami soils, which developed from limy glacial till and are underlain by limestone bedrock at a much greater depth than the Milton soils.

This soil is suitable for cropping and produces favorable yields if it is well managed. Contour cultivation and grassed waterways are needed for erosion control. (Capability unit IIIe–2; woodland suitability group 4)

Milton silt loam, 6 to 12 percent slopes, moderately eroded (MoC2).—This sloping soil lies on the glacial till plain, where it occupies small, somewhat irregularly shaped areas. It is next to other Milton soils and to Miami soil. The surface layer is about half material that formerly was subsoil. Included in areas mapped as this soil are a few severely eroded areas in which the surface layer consists entirely of subsoil material. Also included are a few small areas of Miami soil.

This soil is fairly well suited to crops that are grown in rotation. Under good management, it produces medium yields of most crops, but stripcropping and grassed waterways are needed for erosion control. (Capability unit IVe–1; woodland suitability group 4)

Milton silt loam, 18 to 25 percent slopes, moderately eroded (MoE2).—This soil occupies narrow bands on side slopes along streams and drainageways on the glacial till plain. It adjoins Miami soils and other Milton soils. Its surface layer is a little finer textured than that of uneroded Milton silt loams, for it contains some of the yellowish-brown subsoil. A few included areas are severely eroded, and a few are only slightly eroded. Also included are areas having slopes of slightly less than 18 percent, and a few small areas of Ritchey soils, particularly on the steeper side slopes.

This soil is better suited to pasture or trees than to other crops. Erosion is likely to be very severe if the soil is cultivated. (Capability unit VIe–1; woodland suitability group 4)

Monongahela Series

In the Monongahela series are deep, nearly level to sloping, moderately well drained soils that have a silty surface layer underlain by a moderately fine textured, very firm, dense subsoil. These soils occur on high terraces in upland valleys in the southern part of the county.

Typical profile (Monongahela silt loam in a cultivated field):

0 to 7 inches, dark-brown, very strongly acid, friable silt loam.
7 to 24 inches, yellowish-brown, very strongly acid, friable to firm silty clay loam mottled with pale brown.
24 to 49 inches, mottled pale-brown, light brownish-gray, and yellowish-brown, very strongly acid, very firm, brittle silty clay loam.
49 to 90 inches +, mottled yellowish-brown and pale-brown, very firm, compact silty clay loam or clay loam.

The depth to very firm, brittle silty clay loam ranges from 18 to 30 inches. The profile is very strongly acid or extremely acid throughout.

Monongahela soils are slowly permeable. In areas that are not severely eroded, they are medium in productivity and have moderate available moisture capacity in the root zone. Provided that measures are used for controlling erosion and lime and fertilizer are applied in sufficient amounts, adequate yields can be obtained from all crops suited to the county. In some of the more mildly sloping areas, diversion terraces are needed to divert runoff from adjacent hillsides.

Monongahela silt loam, 0 to 2 percent slopes (MpA).—This nearly level soil is in small areas on terraces. It is adjacent to more sloping Monongahela soils and to wetter,

grayer Tyler soils. It shows little erosion but, in a few areas, is covered by silty overwash 6 to 12 inches thick. A few areas of Tyler soil were included in mapping, mainly as narrow strips along waterways.

This soil is suited to cultivated crops. Excess water from adjacent hillsides is the principal hazard, which can be removed by constructing diversion terraces that have suitable outlets. (Capability unit IIw–4; woodland suitability group 4)

Monongahela silt loam, 2 to 6 percent slopes (MpB).—This gently sloping soil generally lies in medium-sized areas on terraces, but it also occurs on ridgetops where it is underlain by bedrock at a depth of 4 to 5 feet. It adjoins more strongly sloping Monongahela soils, the channery Philo soils, and the wetter, grayer Tyler silt loam. Little of the surface layer has been lost through erosion, but a few areas adjacent to waterways are covered with 6 to 12 inches of silty material that washed from the Coolville, Fawcett, and Rarden soils.

Included with this soil are a few areas of Tyler silt loam. Some of these areas are narrow and lie along waterways; others, small and fan shaped, are at the heads of drainageways.

This Monongahela soil is suited to crops and generally produces favorable yields if it is well managed and is kept from eroding by use of contour farming and other suitable practices. The hazard of erosion is slight. (Capability unit IIe–2; woodland suitability group 4)

Monongahela silt loam, 6 to 12 percent slopes, moderately eroded (MpC2).—This soil is in small, irregularly shaped bands along streams and waterways, and it lies on ridgetops in basinlike areas at the heads of stream branches. It is next to more mildly sloping Monongahela soils and to Stendal and Philo soils. The present surface layer consists of original surface soil and subsoil material in about equal amounts. Areas on ridgetops are underlain by bedrock at a depth of 4 or 5 feet. A few small areas of uneroded Philo soils are included, particularly as narrow strips along waterways.

This soil is suitable for cultivation if it is well managed and is farmed in a long rotation. Grassed waterways and other practices are needed to control erosion. Diversion terraces can be used to check soil losses in fields where the slope is sufficiently long and where adequate outlets are available for disposing of excess water. (Capability unit IIIe–4; woodland suitability group 4)

Muskingum Series

Soils of the Muskingum series are sloping to very steep, moderately deep, light colored, and well drained. These soils have a medium-textured surface layer and subsoil and are underlain by sandstone bedrock. They generally occupy rocky hillsides in the eastern and southeastern parts of the county.

Typical profile (Muskingum very stony silt loam in a wooded area):

0 to 15 inches, light-olive to strong-brown, very strongly acid, friable very stony silt loam.
15 to 32 inches, strong-brown, very strongly acid, slightly firm very stony silt loam.
32 inches +, sandstone bedrock.

The content of stones in the surface layer ranges from almost none to about 50 percent. The depth to bedrock ranges from 20 to 48 inches. Muskingum soils are very strongly acid or extremely acid.

In these soils the productivity is low, permeability is moderately rapid, and the available moisture capacity is low. The soils are poorly suited to cultivated crops but are suited to permanent pasture or trees. Needed in areas used for pasture are weed control, avoidance of overgrazing, and additions of lime and fertilizer. Wooded areas should be protected from grazing.

Muskingum very stony silt loam, 6 to 18 percent slopes (MrD).—This soil occurs in long, narrow, irregularly shaped areas along the rim at the top of very steep slopes. These areas lie next to areas of normally gently sloping Monongahela, Rarden, and Cruze soils on one side and areas of steep and very steep Muskingum, Berks, and Neotoma soils on the other. Little erosion is evident. Included in areas mapped as this soil are a few areas of Berks soils.

This soil is well suited to trees and generally is wooded. Most areas are too stony for cultivation. (Capability unit VIIs–1; woodland suitability group 7)

Muskingum and Latham stony silt loams, 12 to 25 percent slopes (MsE).—In this undifferentiated group, the Muskingum soil lies in narrow bands on the uppermost part of hillsides and is underlain by sandstone. The Latham soil is on the lower side slopes and is underlain by shale. Although the Muskingum soil generally is the more stony of the two, both soils are covered by loose fragments that range from channery size to stones and cover 15 to 30 percent of the surface. Practically all the acreage is wooded and shows little erosion.

Included in areas mapped as these soils are a few areas of Berks and Neotoma soils. The Berks soil is in the most stony areas, and the Neotoma soil occupies the steeper parts of northeast-facing slopes. (Capability unit VIs–1; woodland suitability group 7)

Muskingum and Latham very stony silt loams, 25 to 70 percent slopes (MtG).—These soils occupy long, narrow bands on very steep hillsides in the south-central and southwestern parts of the county. In most places they are not eroded. Adjoining them are less strongly sloping Muskingum and Latham soils and steep or very steep Muskingum, Berks, and Neotoma stony silt loams. A few areas of Berks and Neotoma soils are included, the Berks soil generally on the upper slopes and the Neotoma soil in coves and on northeast-facing slopes.

These soils are well suited to trees and generally are wooded. In many areas the stands are clear cut for pulpwood. These areas then revert to woodland. (Capability unit VIIs–1; woodland suitability group 7)

Muskingum, Berks, and Neotoma very stony silt loams, 18 to 25 percent slopes (MuE).—These soils are in rather large areas on steep hillsides. They lie next to less strongly sloping Muskingum very stony silt loam and to steeper Muskingum, Berks, and Neotoma stony silt loams. Their surface layer, which consists mostly of original surface soil, contains many channery fragments and stones. The Neotoma soil is in coves and on northeast-facing slopes, but it does not occur in all the areas of this undifferentiated group that were mapped.

Included with these soils are a few areas that have a surface layer of coarse silt loam or loam and a few areas of Latham soil, generally at the base of slopes. Most inclu-

sions of Latham soil are in the western, south-central, and southwestern parts of the county.

These soils are well suited to trees and, in most places, are wooded. (Capability unit VIIs–1; woodland suitability group 7)

Muskingum, Berks, and Neotoma very stony silt loams, 25 to 70 percent slopes (MuG).—These soils are in large areas on very steep hillsides. The Neotoma soil is in coves and on north-facing slopes. The soils of this group occur in southeastern Ross County—an area that is shaped roughly like a triangle that is formed by the eastern and southern boundaries of the county and an imaginary line between Adelphi and Nipgen. In the eastern part of the triangle they adjoin the Dekalb soils and other Muskingum soils, and in the western part, the Colyer and Latham soils.

Small included areas have a coarse silt loam to loam surface layer. Also included are a few areas of Dekalb, Colyer, and Latham soils. The Dekalb soils are generally on the upper slopes, and the Colyer and Latham soils are on the lower ones.

The soils in this group are well suited to trees. Nearly all the acreage is wooded (fig. 8), and a large part of it is in State-owned forest. Slopes are so steep that trees are difficult to harvest with modern equipment. For this reason, the trees are commonly cut with a chain saw and the logs are snaked out with horses or mules. (Capability unit VIIs–1; woodland suitability group 7)

Negley Series

The Negley series consists of sloping to very steep, well-drained soils that have a medium-textured surface layer and a moderately fine textured subsoil underlain by stratified, gravelly and sandy glacial outwash. These soils are on terraces in the southeastern and extreme southwestern parts of the county.

Figure 8.—**In the background are Muskingum, Berks, and Neotoma very stony silt loams, 25 to 70 percent slopes, that are covered with second-growth timber. Small grain in foreground is growing on Pope silt loam.**

Typical profile (Negley loam in a cultivated field):

0 to 12 inches, dark-brown to brown, slightly acid, friable loam.
12 to 53 inches, strong-brown, strongly acid, firm sandy clay loam.
53 to 76 inches, dark-brown, friable sandy loam; strongly acid in upper part ranging to slightly acid in lower part.
76 to 86 inches, loose, limy gravel and sand.

The subsoil ranges from sandy clay loam to clay loam. The depth to loose, limy gravel and sand ranges from 6 to 8 feet.

These soils have moderately rapid permeability and moderate available moisture capacity, and they tend to be droughty in dry periods. Except in areas that are severely eroded, productivity is moderately low. Many of the common crops are suited to these soils, and medium yields can be obtained if erosion is controlled and if lime and fertilizer are used in sufficient amounts. Steep or severely eroded Negley soils are suited to trees or permanent pasture.

Negley soils, 6 to 12 percent slopes, moderately eroded (NeC2).—These soils are in small, irregularly shaped, hummocky areas on ridgetops on terraces. Their surface layer ranges from loam to sandy loam and is a mixture of original surface soil and some of the strong-brown subsoil. These soils adjoin more strongly sloping Negley soils and less sloping Parke and Rainsboro soils. A few areas of slightly eroded Parke silt loam are included.

Although these soils are droughty and are moderately susceptible to erosion, they are suited to pasture and to crops grown in rotation. To control soil losses, a dense cover of plants is needed most of the time. (Capability unit IIIe–2; woodland suitability group 5)

Negley and Fox soils, 12 to 18 percent slopes, moderately eroded (NfD2).—These moderately steep soils are in small, irregularly shaped areas on hillsides along stream terraces. Their surface layer consists of original surface soil mixed with part of the subsoil. Some included areas are only slightly eroded.

Both of these soils are well suited to pasture, but they are droughty for row crops. Because the erosion hazard is moderately severe, a dense vegetative cover and grassed waterways are needed for controlling soil losses. (Capability unit IVe–1; woodland suitability group 5)

Negley and Fox soils, 12 to 18 percent slopes, severely eroded (NfD3).—In places these soils are marked by many shallow gullies, and in local areas there are deep ones. In areas that are deeply gullied, the original soils have been destroyed except for small tracts between the gullies. A few areas of moderately eroded Parke soils are included, generally on the milder slopes.

In most places the soils of this mapping unit are used for pasture or are lying idle as they revert to woodland. Areas still cultivated are in poor tilth and generally produce low yields of crops. Ordinarily, the trees in wooded areas are of poor quality. (Capability unit VIe–1; woodland suitability group 5)

Negley and Fox soils, 18 to 25 percent slopes, moderately eroded (NfE2).—In most places the surface layer of these soils is loam, but in some areas, generally of Negley soil, it is silt loam. About half of this layer is material that was brought up from the subsoil during tillage.

Slopes generally are short and irregular and are dissected by many waterways.

Included with these soils are a few gravelly areas, indicated by symbol on the soil map. Included, too, are a few areas of Warsaw soils, most commonly on the milder slopes.

Most of the acreage is in long-term pasture. (Capability unit VIe–1; woodland suitability group 5)

Negley and Fox soils, 18 to 25 percent slopes, severely eroded (NfE3).—The surface layer of these soils generally is clay loam, but in some places it is sandy clay loam or silty clay loam. Locally, the soils are gullied. Included in mapped areas are a few areas of gravelly soils, indicated by symbol on the soil map, and a few areas of Parke soils.

Most areas of these soils have been cleared and cultivated, but most of these are lying idle as they revert to woodland. (Capability unit VIIe–1; woodland suitability group 5)

Negley, Fox and Lorenzo soils, 25 to 40 percent slopes (NlF).—These very steep soils generally occupy short, irregular slopes adjacent to streams and waterways (fig. 9). Lorenzo soils are generally on north-facing slopes. The soils in this group have a surface layer that consists partly of subsoil material and, in most places, is loam. Some included areas are severely eroded, and small areas of Casco soils are included, mainly on the steeper slopes.

Erosion is a severe hazard. Most of the acreage is in pasture, brush, or trees. (Capability unit VIIe–1; woodland suitability group 5)

Neotoma Series

Soils of the Neotoma series are steep or very steep, dark colored, and well drained. They are medium textured in the surface layer and subsoil, and they overlie sandstone bedrock. These soils occur in coves and on northeast-facing rocky hillsides in the eastern and southeastern parts of the county.

Typical profile (Neotoma very stony silt loam in a wooded area):

0 to 6 inches, very dark grayish-brown, slightly acid, friable very stony silt loam.
6 to 15 inches, dark-brown to yellowish-brown, medium acid, friable channery silt loam.

Figure 9.—In left center are Negley, Fox and Lorenzo soils, 25 to 40 percent slopes. Other soils making up this landscape are sloping Parke soils (center); Taggart silt loam, 0 to 2 percent slopes (right center); and Cana silt loam, 18 to 25 percent slopes (foreground).

15 to 40 inches, yellowish-brown, strongly acid, friable very channery loam.
40 to 50 inches, yellowish-brown very flaggy loam.
50 inches +, sandstone bedrock; acid.

The dark-colored surface layer ranges from 6 to 10 inches in thickness. This layer is nearly free of stones in some places, but it ranges to more than 50 percent in stone content. The depth to bedrock is 30 to 60 inches. Neotoma soils are slightly acid to strongly acid in the surface layer and are medium acid to very strongly acid in the subsoil.

These soils are moderately low in productivity for cultivated crops, and they have low to moderate available moisture capacity. Their permeability is moderately rapid, and their root zone is moderately thick or thick. They are suited to trees and are good soils for tulip-poplar, but wooded areas need protection from grazing. Permanent pasture can be grown in cleared areas that are limed, fertilized, protected from overgrazing, and kept reasonably free of weeds. Under good management, pasture and hay produce medium yields.

In Ross County the Neotoma soils occur closely with the Dekalb, Muskingum, and Berks soils and were mapped only in undifferentiated groups with those soils. The groups are described under the headings "Dekalb Series" and "Muskingum Series."

Ockley Series

The Ockley series consists of deep, nearly level and gently sloping, well-drained soils that have a silty surface layer and a moderately fine textured subsoil underlain by calcareous gravel-and-sand outwash. These soils are on second bottoms and terraces along the major streams.

Typical profile (Ockley silt loam in a cultivated field):

0 to 8 inches, brown, slightly acid, friable silt loam.
8 to 17 inches, strong-brown or dark-brown, medium acid, friable silt loam or loam.
17 to 42 inches, dark-brown, medium acid, firm sandy clay loam.
42 to 48 inches, strong-brown, neutral sandy loam.
48 inches +, loose, stratified, limy gravel and sand.

In texture the subsoil ranges from sandy clay loam and clay loam to loam. The depth to limy gravel and sand ranges from 42 to 60 inches.

Ockley soils are moderately permeable, have moderate to high available moisture capacity, and are highly productive. If they are adequately limed and fertilized and are protected from erosion, they produce favorable yields of most crops suited to the county.

Ockley silt loam, 0 to 2 percent slopes (OcA).—This nearly level soil is on second bottoms and has a plow layer that consists mostly of the original surface layer. It adjoins Ockley silt loam, 2 to 6 percent slopes, and the wetter, grayer Thackery and Sleeth soils. Some areas, most of which are near the base of stronger slopes, are covered by 6 to 12 inches of silty overwash.

Included with this soil are a few scattered areas that have a loam surface layer. Also included, chiefly as narrow strips adjacent to waterways, are a few areas of Sleeth soil.

Ockley silt loam, 0 to 2 percent slopes, is excellent for crops. In some places diversion ditches are needed to divert runoff from adjacent hillsides. (Capability unit I–1; woodland suitability group 4)

Ockley silt loam, 2 to 6 percent slopes (OcB).—This soil occupies medium-sized, irregularly shaped areas adjacent to waterways and small streams on second bottoms. It lies next to nearly level Ockley silt loam and to Fox, Thackery, and Sleeth soils. Little erosion is evident. A few areas, which are mainly adjacent to steeper hillsides, are covered with light-colored silty overwash 6 to 12 inches thick. A few areas of Sleeth soils are included.

This soil is well suited to crops, though it is slightly susceptible to erosion. Soil losses can be controlled by cultivating on the contour and establishing grass in the waterways. (Capability unit IIe–1; woodland suitability group 4)

Parke Series

The Parke series consists of gently sloping to steep, well-drained soils that have a silty surface layer and a moderately fine textured subsoil. These soils lie mainly on terraces in the southeastern and extreme southwestern parts of the county.

Typical profile (Parke silt loam in a cultivated field):

0 to 10 inches, dark-brown, slightly acid to strongly acid, friable silt loam.
10 to 21 inches, brown, very strongly acid, friable silty clay loam.
21 to 30 inches, dark yellowish-brown, very strongly acid, firm loam.
30 to 68 inches +, strong-brown, firm clay loam to sandy clay; very strongly acid in upper part, ranging to medium acid in lower part.

The combined thickness of the upper two layers ranges from 20 to 40 inches. The upper subsoil is silty clay loam or heavy silt loam, and the lower subsoil is heavy loam, sandy clay loam, clay loam, or sandy clay. Parke soils are slightly acid to strongly acid in the surface layer and are strongly acid or very strongly acid in the subsoil.

These soils are moderately permeable and have a thick root zone. In areas that are not severely eroded, they have moderate to high available moisture capacity and are medium in productivity. Needed in cultivated fields are additions of lime and fertilizer, as well as practices for controlling erosion. If the soils are well managed, they produce satisfactory yields of most crops common in the county.

Parke silt loam, 2 to 6 percent slopes (PaB).—This gently sloping soil, which shows little erosion, is in small areas on terraces. It adjoins areas of the Rainsboro soils, other Parke soils, and the wetter Taggart soils. Some included areas are moderately eroded, and there are a few inclusions of Taggart soils.

This soil is well suited to crops. Erosion is a hazard but can be controlled by use of contour cultivation and grassed waterways. (Capability unit IIe–1; woodland suitability group 4)

Parke silt loam, 6 to 12 percent slopes, moderately eroded (PaC2).—This sloping soil lies in small, irregularly shaped areas on terraces adjacent to streams. It is surrounded by Rainsboro soils, other Parke soils, and nearly level Taggart soils. A few areas of Taggart soils

are included, particularly in narrow strips along waterways and in small depressions at the heads of drains. Also included are small uneroded areas.

This soil is well suited to crops if it is adequately managed and is protected from erosion by contour stripcropping and grassed waterways. (Capability unit IIIe–3; woodland suitability group 4)

Parke silt loam, 12 to 18 percent slopes, moderately eroded (PaD2).—This moderately steep soil occurs in irregularly shaped areas on hillsides and in fairly narrow bands and terraces adjacent to small streams and branches. It lies next to other Parke soils and to Negley soils. Included are small areas that are wooded and uneroded. Also included, most commonly on the steeper slopes, are a few areas of Negley soils.

This soil is well suited to pasture and to crops grown in a rotation that includes a row crop only 1 year in 6. Erosion can be controlled by improving the natural waterways and keeping the soil in dense sod most of the time. (Capability unit IVe–1; woodland suitability group 4)

Parke silt loam, 18 to 25 percent slopes (PaE).—This steep soil occupies narrow bands on escarpments and along streams. Included with it are small moderately eroded areas and, on the steeper slopes, a few areas of Negley soils.

This soil is well suited to pasture or trees, but it is likely to erode unless protected by a cover of plants. (Capability unit VIe–1; woodland suitability group 4)

Parke soils, 6 to 12 percent slopes, severely eroded (PeC3).—These sloping soils are in small, irregularly shaped areas on stream terraces adjacent to small streams and branches. They adjoin less eroded Parke and Rainsboro soils. Their surface layer consists entirely of subsoil material and generally is heavy silt loam. A few areas of less eroded Parke soils are included, chiefly on the milder slopes.

These severely eroded soils are only moderately well suited to pasture but are well suited to trees and to plants grown for wildlife. White pine is the best tree to plant, and sericea lespedeza and autumn olive are good plants for wildlife food. (Capability unit IVe–2; woodland suitability group 4)

Parke soils, 12 to 18 percent slopes, severely eroded (PeD3).—These soils are more susceptible to erosion than Parke soils, 6 to 12 percent slopes, severely eroded. They are well suited to pasture or trees. (Capability unit VIe–1; woodland suitability group 4)

Parke soils, 18 to 25 percent slopes, severely eroded (PeE3).—These soils occupy long, narrow bands on escarpments along stream terraces, where they are surrounded by less eroded Parke and Negley soils. They have a surface layer of coarse silty clay loam that consists mostly of material from the brown, strongly acid subsoil. Included in mapped areas are a few areas of less eroded Parke soils and, at the base of escarpments, small areas of Sleeth and Westland soils.

These Parke soils are suited to use as woodland and for wildlife. White pine is suitable for planting, and sericea lespedeza provides good food for wildlife. (Capability unit VIe–1; woodland suitability group 4)

Parke-Negley complex, 6 to 12 percent slopes, moderately eroded (PgC2).—These sloping soils occur in small, irregularly shaped areas on ridgetops and toe slopes. The Parke soil has a silt loam surface layer and is generally in the more mildly sloping areas, whereas the Negley soil has a loam surface layer and occupies the stronger slopes. The surface layer of both soils is about half subsoil material. These soils adjoin areas of steeper Parke and Negley soils. Included are a few small areas of Warsaw soils, which are intermingled with areas of Negley soils.

The soils of this complex are well suited to pasture, but management is needed that prevents overgrazing and maintains a thick sod. Although erosion is a severe hazard, cultivated crops generally can be grown. (Capability unit IIIe–3; woodland suitability group 4)

Pekin Series

In the Pekin series are deep, nearly level to steep, moderately well drained soils that have a silty surface layer and a moderately fine textured subsoil. These soils lie on terraces in medium-sized valleys in the northwestern part of the county.

Typical profile (Pekin silt loam in a cultivated field):

0 to 7 inches, dark grayish-brown, medium acid, friable silt loam.
7 to 24 inches, yellowish-brown and pale-brown, strongly acid, friable to firm silt loam.
24 to 60 inches, dark yellowish-brown, very strongly acid, very firm silty clay loam mottled with light brownish gray.
60 to 78 inches, mottled yellowish-brown and pale-brown, strongly acid, friable silt loam.
78 inches +, yellowish-brown and pale-brown, medium acid silt loam.

In texture the subsoil ranges from heavy silt loam to silty clay loam. The depth to very firm silty clay loam ranges from 15 to 36 inches. These soils are neutral to medium acid in the surface layer and are strongly acid or very strongly acid in the subsoil. Soils mapped as Pekin silt loam, over clay, have a fine-textured substratum at a depth of 30 to 50 inches.

The Pekin soils are moderately slowly permeable, have high available moisture capacity, and are medium in productivity. Most crops common in the county are suited to these soils. Needed in cultivated areas are additions of lime and fertilizer, as well as practices that control erosion on slopes. In some places diversion ditches are needed to control runoff from adjacent hillsides, and some of the more nearly level areas have a few wet spots that should be drained.

Pekin fine sandy loam, 2 to 6 percent slopes (PhB).—This gently sloping soil is in small, narrow, irregularly shaped bands adjoining small streams and drainageways. It lies next to the browner, better drained Mentor soils and to the wetter, grayer Bartle soils. The plow layer of this soil consists mostly of original surface soil. A few areas of Mentor very fine sandy loam are included, most commonly on the stronger slopes.

This soil is somewhat droughty for cultivated crops. Erosion, a slight hazard, can be controlled by cultivating on the contour and sodding the waterways. (Capability unit IIe–2; woodland suitability group 4)

Pekin silt loam, 0 to 2 percent slopes (PkA).—This soil occurs in small, irregularly shaped areas and on slight humps on second bottoms. It is next to the wetter, grayer Bartle soils and the browner, better drained Mentor soils. It has a plow layer made up mostly of original surface soil. A few areas of Bartle soils are included, chiefly as small wet spots and as narrow strips along waterways.

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This soil is well suited to cultivated crops. The principal limitations are excess water in the soil and floodwater from adjacent hillsides. Tile lines can be used to drain the few wet spots that are included. Diversion ditches having adequate outlets may be needed for diverting runoff from nearby slopes. (Capability unit IIw–4; woodland suitability group 4)

Pekin silt loam, 2 to 6 percent slopes (PkB).—This gently sloping soil is in irregularly shaped areas adjacent to streams and waterways on second bottoms. It lies next to more strongly sloping Pekin and Mentor soils and to the grayer Bartle soils. The plow layer is made up principally of the original surface layer. Included are a few small areas of Bartle soils; these occur at the heads of drainageways and in narrow strips along waterways.

This soil is well suited to cultivated crops, but it is slightly erodible and needs to be protected by such practices as contour cultivation and grassed waterways. (Capability unit IIe–2; woodland suitability group 4)

Pekin silt loam, 6 to 12 percent slopes, moderately eroded (PkC2).—This soil occupies small, narrow, elongated areas along streams on second bottoms. It adjoins more sloping Mentor soils and less sloping Bartle soils. The present surface layer is a mixture of the original surface layer and the strongly acid, yellowish-brown upper subsoil. A few included areas are only slightly eroded; most of these are wooded. Also included, particularly on the stronger slopes, are a few areas of Mentor soils.

The hazard of erosion is moderate on this soil. Diversion terraces that have adequate outlets are effective in controlling soil losses. (Capability unit IIIe–4; woodland suitability group 4)

Pekin silt loam, 12 to 18 percent slopes, moderately eroded (PkD2).—This soil occurs in small, narrow, irregularly shaped bands adjacent to streams and waterways and on escarpments. It adjoins the Mentor soils and is next to the Pope and Philo soils, which are on nearby first bottoms. Its plow layer contains material brought up from the strongly acid, yellowish-brown subsoil. Included in areas mapped as this soil are a few severely eroded areas and a few small areas of moderately eroded Mentor soils.

This soil is well suited to pasture but can be safely cultivated occasionally. Needed to control erosion is a dense sod that is well managed. (Capability unit IVe–3; woodland suitability group 4)

Pekin soils, 6 to 12 percent slopes, severely eroded (PmC3).—These sloping soils lie in small, irregularly shaped areas on terraces. They are next to sloping, less eroded Pekin soils and to more strongly sloping Mentor soils. Their plow layer consists mainly of subsoil material and ranges from heavy silt loam to silty clay loam. In places there are a few deep gullies, some of which have been cut into the very strongly acid lower subsoil. A few areas of less eroded Pekin soils are included, most commonly on the milder slopes.

These severely eroded soils are fairly well suited to pasture and can be safely cultivated only when necessary for reseeding grass. Grazing should be carefully controlled so that a thick sod is maintained. (Capability unit IVe–4; woodland suitability group 4)

Pekin silt loam, over clay, 2 to 6 percent slopes (PlB).—This gently sloping soil is in small areas on terraces. Adjoining it are the wetter, grayer Bartle soils. Little erosion is evident. A few included areas are nearly level, and a few small areas of Bartle soils are included as narrow bands along waterways and in small depressions at the heads of drainageways.

This soil is suitable for cropping, but contour cultivation and grassed waterways are needed for controlling erosion. (Capability unit IIe–2; woodland suitability group 4)

Pekin silt loam, over clay, 6 to 12 percent slopes, moderately eroded (PlC2).—This sloping soil is on stream terraces, where it lies next to other Pekin silt loams, over clay, and to the wetter, grayer Bartle soils. Its plow layer is a mixture of the original surface layer and part of the yellowish-brown subsoil. Included in mapped areas are a few severely eroded and gullied areas in which some of the gullies have been cut into the underlying clay. Also included, mainly as narrow strips along waterways, are a few areas of Bartle soils, which are covered by 6 to 12 inches of silty overwash.

This soil is suited to crops that are grown in a rotation. Contour stripcropping and other practices are needed to control erosion. (Capability unit IIIe–4; woodland suitability group 4)

Pekin silt loam, over clay, 12 to 18 percent slopes, moderately eroded (PlD2).—This moderately steep soil occurs on hillsides and in small, elongated bands on escarpments. It adjoins less strongly sloping Pekin silt loams, over clay, and steeper Latham soils. Its plow layer consists about equally of original surface soil and subsoil. Included in areas mapped as this soil are a few severely eroded areas that are deeply gullied in places. Also included, most commonly as narrow strips adjacent to waterways, are a few scattered areas of Bartle soils.

This soil is suited to pasture and to crops that are grown in a long rotation in which a row crop is included only about 1 year out of 6. Erosion is a severe hazard, and intensive management is required for controlling soil losses. (Capability unit IVe–3; woodland suitability group 4)

Pekin silt loam, over clay, 18 to 25 percent slopes, moderately eroded (PlE2).—This soil generally occupies small, elongated bands on steep escarpments. It is suitable for pasture and as woodland. (Capability unit VIe–1; woodland suitability group 4)

Philo Series

The Philo series consists of deep, moderately well drained soils that have a medium-textured surface layer and subsoil. These soils occur on nearly level bottom land in the southeastern third of the county. They are subject to flooding.

Typical profile (Philo silt loam in a cultivated field):

0 to 6 inches, dark-brown, very strongly acid, friable silt loam.
6 to 20 inches, brown, very strongly acid, friable silt loam.
20 to 46 inches +, pale-brown, very strongly acid, firm silt loam mottled with light brownish gray and yellowish brown.

The content of stones in the surface layer ranges from 0 to more than 30 percent.

In these soils the permeability is moderate, and the productivity and available moisture capacity are high.

Additions of lime and fertilizer are needed in cultivated areas, but most of the common crops produce favorable yields if they are well managed.

Philo silt loam (Pn).—Most of this nearly level soil is in long but irregularly shaped strips about 150 feet wide on bottom land. The strips range from 20 to 50 acres in size; they are generally next to areas of the browner Pope soils on one side and the wetter, grayer Stendal soils on the other. Some areas are traversed by many sloughs and flood channels, and they resemble the swell and swale of a large body of water.

Included in areas mapped as this soil are a few areas that have a fine sandy loam surface layer. In addition, there are a few inclusions of Stendal soils, chiefly in narrow strips along drainageways and in the bottom of sloughs. (Capability unit IIw–5; woodland suitability group 3)

Philo soils, channery variant (Po).—About 85 percent of the acreage of these nearly level soils is in moderately long and irregularly shaped areas on bottom land in narrow to medium-sized valleys. These areas range from 10 to 25 acres in size. The surface layer is channery silt loam that contains flat fragments of sandstone, 1 to 2 inches across. By volume, these fragments make up about 40 percent of the surface layer and 50 to 75 percent of the subsurface layers.

The remaining 15 percent of the acreage is on alluvial fans that lie at the mouth of narrow drainageways and branches emptying into larger valleys. Here, the sandstone fragments are somewhat larger than those on the bottom land, though they make up about the same percentage of the surface layer. Below the surface layer, the fragments make up 60 to 80 percent of the soil mass.

Included in areas mapped as these soils are a few areas of Pope soils, channery variant. These areas account for a small acreage on bottom land and a somewhat larger acreage on alluvial fans. (Capability unit IIw–5; woodland suitability group 3)

Pike Series

The Pike series consists of deep, well-drained soils that have a silty surface layer underlain by a moderately fine textured or medium-textured subsoil. These soils lie on nearly level and gently sloping terraces in the southeastern part of the county.

Typical profile (Pike silt loam in a cultivated field):

0 to 10 inches, dark-brown, very strongly acid, friable silt loam.
10 to 20 inches, yellowish-brown or brown, very strongly acid, friable silt loam.
20 to 30 inches, strong-brown, very strongly acid, firm silty clay loam.
30 to 56 inches, brownish-yellow, strong-brown, or dark-brown strongly acid, friable silt loam.
56 to 79 inches, mottled brown and light yellowish-brown, medium acid, very firm loam.

The upper part of the soil derived from silty material ranges from 42 to 70 inches in thickness. The depth to very firm loam ranges from 42 to 75 inches. Pike soils are leached and noncalcareous to a depth of 15 to 20 feet.

These soils are moderately permeable. In areas not severely eroded, they are high in productivity and have high available moisture capacity. Needed in cultivated areas, in addition to practices that control erosion, are adequate amounts of lime and fertilizer. Under good management, satisfactory yields can be obtained from most crops suited to the county.

Pike silt loam, 0 to 2 percent slopes (PpA).—This nearly level soil is in medium-sized to large areas on stream terraces. It lies next to the less well drained Rainsboro soils, the grayer and wetter Taggart soils, and Pike silt loam, 2 to 6 percent slopes. The plow layer shows little erosion. A few areas of Rainsboro and Taggart soils are included.

This soil is in good tilth, is well suited to crops, and is highly productive. (Capability unit I–1; woodland suitability group 4)

Pike silt loam, 2 to 6 percent slopes (PpB).—This gently sloping soil occurs in medium-sized to large areas on stream terraces. It is next to the grayer, less well drained Rainsboro and Taggart soils. Little of the original surface layer has been lost through erosion, but a few included areas are moderately eroded and have a plow layer that is about half subsoil material. These areas generally are on the stronger slopes adjacent to streams and waterways. Also included, most commonly as narrow strips along waterways, are a few areas of Rainsboro soils.

Under good management, this soil is well suited to cultivated crops. Erosion can be controlled by cultivating on the contour or terracing. (Capability unit IIe–1; woodland suitability group 4)

Pope Series

In the Pope series are deep, well-drained soils that have a medium-textured surface layer and subsoil. These soils occupy nearly level first bottoms in the southeastern third of the county.

Typical profile (Pope silt loam in a cultivated field):

0 to 12 inches, dark-brown to brown, acid, friable silt loam.
12 to 45 inches, brown to yellowish-brown, very strongly acid, firm silt loam.

The content of stones in the surface layer ranges from 0 to more than 30 percent.

The Pope soils are moderately permeable and have high available moisture capacity. They can be cropped continuously and are highly productive both of row crops and of specialty crops. Most areas are subject to occasional flooding, but floodwater normally does no damage. Pasture is well suited to these soils and generally is grown in the small areas that are frequently flooded.

Pope silt loam (Pr).—This soil contains small, flat fragments of sandstone that make up less than 15 percent of the surface layer, by volume, and as much as 25 percent of the subsurface layers. A few areas having a fine sandy loam surface layer are included. (Capability unit IIw–5; woodland suitability group 3)

Pope soils, channery variant (Ps).—These soils generally occupy long strips about 200 feet wide on nearly level bottom land. The strips range from 20 to 100 acres in size. Normally, they are next to a stream on one side and to areas of the grayer Philo and Stendal soils on the other. About one-fifth of the acreage is on alluvial fans that lie in relatively narrow valleys and have slopes of 2 to 10 percent.

The surface layer of these soils is channery silt loam; it contains flat fragments of sandstone 1 to 2 inches across. Sandstone fragments make up 40 percent of the surface layer and, below this layer, from 50 to 75 percent of the soil mass. (Capability unit IIw–5; woodland suitability group 3)

Rainsboro Series

Soils of the Rainsboro series are deep, nearly level to moderately steep, light colored, and moderately well drained. These soils have a silty surface layer and a dense, compact layer in the subsoil. They occupy terraces in the southeastern and extreme southwestern parts of the county.

Typical profile (Rainsboro silt loam in a cultivated field):

0 to 7 inches, brown, strongly acid, friable silt loam.
7 to 13 inches, brown, very strongly acid, friable silt loam.
13 to 26 inches, dark yellowish-brown, very strongly acid, friable silt loam to clay loam.
26 to 35 inches, strong-brown, very strongly acid, firm and compact silty clay loam mottled with dark yellowish brown and pale brown (fragipan).
35 to 48 inches, mottled yellowish-brown and dark yellowish-brown, very strongly acid, firm, compact loam (fragipan).
48 to 74 inches +, yellowish-brown, firm clay loam mottled with dark yellowish brown and light gray.

In texture the subsoil above the fragipan ranges from heavy silt loam to medium silty clay loam. The depth to the fragipan ranges from 20 to 36 inches. The fragipan is light silty clay loam in the upper part and loam, sandy clay loam, or clay loam in the lower part. Rainsboro soils are medium acid to very strongly acid in the surface layer and are strongly acid or very strongly acid in the upper subsoil and the fragipan.

These soils have moderately slow permeability. In areas that are not severely eroded, they have moderate available moisture capacity in the root zone, and they are medium in productivity. Additions of lime and fertilizer, as well as practices for controlling erosion, are needed in cultivated areas.

Rainsboro silt loam, 0 to 2 percent slopes (RaA).—This soil shows little erosion, but it needs to be drained for the most favorable yields of crops. Most areas have relatively long slopes of about 1 percent. Small areas of level Taggart soils are included, particularly at the heads of drainageways. (Capability unit IIw–4; woodland suitability group 4)

Rainsboro silt loam, 2 to 6 percent slopes (RaB).—This soil has lost only a little of its original surface layer through erosion, though most of the acreage is cultivated (fig. 10). In a few areas lying at the base of stronger slopes, the surface layer is thicker than the typical one because it is covered with silty overwash from adjacent soils. Included are small, moderately eroded areas and, generally along waterways, small areas of Taggart soils. (Capability unit IIe–2; woodland suitability group 4)

Rainsboro silt loam, 6 to 12 percent slopes, moderately eroded (RaC2).—This soil has lost about half of its original surface layer through erosion, and the plow layer contains material that formerly was subsoil. Most of the acreage is cultivated, but some of it is wooded or in permanent pasture. Included in areas mapped as this soil are some slightly eroded areas, most of them wooded, and a few areas of Parke soils, chiefly on the stronger slopes. (Capability unit IIIe–4; woodland suitability group 4)

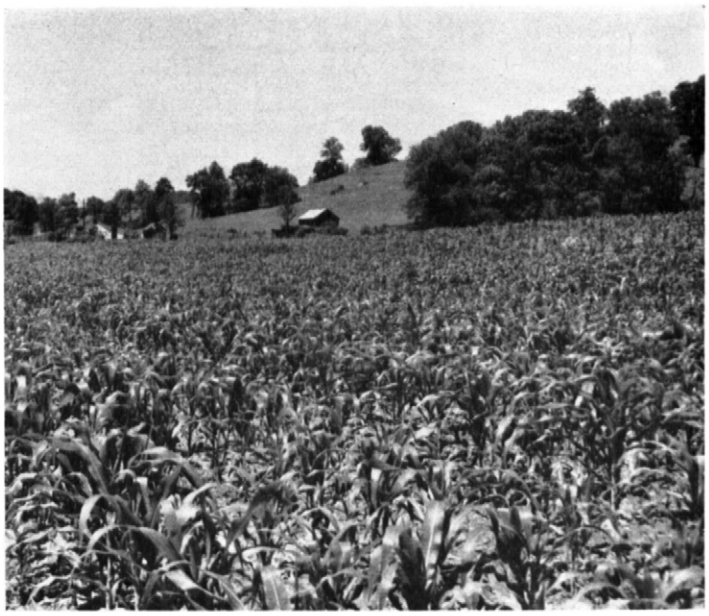

Figure 10.—Corn on Rainsboro silt loam, 2 to 6 percent slopes.

Rainsboro silt loam, 12 to 18 percent slopes, moderately eroded (RaD2).—Most of this soil has been cleared for cultivation, but now most of it is in permanent pasture or is farmed in a crop rotation that includes a row crop only 1 year out of 6. A few areas are wooded or are reverting to trees. (Capability unit IVe–3; woodland suitability group 4)

Rainsboro soils, 6 to 12 percent slopes, severely eroded (RbC3).—These soils have lost nearly all of their original surface layer through erosion. Their plow layer consists almost entirely of strongly acid subsoil material that is in poor tilth and generally gets cloddy if cultivated. In places there are many shallow gullies. Small areas of severely eroded Parke soils are included, most commonly on the stronger slopes.

All the acreage of these Rainsboro soils has been cleared for cultivation, but most of it now is used for permanent pasture or is reverting to woodland. (Capability unit IVe–4; woodland suitability group 4)

Rainsboro soils, 12 to 18 percent slopes, severely eroded (RbD3).—Included in areas mapped as these soils are a few gullied areas in which there are many deep gullies and the original soils have been destroyed except for small patches between the gullies. All the acreage of these soils has been cleared and cultivated, but most of it now is woodland of poor quality or is covered with brush. A few areas are used for permanent pasture. (Capability unit VIe–1; woodland suitability group 4)

Rarden Series

The Rarden series consists of moderately deep to deep, light-colored, well-drained soils that have a silty surface layer underlain by a fine-textured subsoil. These soils occur on sloping to steep ridgetops in the south-central and eastern parts of the county. The original vegetation was oak forest.

Typical profile (Rarden silt loam in a cultivated field):

0 to 6 inches, brown, very strongly acid, friable silt loam.
6 to 9 inches, yellowish-brown, very strongly acid, friable silt loam.
9 to 12 inches, strong-brown, very strongly acid, firm silty clay loam.
12 to 29 inches, mottled yellowish-red and light brownish-gray, very strongly acid, firm silty clay.
29 to 38 inches, mottled strong-brown and light brownish-gray, very strongly acid, very firm clay.
38 inches +, acid clay shale and thin beds of sandstone.

The depth to firm silty clay ranges from 2 to 15 inches. The combined thickness of the surface layer and the subsoil commonly ranges between 24 and 36 inches. These soils are strongly acid to extremely acid throughout.

The Rarden soils are slowly permeable to water. Except in severely eroded areas, they are low in productivity and have low available moisture capacity. They produce medium yields of most field crops, but they need additions of lime and fertilizer, as well as practices that control erosion. The soils are well suited to trees, but yields of wood crops are low.

Rarden silt loam, 12 to 18 percent slopes (RdD).—This moderately steep soil occupies small, irregularly shaped areas on upper hillsides in the southern part of the county. It adjoins the Coolville and Latham soils, and a few areas of Coolville soils are included with it, chiefly on the milder slopes. The soil is wooded, and most of it is uneroded.

This soil is suitable as woodland or for pasture. Native oaks grow fairly well on it, and white pine is a good tree for planting. In areas used for pasture, controlled grazing and other practices that maintain a dense sod are needed to check erosion. (Capability unit VIe–2; woodland suitability group 6)

Rarden silt loam, 12 to 18 percent slopes, moderately eroded (RdD2).—In most places this soil has been cleared. About half of the original surface layer has been removed by erosion, and the rest is mixed with subsoil material in the plow layer. This layer is cloddy and difficult to plow. (Capability unit VIe–2; woodland suitability group 6)

Rarden silt loam, 18 to 25 percent slopes, moderately eroded (RdE2).—This steep soil generally occurs in small, irregularly shaped areas on hillsides. It adjoins less strongly sloping Rarden soils and steeper Latham soils. The surface layer, which contains finer textured material from the subsoil, is cloddy and difficult to plow. Included with this soil are wooded areas that are only slightly eroded, and there are a few inclusions of Latham soils, particularly on the steeper hillsides.

This soil is well suited to trees or pasture. Native oaks do fairly well on it, and white pine is suitable for planting. If the soil is used for pasture, erosion can be checked by controlling grazing and using other practices that maintain a dense sod. (Capability unit VIe–2; woodland suitability group 6)

Rarden soils, 12 to 18 percent slopes, severely eroded (ReD3).—These soils are on moderately steep hillsides, where they lie next to less eroded Rarden soils and to Coolville, Latham, and Cruze soils. The surface layer of these severely eroded soils is a mixture of very strongly acid material from the upper subsoil of strong-brown silty clay loam and the middle subsoil of yellowish-red silty clay. This layer gets cloddy and is difficult to plow. A few scattered areas included with these soils are only moderately eroded. Also included are a few areas of Coolville and Cruze soils.

Woodland and wildlife are good uses for these soils. White pine and pitch pine are trees suitable for planting, and sericea lespedeza can be used for wildlife. Pasture is not well suited, because erosion is a severe hazard and productivity is low. (Capability unit VIIe–2; woodland suitability group 6)

Rarden and Coolville silt loams, 6 to 12 percent slopes (RfC).—These sloping soils are in medium-sized areas on ridgetops, most of which are wooded. These soils adjoin steeper Latham soils and more mildly sloping Fawcett soils. The Coolville soil has a silty upper subsoil that is thicker than the one in the Rarden soil, and it occurs in less sloping areas. A few areas of Fawcett soils are included, most commonly as narrow strips along drainageways and as small depressions at the heads of streams.

Both soils in this group are suited to crops grown in a rotation. Erosion can be controlled by stripcropping on the contour and protecting the waterways with grass. (Capability unit IIIe–4; woodland suitability group 6)

Rarden and Coolville silt loams, 6 to 12 percent slopes, moderately eroded (RfC2).—These soils have been cleared and cultivated, and they have a surface layer consisting of original surface soil mixed with some of the strong-brown, strongly acid subsoil. In other respects they are like Rarden and Coolville silt loams, 6 to 12 percent slopes. (Capability unit IIIe–4; woodland suitability group 6)

Rarden and Coolville soils, 6 to 12 percent slopes, severely eroded (RgC3).—These sloping soils lie in irregularly shaped areas on ridgetops. They adjoin less eroded Rarden and Coolville soils and gently sloping, grayer Fawcett soil. Their very strongly acid plow layer ranges from heavy silt loam to silty clay loam and is a mixture of strong-brown and yellowish-red materials that formerly were subsoil. Included are a few scattered areas that are moderately eroded and a few areas of Fawcett silt loam. This included Fawcett soil is in narrow strips along waterways and generally is covered by 6 to 12 inches of light-colored silty overwash.

These soils are suitable for pasture, woodland, or wildlife. If used for pasture, they need to be managed intensively so that a dense sod is maintained. Tree suitable for planting are white pine and pitch pine, and a good plant for wildlife food is sericea lespedeza. (Capability unit IVe–4; woodland suitability group 6)

Ritchey Series

The Ritchey series consists of steep, light-colored, well-drained soils that are shallow to limestone. These soils developed from calcareous glacial till or outwash underlain by limestone at a depth of 20 inches or less. They occupy the till plain on the uplands. The native vegetation was a mixed stand of maple, hickory, beech, oak, and other deciduous hardwoods.

Typical profile (Ritchey silt loam in a cultivated field):

0 to 9 inches, brown, neutral, friable silt loam.
9 to 15 inches, brown, neutral, firm clay loam.
15 to 20 inches, yellowish-brown, neutral to calcareous, friable channery silt loam.
20 inches +, dolomitic limestone bedrock.

The texture of the subsoil is clay loam, silty clay loam, or clay. The depth to bedrock ranges from 10 to 20 inches. These soils are neutral to medium acid in the surface layer.

The Ritchey soils are moderately slowly permeable, but they have low available moisture capacity because they are shallow. The soils are suited to trees.

Ritchey silt loam, 25 to 35 percent slopes, moderately eroded (RhF2).—This shallow, very steep soil occupies narrow escarpments along the narrow valleys of streams. It adjoins less strongly sloping Milton soils, as well as Eel and Shoals soils on first bottoms. In most areas there are outcrops, ledges, and cliffs of limestone. Some included areas are severely eroded, and a few areas of Milton soils are included, chiefly on the milder slopes.

This soil is droughty but is well suited to trees. (Capability unit VIIe–1; woodland suitability group 4)

Riverwash

Riverwash (Rk) consists of areas in stream channels that are flooded for as much as half the year. Within short distances the soil and rock material varies widely in texture and composition. Along streams that rise in the glaciated part of the county, the fine material has a high content of lime. Here, most of the coarse material consists of rounded pebbles of granite and limestone that range from ⅛ inch to 3 inches across. In streams that head in the unglaciated part of the county, the fine material is acid and the coarse material is mostly fragments of sandstone and hard shale.

In most areas of Riverwash, plants are few and scattered because of coarse texture and periodic flooding. Areas that are fairly well protected from swift water support a growth of willow, alder, elm, sycamore, and low bushes.

Areas of Riverwash are used by many forms of wildlife. They can be used for hiking and rock collecting during periods of low water, and some of them adjoin streams that are good for fishing and boating. (Capability unit not assigned; woodland suitability group 9)

Rodman Series

In the Rodman series are dark-colored, moderately coarse textured, well-drained soils that are very shallow over gravel and sand. They occur on very steep second bottoms along the major streams of the county.

Typical profile (a Rodman soil in a wooded area):

0 to 9 inches, very dark brown to dark grayish-brown, neutral, friable fine gravelly loam to sandy loam.
9 to 21 inches +, loose, limy gravel and sand.

The surface layer is neutral to moderately calcareous. The depth to limy gravel and sand ranges from 4 to 12 inches.

Rodman soils are low in productivity. They are rapidly permeable, have low available moisture capacity, and are extremely droughty. As a consequence, these soils are unsuited to field crops, though they are suited to trees and pasture.

Rodman-Lorenzo complex, 25 to 50 percent slopes (RlG).—The soils of this complex lie in narrow bands on escarpments along second bottoms in the valleys of the larger creeks and the Scioto River. These soils adjoin less sloping Fox and Warsaw soils and, below the escarpments, the Eel, Shoals, and Ross soils. Their present surface layer, which generally consists mostly of original surface soil, ranges from sandy loam or fine sandy loam to loam. Many areas are very gravelly. Scattered throughout the areas mapped as these soils are a few small areas of Warsaw soils.

The soils of this complex are well suited to trees and, in most places, are wooded. They are droughty and generally are not productive of pasture. (Capability unit VIIe–1; woodland suitability group 5)

Ross Series

Soils of the Ross series are nearly level, deep, dark colored, medium textured, and well drained. They occur on second bottoms along the major streams.

Typical profile (Ross silt loam in a cultivated field):

0 to 7 inches, very dark gray, mildly alkaline, friable silt loam.
7 to 14 inches, very dark gray, neutral, friable loam.
14 to 30 inches, very dark brown, neutral, friable loam.
30 to 57 inches, dark-brown, neutral, friable loam.
57 to 64 inches, light yellowish-brown, limy, loose sand.

The surface layer is silt loam, loam, fine sandy loam, or light silty clay loam. The combined thickness of the dark-colored surface and subsurface layers ranges from 20 to 50 inches. Stratification is evident in the subsoil and in the material underlying it. The Ross soils are slightly acid to mildly alkaline.

These soils are moderately permeable, high in available moisture capacity, and highly productive. Lime is seldom needed, but the response to adequate fertilization is good. Flooding is an occasional hazard, and some areas are infested with johnsongrass. Nevertheless, if the Ross soils are well managed, they produce favorable yields of all crops suited to the county.

Ross fine sandy loam (Rm).—This soil is in somewhat irregularly shaped areas on gently undulating flood plains along the larger creeks and the Scioto River. The flood plains are dissected by many shallow channels and sloughs. Adjoining areas of this soil are large areas of Genesee and Eel soils and smaller areas of Abscota sandy loam. A few areas of the Abscota soil are included.

Ross fine sandy loam is well suited to cultivated crops, though it is somewhat droughty and is subject to seasonal flooding. The floods generally occur before crops are planted in spring. Some areas are infested with johnsongrass. This soil is suitable for irrigation. (Capability unit IIw–5; woodland suitability group 3)

Ross silt loam (Rn).—This soil occurs in large, broad, uniformly shaped areas on flood plains along the larger creeks and the Scioto River. In a few places it is dissected by large sloughs and flood channels. Areas of this soil adjoin large areas of Genesee soil and smaller areas of Eel and Shoals soils. A few areas of Shoals soils are included, mainly along the bottom of large sloughs and channels. Also included are areas that have a loam surface layer.

This soil is well suited to field crops (fig. 11). In areas where johnsongrass is not a problem, the soil also is suited to truck crops. (Capability unit IIw–5; woodland suitability group 3)

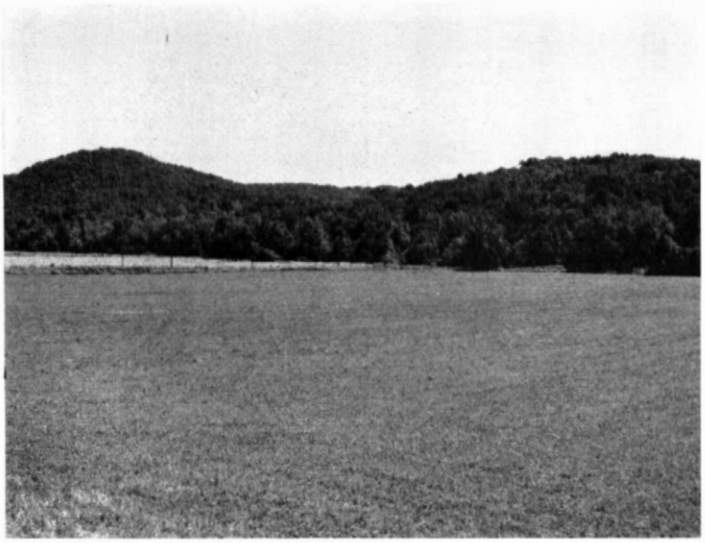

Figure 11.—Soybeans on Ross silt loam. In the background are wooded Colyer and Muskingum soils.

Ross silty clay loam (Ro).—This soil lies in irregularly shaped areas on flood plains along the larger creeks and the Scioto River. Here, it generally occurs farther from streams than other Ross soils, and hence its surface layer is finer textured. This soil lies next to Ross silt loam and to Genesee, Eel, and Shoals soils. A few areas of Shoal soils are included, mainly as narrow strips in the bottom of flood channels.

This soil is suited to cultivated crops. It is in poorer tilth than other Ross soils, however, and the surface layer clods if plowed when wet. Some areas are infested with johnsongrass. (Capability unit IIw–5; woodland suitability group 3)

Rossmoyne Series

Soils of the Rossmoyne series are deep and moderately well drained. They have a silty surface layer underlain by a moderately fine textured subsoil that is compact and dense in the lower part. These soils are on nearly level to sloping ridgetops and moderately steep or steep hillsides in the southwestern and central parts of the county.

Typical profile (Rossmoyne silt loam in a cultivated field):

0 to 8 inches, dark grayish-brown, slightly acid, friable silt loam.
8 to 16 inches, yellowish-brown, medium acid, friable silt loam.
16 to 27 inches, yellowish-brown to strong-brown, very strongly acid, firm silty clay loam mottled with pale brown or light brownish gray.
27 to 38 inches, yellowish-brown, very strongly acid, dense, very firm silty clay loam mottled with pale brown and light gray (fragipan).
38 to 120 inches, yellowish-brown, firm clay to clay loam with pale-brown and light-gray mottles; very strongly acid in upper part, ranging to medium acid in lower part.
120 inches +, calcareous glacial till of loam texture.

The depth to the very firm, dense, mottled layer (fragipan) ranges from 20 to 32 inches. The depth to calcareous glacial till varies between 8 and 10 feet on the milder slopes but ranges to about 5 feet on the stronger slopes. Below the surface layer these soils are strongly acid or very strongly acid to a depth of 40 inches or more.

Rossmoyne soils are slowly permeable. Except in severely eroded areas, they have moderate available moisture capacity in the root zone, and they are medium in productivity. Adequate amounts of lime and fertilizer, as well as practices that control erosion, are needed in cultivated areas. If the soils are well managed, however, they produce medium yields of all the common crops.

Rossmoyne silt loam, 0 to 2 percent slopes (RpA).—This nearly level soil is on small, irregularly shaped knolls on ridgetops in the central and south-central parts of the county. It adjoins Avonburg and Clermont soils, and small areas of Avonburg soil are included with it. These inclusions are in small depressions at the heads of drainageways and in narrow strips along waterways.

This soil shows little erosion but has limitations because of excess water. Surface ditches laid out across the slope are effective in removing the water. (Capability unit IIw–4; woodland suitability group 4)

Rossmoyne silt loam, 2 to 6 percent slopes (RpB).—This gently sloping soil occupies large areas on ridgetops, where it lies next to more sloping Rossmoyne soils and to Clermont and Avonburg soils. Little erosion is evident. Included in mapped areas are a few areas of slightly eroded Avonburg soils, which generally occur in narrow strips along waterways.

Erosion is a hazard on this soil, but it can be controlled by contour cultivation and grassed waterways. (Capability unit IIe–2; woodland suitability group 4)

Rossmoyne silt loam, 2 to 6 percent slopes, moderately eroded (RpB2).—The surface layer of this moderately eroded soil is about half subsoil material. It is in poorer tilth than that of uneroded Rossmoyne soils and is more likely to be cloddy. Otherwise, this soil is like Rossmoyne silt loam, 2 to 6 percent slopes. Included are small areas of Avonburg soils that are covered with silty overwash 6 to 12 inches thick. (Capability unit IIe–2; woodland suitability group 4)

Rossmoyne silt loam, 6 to 12 percent slopes, moderately eroded (RpC2).—This sloping soil occurs in small, irregularly shaped areas on ridgetops. It is next to other Rossmoyne soils and to Hickory and Avonburg soils. The plow layer of this soil contains material brought up from the subsoil. Included are areas that are wooded and uneroded, and a few small areas of Hickory and Avonburg soils. The inclusions of Hickory soil generally are on the steepest parts of ridgetops, and those of Avonburg soil occur as small, narrow strips along waterways.

The hazard of erosion is severe on this soil. Cleared areas can be kept from eroding by using management that includes contour stripcropping and grassed waterways. (Capability unit IIIe–4; woodland suitability group 4)

Rossmoyne silt loam, 12 to 18 percent slopes, moderately eroded (RpD2).—This moderately steep soil is in small, irregularly shaped areas on upper hillsides. It has a plow layer that is a mixture of original surface soil and part of the strongly acid, yellowish-brown subsoil. Lying next to this soil are Hickory soils and other Rossmoyne soils, and there are a few areas of Hickory soils included, particularly on the lower and generally steeper side slopes.

This soil is highly susceptible to erosion. It is well suited to permanent pasture, but a dense sod is needed to

check soil losses. If the soil is cropped, erosion can be controlled by stripcropping on the contour and using a rotation that includes a cultivated crop only 1 year in 6. (Capability unit IVe–3; woodland suitability group 4)

Rossmoyne silt loam, 18 to 25 percent slopes, moderately eroded (RpE2).—This steep soil occurs in small areas on short, irregular slopes. Here, it adjoins Hickory, Colyer, and Latham soils. It has a plow layer that consists of original surface soil mixed with some of the strongly acid upper subsoil. Included in areas mapped as this soil are a few slightly eroded areas; a few severely eroded areas; and a few areas of Hickory soils, which lie chiefly on the steeper slopes and in narrow bands along streams.

This soil is subject to severe erosion but is suitable for pasture or as woodland. If pasture is grown, controlled grazing and other practices are needed to maintain a dense sod. (Capability unit VIe–2; woodland suitability group 4)

Rossmoyne soils, 6 to 12 percent slopes, severely eroded (RsC3).—These sloping soils occupy medium-sized, irregularly shaped areas on ridgetops, where they adjoin less eroded Rossmoyne soils and more mildly sloping Avonburg soils. The plow layer is a mixture of very strongly acid, yellowish-brown and strong-brown materials that formerly made up the upper subsoil. A few included areas are gullied. In addition, there are a few inclusions of Avonburg soils, in narrow bands adjacent to waterways, that have been covered with 6 to 12 inches of light-colored silty overwash.

These soils are suited to pasture or trees, though they can be cultivated occasionally. Areas used for pasture need to be protected by a thick growth of tall fescue or other grass that is carefully grazed and otherwise well managed. Trees suitable for planting are white and Austrian pines. (Capability unit IVe–4; woodland suitability group 4)

Rossmoyne soils, 12 to 18 percent slopes, severely eroded (RsD3).—These moderately steep soils lie in small, narrow bands on upper hillsides and generally are surrounded by less eroded Rossmoyne and Hickory soils. Their plow layer consists mostly of material from the subsoil. Included are a few small areas that are only moderately eroded. Also included, in a few small areas, are moderately eroded Hickory soils, generally between shallow gullies on steeper hillsides, and small areas of less eroded, less strongly sloping Rossmoyne soils.

These severely eroded soils are suitable for trees or wildlife. White and Austrian pines are among the best trees for planting, and sericea lespedeza planted for wildlife food grows well. (Capability unit VIe–2; woodland suitability group 4)

Shoals Series

The Shoals series consists of deep, nearly level, somewhat poorly drained soils that are medium textured in the surface layer and the subsoil. These soils occupy bottom land in the northwestern two-thirds of the county and in the valley of the Scioto River.

Typical profile (Shoals silt loam in a cultivated field):

0 to 7 inches, dark grayish-brown, neutral, friable silt loam.
7 to 49 inches, dark grayish-brown to dark-gray, neutral, firm loam mottled with yellowish brown.
49 inches +, yellowish-brown, limy gravelly loamy sand.

Below the surface layer, to a depth of 40 inches or more, the texture generally ranges from silt loam to silty clay loam but, in some places, is loam. In many places the profile shows stratification. The depth to limy, coarse-textured material ranges from 40 to 60 inches. Shoals soils are slightly acid to mildly alkaline throughout the profile.

These soils are medium in productivity, are moderately slow in permeability, and have high available moisture capacity. Satisfactory yields can be obtained by using adequate amounts of lime and fertilizer. In areas that lie in small to medium-sized valleys, diversion ditches may be needed to take care of excess water from adjacent hillsides. Tiling is suitable only if adequate outlets are available and if the hazard of flood damage to crops is slight.

Shoals silt loam (Sh).—This soil is in small, irregularly shaped, nearly level to slightly depressional areas on bottom land. In many places it lies close to the uplands or to escarpments along stream terraces, and it occurs in valleys ranging from small to large, including the valley of the Scioto River. This soil adjoins the browner, better drained Eel and Genesee soils, as well as soils that lie on adjacent escarpments A few areas are covered with 6 to 12 inches of lighter colored silty material that washed from soils on uplands.

Included with this soil are a few areas that have a silty clay loam surface layer and subsoil. Also included are a few tracts of Eel silt loam, mainly in areas that are not adjacent to escarpments.

Shoals silt loam is well suited to crops, but it has limitations because of excess water. It is somewhat poorly drained and is frequently covered by floodwater from nearby slopes, though such floods are usually of short duration. Shallow surface ditches or tile lines are effective in draining this soil. Diversion ditches that have adequate outlets will safely carry away runoff from adjacent hillsides. (Capability unit IIw–1; woodland suitability group 2)

Sleeth Series

Soils of the Sleeth series are deep, nearly level, light colored, and somewhat poorly drained. They have a silty surface layer and a moderately fine textured subsoil that is underlain by coarse gravel and sand outwash at a depth of more than 40 inches. These soils occupy terraces along the major streams.

Typical profile (Sleeth silt loam in a cultivated field):

0 to 12 inches, dark grayish-brown to brownish-yellow, medium acid, friable silt loam.
12 to 32 inches, mottled yellowish-brown and light yellowish-brown to light brownish-gray, strongly acid, firm silty clay loam.
32 to 46 inches, mottled light yellowish-brown and dark yellowish-brown, slightly acid to neutral, firm sandy clay loam.
46 inches +, yellowish-brown, limy gravel and sand.

The texture of the subsoil ranges from silty clay loam, sandy clay loam, and clay loam to loam. The depth to yellowish-brown, limy gravel and sand ranges from 40 to 60 inches. These soils are neutral to medium acid in the surface layer, medium acid to very strongly acid in the upper subsoil, and slightly acid or neutral in the lower subsoil.

The Sleeth soils are medium in productivity and high in available moisture capacity. They are moderately slowly permeable and have a high water table in wet periods. Unless drained, they are slow to dry out and warm up in spring, but drainage can be improved by tiling. In some areas adjacent to hillsides, diversion ditches are needed to protect crops from overflow.

Sleeth silt loam (Sl).—This nearly level soil is in shallow depressions on terraces. It occupies small, irregularly shaped areas that commonly lie close to very steep escarpments. It adjoins the very dark gray Westland silty clay loam and the browner, better drained Thackery and Ockley soils. A few areas are covered with 6 to 12 inches of silty to loamy material that washed from more sloping soils.

A few areas of Westland soil are included; these are narrow strips along waterways and small depressions at the heads of drainageways.

Sleeth silt loam is suited to crops, but it is somewhat poorly drained and is frequently flooded by runoff from adjacent slopes. Tile drainage works well in it. Diversion ditches that have adequate outlets are effective in diverting excess water from nearby slopes. (Capability unit IIw–2; woodland suitability group 2)

Stendal Series

The Stendal series consists of deep, light-colored, somewhat poorly drained soils that have a medium-textured surface layer and subsoil. These soils are on nearly level bottom land in the southern part of the county.

Typical profile (Stendal silt loam in a cultivated field):

0 to 9 inches, brown, strongly acid, friable silt loam.
9 to 48 inches, light brownish-gray, very strongly acid, firm to friable silt loam mottled with yellowish brown.

In places the surface layer is free of stones, but its stone content ranges to more than 30 percent in some places. Below the surface layer the texture ranges from heavy silt loam to light silty clay loam. These soils are strongly acid or very strongly acid throughout.

The Stendal soils are medium in productivity. They have moderately slow permeability and high available moisture capacity. Additions of lime and fertilizer are needed if crops are grown. To protect areas in small to medium-sized valleys, diversion ditches can be used to remove excess water that runs off adjacent hillsides. Tiling is suitable in areas where outlets are adequate and the hazard of flood damage to crops is slight.

Stendal silt loam (Sn).—This nearly level to slightly depressional soil is on bottom land along small to medium-sized streams. It occupies somewhat irregularly shaped areas of medium size that generally lie close to hillsides or to escarpments below second bottoms. These areas adjoin areas of browner, better drained Pope and Philo soils. In some places this soil is covered with 6 to 12 inches of light-colored silty material that washed from adjacent uplands or second bottoms. A few areas of uneroded Philo soils are included, most commonly on the stronger slopes.

Crops are well suited to this soil. Disposing of excess water is the principal problem. Runoff from adjacent slopes can be safely removed by constructing diversion ditches. (Capability unit IIw–1; woodland suitability group 2)

Stone Quarries

Stone quarries (Sr) are open pits that occur in areas where limestone bedrock is relatively near the surface and is of a quality suitable for mining. After the soil overlying the bedrock is removed, the limestone is taken for road construction, ground lime, buildings, and other industrial or agricultural uses. In areas where mining continues, the pits are increasing in size.

Inactive quarries can be used for ponds, woodland, recreation, or wildlife. They are suited to trees and other plants that can grow in shallow, rocky, limy soil material that is in poor physical condition and has low available moisture capacity. Stone quarries have not been placed in a capability unit. (Woodland suitability group 9)

Taggart Series

The Taggart series consists of deep, light-colored, somewhat poorly drained soils that have a silty surface layer and a moderately fine textured subsoil underlain by gravelly loam or clay loam materials below a depth of 40 to 60 inches. These soils are on nearly level to gently sloping terraces in the southeastern and extreme southwestern parts of the county.

Typical profile (Taggart silt loam in a cultivated field):

0 to 10 inches, grayish-brown to light olive-brown, medium acid, friable silt loam.
10 to 25 inches, mottled grayish-brown and strong-brown, strongly acid, firm silty clay loam.
25 to 50 inches, mottled gray and strong-brown, strongly acid, firm silty clay loam.
50 to 70 inches +, mottled dark yellowish-brown and gray, firm, compact clay loam.

The depth to mottled gray and strong-brown, firm silty clay loam ranges from 18 to 48 inches. These soils are mottled just below the plow layer and have gray coatings and mottles throughout the profile. The upper subsoil is light to medium silty clay loam, and the lower subsoil is gravelly clay loam, sandy clay loam, or clay loam. The profile is nearly free of stones to a depth of 40 to 60 inches. Below that depth, however, the gravel content increases. The subsoil generally is strongly acid or very strongly acid, but the acidity decreases below a depth of 50 inches.

Taggart soils are moderately low in productivity but have high available moisture capacity. They are slowly permeable and have a high water table in wet periods. These soils can be drained by surface ditches but, even if drained, are slow to dry out and warm up in spring. For this reason, they are generally used for soybeans. Although lime and fertilizer are needed, favorable yields of most crops can be obtained if management is good.

Taggart silt loam, 0 to 2 percent slopes (TaA).—This soil is in shallow depressions on stream terraces, where it adjoins Taggart silt loam, wet, and the browner, better drained Rainsboro and Pike soils. A few areas adjacent to streams and escarpments are covered with 6 to 12 inches of light-colored silty overwash. A few areas of Taggart

silt loam, wet, are included, particularly as narrow bands next to waterways.

Drained areas of this soil are fairly good for crops. Surface ditches across the slope are suitable for removing excess water. (Capability unit IIw–2; woodland suitability group 2)

Taggart silt loam, 2 to 6 percent slopes (TaB).—This gently sloping soil is in small, irregularly shaped areas at the heads of drainageways. It lies next to other Taggart soils and to Pike and Rainsboro soils. Included are a few small areas that are moderately eroded, and there are a few inclusions of Taggart silt loam, wet, chiefly as narrow strips along waterways.

This somewhat poorly drained soil is suited to crops but is slightly susceptible to erosion. Drainage can be improved and soil losses controlled by constructing surface ditches and cultivating across the slope. (Capability unit IIw–2; woodland suitability group 2)

Taggart silt loam, wet (Te).—This soil occurs in small, irregularly shaped, nearly level areas and depressions on terraces. It adjoins the browner, better drained Bartle and Pekin soils and the dark-colored Bonpas silty clay loam. In some areas it is adjacent to the Rainsboro soils and other Taggart soils, and here it likely is underlain by sand and gravel at a depth of 8 to 12 feet. The plow layer consists mainly of original surface soil, but a few areas are covered with 6 to 12 inches of light-colored silty material that washed from surrounding soils. A few small areas of Bartle and Bonpas soils are included, the Bartle soil generally as narrow strips along waterways, and the Bonpas soil as small pockets at the heads of drainageways.

The use of this soil is limited principally by excess water, which can be removed fairly easily through tile lines or open ditches. In some places diversion terraces are needed to divert runoff from adjacent hillsides. (Capability unit IIIw–2; woodland suitability group 1)

Thackery Series

The Thackery series consists of deep, moderately well drained soils that have a medium-textured surface layer and a moderately fine textured subsoil underlain by calcareous gravelly and sandy outwash at a depth of more than 40 inches. These soils occur on nearly level and gently sloping terraces along the major streams.

Typical profile (Thackery silt loam in a cultivated field):

0 to 7 inches, dark grayish-brown, neutral, friable silt loam.
7 to 17 inches, brown, slightly acid, friable to firm silt loam to loam.
17 to 29 inches, brown, medium acid, firm clay loam mottled with yellowish brown.
29 to 49 inches, mottled grayish-brown, yellowish-brown, medium acid ranging to neutral, friable gravelly sandy clay loam.
49 inches +, grayish-brown, limy gravel and sand.

Textures in the subsoil are loam, silty clay loam, sandy clay loam, and clay loam. The depth to limy gravel and sand ranges from 40 to 60 inches. Thackery soils are neutral to medium acid in the surface layer, medium acid to very strongly acid in the upper subsoil, and slightly acid to mildly alkaline in the lower subsoil.

Productivity is high, permeability is moderate, and the available moisture capacity is high. Needed in cultivated areas are additions of lime and fertilizer, as well as practices that control erosion. Under good management, favorable yields can be obtained from most crops suited to the county.

Thackery silt loam, 0 to 2 percent slopes (ThA).—This nearly level soil is on terraces. It lies next to the browner, better drained Ockley soils and the wetter, grayer Sleeth soils. Its plow layer shows little erosion, but a few areas are covered with light-colored silty overwash 8 to 12 inches thick. A few included areas have a loam surface layer. Also included are a few areas of Sleeth soils, generally in small depressions near the heads of waterways.

This soil is excellent for crops. In some places there are wet spots that can be drained by random tiling. (Capability unit I–1; woodland suitability group 4)

Thackery silt loam, 2 to 6 percent slopes (ThB).—This gently sloping soil lies in small, fan-shaped areas at the heads of drainageways and in narrow bands along waterways. It adjoins nearly level Sleeth silt loam and more strongly sloping Ockley and Fox soils. Only a little of its original surface layer has been lost through erosion. A few areas, mainly along waterways, are covered with 8 to 12 inches of light-colored silty overwash. A few included areas have a loam surface layer, and there are a few inclusions of Ockley soils, chiefly on the stronger slopes.

This soil is well suited to crops. It is slightly susceptible to erosion, which can be controlled by contour cultivation and grassed waterways. (Capability unit IIe–1; woodland suitability group 4)

Tyler Series

In the Tyler series are deep, somewhat poorly drained soils that have a silty surface layer and a moderately fine textured, very firm, compact subsoil. These soils are on nearly level and gently sloping second bottoms in upland valleys in the southern part of the county.

Typical profile (Tyler silt loam in a cultivated field):

0 to 9 inches, dark grayish-brown, strongly acid, friable silt loam.
9 to 14 inches, light yellowish-brown, strongly acid, friable silt loam.
14 to 18 inches, pale-brown, very strongly acid, firm silty clay loam mottled with light yellowish brown.
18 to 34 inches, mottled light-gray and yellowish-brown, very strongly acid, very firm, compact silty clay loam (fragipan).
34 to 59 inches, mottled light yellowish-brown and light brownish-gray, very strongly acid, very firm, very compact silty clay loam.

The depth to the very firm, compact layer (fragipan) ranges from 15 to 30 inches. These soils are strongly acid to extremely acid throughout.

The Tyler soils are low in productivity but are moderate in available moisture capacity. They are slowly permeable and have a high water table in wet periods. They respond fairly well to surface drainage, but drained areas are slow to dry out and warm up in spring. For this reason, the soils are commonly planted to soybeans. Large amounts of lime and fertilizer are needed in cultivated areas. If the soils are well managed, however, they produce medium yields of most crops common in the county.

Tyler silt loam (Ty).—This slightly depressional soil is in small to medium-sized, irregularly shaped areas that generally lie close to more sloping uplands or are at the

heads of drainageways. A few narrow areas are bordering on waterways. Adjoining this soil are the browner, better drained Monongahela soils, as well as the Cruze soils of nearby uplands.

Included in areas mapped as this soil are a few gently sloping areas that are moderately eroded. Also included are a few areas of Monongahela and Cruze soils.

The principal limitation to the use of this soil is excess water. Drainage is somewhat poor, and areas adjacent to uplands are frequently flooded by runoff. Drainage ditches constructed across the slope will remove surface water, and diversion ditches having adequate outlets can be used to divert excess water from hillsides. (Capability unit IIIw–2; woodland suitability group 2)

Uniontown Series

The Uniontown series consists of deep, light-colored, moderately well drained to well drained soils that have a silty surface layer underlain by a moderately fine textured subsoil. These soils occupy nearly level to sloping terraces, principally along the Scioto River.

Typical profile (Uniontown silt loam in a cultivated field):

0 to 7 inches, brown, neutral, friable silt loam.
7 to 11 inches, brown, slightly acid, friable silt loam.
11 to 27 inches, dark yellowish-brown, medium acid, firm silty clay loam.
27 to 60 inches, brown to yellowish-brown, medium acid to neutral, firm silty clay loam mottled with light gray.
60 to 70 inches +, dark yellowish-brown, firm, limy silt loam.

The subsoil ranges from heavy silt loam to medium silty clay loam and is stratified. The depth to firm, limy silt loam ranges from 40 to 70 inches. Uniontown soils are neutral to medium acid in the surface layer, slightly acid to strongly acid in the upper subsoil, and medium acid to neutral in the lower subsoil.

These soils have moderately slow permeability and high available moisture capacity. Their productivity is high. In addition to practices that control erosion on slopes, sufficient lime and fertilizer are needed in cultivated areas. Most of the common crops are suited to these soils.

Uniontown silt loam, 0 to 2 percent slopes (UnA).—This soil is in small, irregularly shaped areas on terraces, where it adjoins wetter, grayer Henshaw silt loam and very dark gray or black Bonpas silty clay loam. In most places the plow layer consists mainly of the original surface layer, but a few areas are covered with 8 to 12 inches of light-colored silty material that washed from adjacent uplands. A few areas of the Henshaw soil are included; these occur as small, slight depressions and as narrow strips close to waterways.

This soil is subject to little or no erosion and is excellent for crops. In places there are a few wet spots that can be drained by random tiling or cross-slope ditching. (Capability unit I–1; woodland suitability group 4)

Uniontown silt loam, 2 to 6 percent slopes (UnB).—This gently sloping soil is in small bands adjoining waterways. It lies next to other Uniontown soils and to the wetter Henshaw and Bonpas soils. This soil shows little erosion but, in a few areas, is covered with 6 to 12 inches of light-colored silty overwash from surrounding soils on uplands. A few areas of Henshaw soil are included, mainly as long, narrow strips along waterways.

This soil is suited to cultivated crops. Erosion is a slight hazard but can be controlled by cultivating on the contour and protecting the waterways with grass. (Capability unit IIe–1; woodland suitability group 4)

Uniontown silt loam, 6 to 12 percent slopes, moderately eroded (UnC2).—This sloping soil is on escarpments and in long, narrow bands next to waterways. It adjoins Uniontown silt loam, 2 to 6 percent slopes, as well as Shoals and Eel soils of the adjacent bottom land. The plow layer of this soil is made up of the original dark-colored surface layer mixed with part of the yellowish-brown upper subsoil. A few included areas are on moderately steep escarpments, and there are a few areas of Shoals silt loam included, most commonly at the extreme base of escarpments.

Although this soil is moderately susceptible to erosion, it is suited to crops grown in a rotation or to pasture. If slopes are sufficiently long, contour stripcropping can be used to control soil losses. (Capability unit IIIe–1; woodland suitability group 4)

Wallkill Series

In the Wallkill series are light-colored, somewhat poorly drained soils that consist of recently deposited mineral material underlain by organic material. These soils occupy nearly level and depressional areas along the major streams of the county. Their surface layer is medium textured.

Typical profile (Wallkill silt loam in a pastured area):

0 to 12 inches, grayish-brown, neutral, friable silt loam.
12 to 24 inches, black, slightly acid, very friable muck.
24 inches +, very dark brown, neutral, fibrous muck and plant remains.

The depth to buried organic material ranges from 10 to 30 inches. These soils are slightly acid to mildly alkaline throughout.

The Wallkill soils have high available moisture capacity and are highly productive. Although their permeability is moderately rapid, the soils need to be drained and are subject to flooding. Their root zone is moderately thick. Under good management, favorable yields can be obtained from most crops common in the county.

Wallkill silt loam (Wa).—This nearly level soil lies in small, irregularly shaped, shallow depressions on stream terraces. It commonly occurs at the base of steep escarpments. Adjoining it are the Carlisle, Westland, and Willette soils, and a few areas of Willette muck are included with it, particularly in the areas farthest from uplands.

This soil is suited to cultivated crops. Its use is limited principally by excess water. Open ditches are most effective in draining the soil, and diversion ditches are needed in some places to divert runoff that would come in from nearby hillsides or escarpments. (Capability unit IIw–1; woodland suitability group 1)

Warners Series

The Warners series is made up of shallow, dark-colored, very poorly drained soils that have an organic-mineral surface layer underlain by marl. These soils lie

in nearly level and depressional areas on terraces along the major streams of the county.

Typical profile (Warners mucky silt loam in a pastured area):

0 to 13 inches, very dark gray, limy, friable mucky silt loam.
13 inches +, light-gray marl that contains scattered shells and plant remains.

These soils are very dark gray to black and are limy throughout the profile. The depth to marl ranges from 6 to 14 inches.

Warners soils are medium in productivity, and they have moderately rapid permeability and a thin root zone. Drainage must be improved before crops can be grown. In drained areas the available moisture capacity is moderate. If the soils are well managed, they produce adequate yields of most crops common in the county.

Warners mucky silt loam (We).—This nearly level soil is in small, irregularly shaped, shallow depressions on second bottoms. It lies next to Carlisle, Fox, and Westland soils and commonly occurs at the base of steep escarpments. Included in areas mapped as this soil are a few areas that have a silt loam surface layer and a few areas of Carlisle muck.

Crops can be grown on Warners mucky silt loam, but excess water is a severe limitation. Adequate drainage can be provided by surface ditching. In some places diversion ditches are needed to control floodwater that runs off adjacent slopes.

Because this soil contains an excessive amount of lime, the availability of potassium and trace elements is generally low. For adequate yields, fertilizer must be added in sufficient amounts. (Capability unit IIIw–1; woodland suitability group 8)

Warsaw Series

The Warsaw series consists of deep, dark-colored, well-drained soils that have a medium-textured surface layer and a moderately fine textured subsoil underlain by stratified gravel and sand outwash. These soils occur on nearly level terraces along the major streams of the county.

Typical profile (Warsaw loam in a cultivated field):

0 to 12 inches, very dark brown, slightly acid, friable loam.
12 to 20 inches, yellowish-brown, medium acid, firm clay loam.
20 to 33 inches, dark reddish-brown, friable to firm gravelly clay loam; medium acid in upper part and slightly acid in lower part.
33 to 50 inches, light brownish-gray, limy gravel and sand.

The thickness of the very dark brown surface layer ranges from 10 to 15 inches. In texture the subsoil ranges from heavy loam to clay loam, gravelly clay loam, and sandy clay loam. The depth to limy gravel and sand is 20 to 40 inches. These soils are neutral to medium acid in the surface layer, slightly acid to strongly acid in the upper subsoil, and slightly acid or neutral in the lower subsoil.

Productivity is moderately high, permeability is moderately rapid, and the available moisture capacity is moderate. Lime and fertilizer are needed if crops are grown, but satisfactory yields can be obtained from most of the common crops if management is good. Although the soils are droughty, they are well suited to irrigation.

Warsaw loam (Wl).—This nearly level soil occupies small, irregularly shaped areas on terraces. It lies next to Fox, Ockley, and Wea soils. Included are a few sloping areas, some of which are moderately eroded, and a few areas of Wea silt loam, particularly on the more nearly level slopes.

This soil is suitable for crops, though it is slightly droughty. Irrigated crops do well on it. (Capability unit IIs–1; woodland suitability group 5)

Wea Series

In the Wea series are deep, dark-colored, well-drained soils that have a silty surface layer and a medium-textured to moderately fine textured subsoil. These soils are underlain by stratified, calcareous gravel and sand at a depth greater than 40 inches. They occupy nearly level to gently sloping terraces along the major streams.

Typical profile (Wea silt loam in a cultivated field):

0 to 17 inches, very dark gray, slightly acid, friable silt loam.
17 to 30 inches, dark-brown, medium acid, friable fine silt loam to silty clay loam.
30 to 42 inches, yellowish-brown to brown, slightly acid, firm clay loam.
42 to 45 inches, dark grayish-brown, mildly alkaline sandy clay loam.
45 inches +, limy gravel and sand.

The very dark gray surface layer ranges from 10 to 20 inches in thickness. The texture of the subsoil ranges from heavy loam to clay loam, sandy clay loam, and gravelly clay loam. Below a depth of 20 to 36 inches, the gravel content increases. The depth to limy gravel and sand is 40 to 60 inches. These soils are neutral to medium acid in the surface layer, slightly acid to strongly acid in the upper subsoil, and slightly acid or neutral in the lower subsoil.

The Wea soils are highly productive and have moderate to high available moisture capacity. Their permeability is moderate. If the soils are adequately limed and fertilized and otherwise are well managed, they produce favorable yields of all crops suited to the county.

Wea silt loam, 0 to 2 percent slopes (WsA).—This nearly level soil on terraces has a plow layer that consists mostly of the original surface layer. It adjoins more sloping Wea soils and nearly level Fox, Ockley, and Warsaw soils. A few areas of Warsaw loam are included, generally on the stronger slopes.

This soil is excellent for crops. In places there are a few wet spots that can be drained by random tiling. (Capability unit I–1; woodland suitability group 4)

Wea silt loam, 2 to 6 percent slopes (WsB).—This gently sloping soil is in small, narrow areas along waterways and small streams on terraces. It lies next to gently sloping Fox and Ockley soils and to nearly level Wea and Thackery soils. Little erosion is evident except in a few included areas that are moderately eroded. Also included are a few areas of Warsaw soils, chiefly on the stronger slopes.

This soil is slightly susceptible to erosion but is well suited to crops. Erosion can be controlled by cultivating on the contour. (Capability unit IIe–1; woodland suitability group 4)

Wellston Series

The Wellston series consists of moderately deep to deep, light-colored, well-drained soils that have a silty surface layer and a moderately fine textured to medium-textured subsoil underlain by sandstone or siltstone bedrock. These soils are on sloping ridgetops in the extreme eastern part of the county.

Typical profile (Wellston silt loam in a cultivated field):

0 to 7 inches, brown to yellowish-brown, medium acid to strongly acid, friable silt loam.
7 to 31 inches, strong-brown or yellowish-brown, very strongly acid silty clay loam to silt loam.
31 to 45 inches, reddish-yellow, strongly acid very channery silt loam.
45 inches +, sandstone bedrock.

The texture of the subsoil ranges from fine silt loam to medium silty clay loam. The depth to sandstone bedrock ranges from 30 to 60 inches. These soils are medium acid to very strongly acid in the surface layer and strongly acid to extremely acid in the subsoil.

Wellston soils are medium in productivity, are moderately permeable, and have moderate available moisture capacity. Most of the common crops can be grown in the less sloping areas if sufficient amounts of lime and fertilizer are applied, but woodland is the most suitable use for other areas. If the stronger slopes are cleared, they should be kept in permanent pasture.

Wellston silt loam, 6 to 12 percent slopes (WtC).—This soil occupies long, irregularly shaped, medium-sized areas on rolling ridgetops. Here, it lies next to more strongly sloping Berks, Muskingum, and Neotoma soils. Included with it are small areas having slopes of slightly more than 12 percent; small areas in which the surface layer is fine sandy loam; and a few areas of Muskingum soils, generally on the strongest slopes.

Erosion is a moderate hazard on this soil, but crops are suitable if they are grown in a rotation. Stripcropping on the contour and protecting the waterways with grass are good ways to control erosion. (Capability unit IIIe–3; woodland suitability group 7)

Westland Series

The Westland series consists of nearly level and depressional, dark-colored, very poorly drained soils that are moderately fine textured in the surface layer and subsoil and are underlain by sand and gravel. These soils occur on terraces along the major streams.

Typical profile (Westland silty clay loam in a cultivated field):

0 to 13 inches, very dark gray, slightly acid, firm silty clay loam.
13 to 28 inches, grayish-brown, neutral, firm clay loam mottled with yellowish brown and dark gray.
28 to 50 inches, grayish-brown, mildly alkaline gravelly loam mottled with yellowish brown.
50 to 56 inches +, stratified calcareous sand and gravel.

The dark-colored surface layer ranges from 10 to 20 inches in thickness. In the subsoil the texture is heavy loam to medium clay loam and silty clay loam, and the content of gravel is variable. The depth to carbonates ranges from 30 to 45 inches. The depth to stratified sand and gravel is 40 to 60 inches. Westland soils are neutral to medium acid in the surface layer and are medium acid to alkaline in the subsurface layers.

These soils are highly productive and have moderate to high available moisture capacity. They have a high content of organic matter and a moderately thick root zone. Although permeability is moderate, artificial drainage is needed if the soils are cropped. Also needed are additions of lime and fertilizer. Under good management, favorable yields can be obtained from most of the common crops.

Westland silty clay loam (Wu).—This soil lies in shallow depressions on terraces, where it adjoins the better drained Sleeth and Thackery soils. Included in areas mapped as this soil are a few areas that have a silt loam surface layer. Also included are a few narrow areas of Sleeth silt loam; these occur along the edge of areas mapped as this Westland soil.

If drained, this soil is excellent for crops. Excess water is the chief limitation. Tile drainage works well in fields where outlets are adequate. The soil tends to get cloddy if plowed when wet. (Capability unit IIw–3; woodland suitability group 1)

Willette Series

In the Willette series are moderately deep, dark-colored, very poorly drained organic soils. These soils consist of muck underlain by fine-textured mineral material. They occur in nearly level and depressional areas on terraces along the major streams of the county.

Typical profile (Willette muck in a cultivated area):

0 to 7 inches, very dark brown, slightly acid, very friable muck.
7 to 27 inches, dark-brown, slightly acid, fibrous muck and plant remains.
27 to 36 inches +, light-gray, limy clay to silty clay.

The depth to clayey material ranges from 20 to 40 inches. In places this material is underlain by calcareous sand and gravel at a depth exceeding 48 inches. These soils are neutral to medium acid.

Willette soils are highly productive and have very high available moisture capacity. Permeability is moderate in the muck but is slow in the underlying material. Improved drainage is needed, for the water table is high much of the year. Most of the common crops can be grown, and specialty crops are suitable.

Willette muck (Wv).—This soil lies in small, irregularly shaped, shallow depressions on second bottoms, commonly near the base of steep escarpments. It adjoins the Carlisle, Westland, and Sleeth soils, and a few small areas of Carlisle muck are included. The Carlisle soil is deeper to clay than Willette muck.

The use of this soil is limited chiefly by excess water, but drained areas are suited to crops. In areas where outlets are available, surface ditches are effective in draining this soil. The removal of excess water through tile lines is slow. In some places diversion ditches are needed to divert runoff from nearby slopes. (Capability unit IIIw–1; woodland suitability group 8)

Formation and Classification of Soils

This section consists of four main parts. The first part explains the factors of soil formation as they relate to the formation of soils in Ross County, and the second part deals with the classification of soils. In the third part is a description of each soil series in the county, including a profile that is representative of the series. The fourth part gives laboratory data for selected soils in the county.

Factors of Soil Formation

Soils are formed by the processes of weathering and soil development acting upon parent materials that have been deposited or accumulated by geological activity. The characteristics of the soil at any given point depend on the interrelationships of (1) the physical and mineralogical composition of the parent material; (2) the climate under which the material has accumulated and existed; (3) the living organisms, plant and animal life, in and on the soil; (4) the relief, or lay of the land; and (5) the length of time the forces of soil development have acted upon the soil material. These are termed the soil-forming factors. Because different factors dominate from place to place, many kinds of soil have been formed.

Climate and vegetation are the active factors in soil formation. Less is known about the effects of the microorganisms, earthworms, and other plants and animals living in the soil, but they have an influence on soil composition by mixing soil material and adding organic matter to it. Also, the vegetation and animal and microbial life, influenced by the climate, act upon parent material and slowly change it into a natural body having genetically related horizons.

The effects of climate and vegetation on soil development are modified by the parent material and by the relief. Parent material and relief influence the kind of soil profile that can be formed and in some places dominate over the other factors of soil formation.

Finally, time is required before the parent material can be transformed into a soil. The weathering, leaching, translocation of soil particles, formation of soil structure, and other soil-forming processes require time to differentiate horizons in the soil parent material.

Parent material

Parent material is the mass of material from which a soil develops. Some soils have formed in more than one kind of parent material, such as loess over residual material. The following paragraphs discuss the various kinds of parent material from which the soils in Ross County have developed.

Some of the soils developed in residuum weathered from sedimentary rocks. The Colyer soils formed in material derived from acid, carbonaceous shale. Fragments of black shale that commonly occur in Colyer soils are inherited from the parent material. The Dekalb soils contain sandy material and coarse fragments inherited from coarse-textured parent material. The sandy Dekalb soils contrast sharply with the clayey Cana, Rarden, and Latham soils, all of which formed in parent material weathered from acid clay shale. The red streaks commonly observed in Rarden soils are weathered bands of red clay shale. Soils formed in residuum from these shales and from sandstone are low in base saturation and natural fertility because the original rocks were low in bases. As the soils formed, leaching lowered the base status still further and generally caused these soils to be strongly acid.

A more common kind of parent material in Ross County is a thick layer of material laid down by glaciers. This material consists of glacial till of both Wisconsin and Illinoian ages. The Illinoian till is much older than the Wisconsin till, and consequently it is weathered to a greater depth and is more strongly leached. Because much of the Illinoian till is covered with loess, the upper part of the soils in these areas formed in silty material, whereas the lower part formed in till. Among these soils are the Avonburg, Rossmoyne, and Clermont soils, all of which have a thick solum, are leached to a depth of 7 feet or more, and generally are low in natural fertility. Leached to an even greater depth are the Negley, Parke, and Pike soils. These soils formed in sandy and gravelly outwash that is mantled with wind-deposited material of variable thickness. In areas where the Negley soils formed, the loess mantle is thin or missing and the soils are sandy and gravelly. The parent material for the Parke and Pike soils consists of wind-deposited silty material underlain by a buried soil that developed in sandy and gravelly outwash.

Glacial till of Wisconsin age covers the northern one-third to one-half of the county. Practically all of this material is calcareous. Formed in it are the Brookston, Celina, Crosby, and Miami soils. Some areas in which these soils formed are covered with a thin layer of wind-deposited silt. The soils have higher base status and generally a thinner solum than the Cardington, Alexandria, and other soils that formed from till of similar age but contain significant amounts of acid shale and sandstone.

Gravelly and sandy outwash of Wisconsin age is most extensive in the valleys of the Scotio River and Paint Creek. The outwash consists of thick, stratified, highly calacareous gravel and sand. It underlies the Casco, Fox, Lorenzo, Ockley, Warsaw, and Wea soils. In some areas only the lower part of these soils formed in gravel and sand, for the upper horizons formed in less coarse textured material deposited by wind or water. Because the underlying outwash is coarse textured, it greatly reduces the available moisture capacity and limits the root zone in these soils.

Some soils in the county have formed in lacustrine, or slack water, deposits of fine sand, silt, and clay. The Bartle, Bonpas, Henshaw, Markland, McGary, Mentor, Pekin, and Uniontown soils formed in this lacustrine material. The more clayey of these soils are less deeply leached of lime than those having a high content of silt and fine sand.

Many areas in the county, as mentioned before, have a mantle of silt, or loess, that was laid down by wind. The Alford soils formed in a thick deposit of this material.

Soils on flood plains along the major streams formed in material that washed from surrounding areas of high-

ly calcareous glacial till. For this reason, the soils are high in natural fertility. Periodically, they receive fresh material during floods.

Climate

Climate is an active factor in soil formation. Ross County is located in an area that has a humid, temperate, continental climate. Climatic data for the county are given in the section "General Nature of the County."

Climatic factors that are important in soil formation are precipitation, temperature, and the evapo-transpiration ratio. These factors are interrelated with types of vegetation and, on a regional basis, determine the kinds of soil that have developed. In an area the size of Ross County, the climate is fairly uniform and soil differences are determined more by local differences in vegetation, parent material, relief and drainage, and the age of the soil materials. The climate of the county tends to develop moderately leached and weathered soils.

Living organisms

A dense forest of hardwoods made up the original plant cover in nearly all of the area that is now Ross County. In the hilly southern part, some of the stands were a mixture of hardwoods and conifers. Openings covered with prairie grasses were scattered through some of the Wisconsin glacial area. These trees and grasses have had an important influence on the development of soils in the county, though they do not account for the great differences among soils. The effect of vegetation is modified by drainage.

Most soils in the county developed under forest, but a few developed under prairie grasses. If other soil-forming factors were equal, more organic matter accumulated in areas of prairie than in areas of forest. Consequently, such soils as the Warsaw and Wea, which developed under grass, are darker colored than soils that developed under trees.

The original distribution of tree species in the northern part of the county was not uniform. Soil moisture appears to have been one of the more important factors that caused the species composition to vary. Because of soil moisture and probably other factors, the trees making up the original forest occurred in groups in which one or more species were dominant.

For a more detailed discussion of forest in Ross County, see the subsection "Use of Soils as Woodland."

Man's use of the land has brought about changes in the soils of this area. Soils change considerably under cultivation. In some places surface soil is removed and the lower horizons are exposed by accelerated erosion. The organic-matter content generally decreases under cultivation, even if little erosion occurs. Plant nutrients are removed by crops, leaching, and erosion. The crumbly and granular surface horizon of the Bonpas, Brookston, Millsdale, Warners, and Westland soils is likely to get hard and cloddy if the soils are poorly managed.

Artificial drainage affects the characteristics of a soil over a period of years. It improves aeration in the solum and thus allows some of the minerals in the soil to oxidize.

Other changes in the soil may result from changing the natural flow of surface water.

Relief

The relief of Ross County is characterized by wide extremes. More than any other factor, it has influenced the development of differences among the soils in the county. Relief modifies the effectiveness of the active factors of soil formation through its influence on runoff, erosion, ponding, depth of water table, internal drainage, leaching, accumulation and removal of organic matter, and other phenomena.

The Brookston soils and other dark-colored, very poorly drained soils contain more organic matter than the well-drained soils, chiefly because organic matter decomposes more slowly in wet soils, particularly if soluble carbonates are present. The level to basinlike relief of very poorly drained soils has resulted in the development of a surface layer that is rich in organic matter, although this layer developed under forest.

Among the external features of soils, slope is the most reliable in differentiating many soil series. Commonly, a given set of soil characteristics is related to slope and internal drainage. A knowledge of this relationship contributes to the accuracy of classification and mapping.

Time

The length of time that the land surface has been exposed to soil-forming processes is an important factor in the development of the soil profiles. All soils require time for the differentiation of distinct horizons. The influence of time, however, may be greatly modified by various soil-forming processes, particularly erosion, deposition, relief, and the kind of parent material.

The parent materials of the soils in Ross County may be separated by age into four general groups. The oldest materials are those in the southeastern part of the county that has never been covered by glaciers. Here, the bedrock from which the soils are derived is millions of years old.

The next oldest materials are those deposited by the Illinoian glaciation, which geologists believe occurred about 100,000 to 300,000 years ago. In places, however, the surface of the Illinoian till has been modified by a thin cover of loess, part of which was deposited in the Wisconsin age.

The Wisconsin materials are younger than the Illinoian materials. Geologists place their age at 10,000 to 30,000 years. In the Wisconsin materials the depth of weathering is less.

The present flood plains receive fresh alluvium from time to time, and the soils show little or no differentiation of horizons. They are young soils compared with other soils in the county.

The age of soils on the steeper slopes is intermediate between that of soils on the level uplands and those on the recent flood plains. Geological erosion on slopes has removed part of the soil as it formed and has prevented the full expression of the other soil-forming factors.

Classification of Soils

Soils are placed in narrow classes for the organization and application of knowledge about their behavior on farms and woodlands or in counties. They are placed in

broad classes for study and comparison of large areas, such as continents.

Two systems of classifying soils have been used in the United States in recent years. The older system was adopted in 1938 (*2*) and revised later (*8*). The system currently used was adopted for general use by the National Cooperative Soil Survey in 1965. The current system is under continual study (*6*, *10*). Therefore, readers interested in developments of the system should search for the latest literature available.

In table 7 the soils of Ross County are classified according to the current and the 1938 systems. These systems are discussed in the following pages. Placement of some soil series in the current system of classification may change as more precise information becomes available.

1938 classification

The 1938 system, with later revisions, consists of six categories. In the highest of these, the soils of the whole country have been placed in three orders. Two categories, suborder and family, were never fully developed. As a consequence, they have not been used much. More attention has been centered on the categories, great soil group, soil series, and soil type. A further subdivision of the soil type, called a soil phase, is defined, along with soil type and soil series, in the section "How This Survey Was Made" in the front part of this report.

TABLE 7.—*Soil series classified according to the present system of classification and the 1938 system with its later revisions*

Series	Current classification			1938 classification
	Family	Subgroup	Order	Great soil group
Abscota	Sandy, siliceous, mesic	Entic Hapludolls	Mollisols	Alluvial soils.
Alexandria	Fine, illitic, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Alford	Fine silty, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Algiers	Fine loamy, mixed, nonacid, mesic	Thapto-Aquollic Udifluvents	Entisols	Alluvial soils.
Alvin	Fine loamy, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Avonburg	Fine silty, mixed, mesic	Aeric Fragiaqualfs	Alfisols	Planosols.
Bartle	Fine silty, mixed, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Berks	Loamy skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols	Sols Bruns Acides.
Bonpas	Fine silty, mixed, noncalcareous, mesic	Typic Haplaquolls	Mollisols	Humic Gley soils.
Brookston	Fine loamy, mixed, noncalcareous, mesic.	Typic Argiaquolls	Mollisols	Humic Gley soils.
Cana	Fine, illitic, mesic	Paraquic Hapludults	Ultisols	Gray-Brown Podzolic soils.
Cardington	Fine, illitic, mesic	Aquic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Carlisle	[1]	[1]	Histosols	Bog soils.
Casco	Fine loamy, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Celina	Fine, illitic, mesic	Aquic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Clermont	Fine silty, mixed, mesic	Typic Fragiaqualfs	Alfisols	Planosols.
Colyer	Loamy skeletal, mixed, mesic	Lithic Dystrochrepts	Inceptisols	Lithosols.
Coolville	Fine, mixed, mesic	Paraquic Hapludults	Ultisols	Red-Yellow Podzolic soils.
Crosby	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Cruze	Clayey, mixed, mesic	Aquic Hapludults	Ultisols	Red-Yellow Podzolic soils.
Dekalb	Coarse loamy, mixed, mesic	Typic Dystrochrepts	Inceptisols	Sols Bruns Acides.
Eel	Fine loamy, mixed, nonacid, mesic	Typic Udifluvents	Entisols	Alluvial soils.
Fawcett	Clayey, mixed, mesic	Aquic Hapludults	Ultisols	Red-Yellow Podzolic soils.
Fox	Fine loamy, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Genesee	Fine loamy, mixed, nonacid, mesic	Typic Udifluvents	Entisols	Alluvial soils.
Henshaw	Fine silty, mixed, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Hickory	Fine loamy, mixed, mesic	Alfic Hapludults	Ultisols	Red-Yellow Podzolic soils.
Kendallville	Fine loamy, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Latham	Clayey, mixed, mesic	Aquic Hapludults	Ultisols	Red-Yellow Podzolic soils.
Lorenzo	Fine loamy, mixed, mesic	Typic Argiudolls	Mollisols	Brunizems.
Loudonville	Fine loamy, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Markland	Fine, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
McGary	Fine, mixed, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Mentor	Fine loamy, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Miami	Fine, illitic, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Millsdale	Fine, illitic noncalcareous, mesic	Typic Argiaquolls	Mollisols	Humic Gley soils.
Milton	Fine, illitic, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Monongahela	Fine loamy, mixed, mesic	Typic Fragiudults	Ultisols	Red-Yellow Podzolic soils.
Muskingum	Fine loamy, mixed, mesic	Typic Dystrochrepts	Inceptisols	Sols Bruns Acides.
Negley	Fine loamy, mixed, mesic	Alfic Hapludults	Ultisols	Gray-Brown Podzolic soils.
Neotoma	Coarse loamy, mixed, mesic	Mollic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Ockley	Fine loamy, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Parke	Fine silty, mixed, mesic	Alfic Hapludults	Ultisols	Gray-Brown Podzolic soils (intergrading toward Red-Yellow Podzolic soils).
Pekin	Fine silty, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils (intergrading toward Red-Yellow Podzolic soils).
Philo	Fine loamy, mixed, acid, mesic	Aquic Udifluvents	Entisols	Alluvial.
Pike	Fine silty, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils (intergrading toward Red-Yellow Podzolic soils).

See footnote at end of table.

TABLE 7.—*Soil series classified according to the present system of classification and the 1938 system with its later revisions* —Continued

Series	Current classification			1938 classification
	Family	Subgroup	Order	Great soil group
Pope	Coarse loamy, mixed, acid, mesic	Typic Udifluvents	Entisols	Alluvial soils.
Rainsboro	Fine silty, mixed, mesic	Typic Fragiudalfs	Alfisols	Gray-Brown Podzolic soils (intergrading toward Red-Yellow Podzolic soils).
Rarden	Clayey, mixed, mesic	Aquic Hapludults	Ultisols	Red-Yellow Podzolic soils.
Ritchey	Fine, illitic, mesic	Lithic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Rodman	Loamy skeletal, carbonatic, mesic	Eutrochreptic Rendolls	Mollisols	Rendzina soils.
Ross	Fine loamy, mixed, mesic	Fluventic Hapludolls	Mollisols	Alluvial soils.
Rossmoyne	Fine silty, mixed, mesic	Aquic Fragiudalfs	Alfisols	Gray-Brown Podzolic soils (intergrading toward Red-Yellow Podzolic soils).
Shoals	Fine loamy, mixed, nonacid, mesic	Aeric Fluventic Haplaquepts	Inceptisols	Alluvial soils.
Sleeth	Fine silty, mixed, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Stendal	Fine silty, mixed, acid, mesic	Aeric Fluventic Haplaquepts	Inceptisols	Alluvial soils.
Taggart	Fine silty, mixed, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Thackery	Fine loamy, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Tyler	Fine loamy, mixed, mesic	Typic Fragiaqults	Ultisols	Planosols.
Uniontown	Fine silty, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Wallkill	Fine loamy, mixed, nonacid, mesic	Thapto-Histic Haplaquepts	Inceptisols	Alluvial soils.
Warners	Coarse loamy, carbonatic, mesic	Histic Humaquepts	Inceptisols	Humic Gley soils (intergrading toward Bog soils).
Warsaw	Fine loamy, mixed, mesic	Typic Argiudolls	Mollisols	Brunizems.
Wea	Fine loamy, mixed, mesic	Typic Argiudolls	Mollisols	Brunizems.
Wellston	Fine silty, mixed, mesic	Alfic Hapludults	Ultisols	Gray-Brown Podzolic soils (intergrading toward Red-Yellow Podzolic soils).
Westland	Fine loamy, mixed, noncalcareous, mesic.	Typic Argiaquolls	Mollisols	Humic Gley soils.
Willette	[1]	[1]	Histosols	Bog soils.

[1] Carlisle and Willette soils have not been placed in a family and a subgroup.

A great soil group consists of soils that have similar major profile characteristics. Their horizons are arranged in the same way, though the soils may differ in such features as thickness of profile and degree of development in the different horizons.

The great soil groups in this county are Gray-Brown Podzolic soils, Red-Yellow Podzolic soils, Sols Bruns Acides, Brunizems, Humic Gley soils, Planosols, Bog (organic) soils, Rendzina soils, Alluvial soils, and Lithosols.

In the following paragraphs each great soil group is discussed. Some soils in some of the great soil groups intergrade toward other great soil groups. That is, they have characteristics of two groups.

GRAY-BROWN PODZOLIC SOILS

Gray-Brown Podzolic soils developed under deciduous forest in a humid, temperate climate. They have a well-developed profile and are well drained to somewhat poorly drained. Soils classified in this great soil group occupy a larger total acreage in Ross County than soils in any other great soil group.

In undisturbed areas Gray-Brown Podzolic soils have a thin, dark-colored A1 horizon and generally a gray, grayish-brown, or pale-brown, eluviated A2 horizon. In cultivated fields all or part of the A2 horizon may be in the plow layer. These soils have a textural B horizon that generally is higher in clay content than the A1 and A2 horizons or the layers underlying the B horizon. The accumulation of clay in the B horizon has resulted from the eluviation of clay from the surface horizon and possibly also from the development of clay in place. In addition, it may have resulted from the concentration of clay because of the leaching of calcareous materials. The B horizon also has higher chroma than the other horizons and most commonly is brown, yellowish brown, or strong brown. This horizon has moderate to strong, subangular blocky to angular blocky structure.

In Gray-Brown Podzolic soils the lower A and the upper B horizons are more acid than the other horizons. Base saturation shows a similar pattern. In the lower A and the upper B horizons, saturation values are as low as 30 percent, whereas in the lower B horizon they are higher than 35 percent.

The well drained and moderately well drained Gray-Brown Podzolic soils in Ross County developed in several different kinds of materials. The well drained soils are nearly level to steep, whereas the moderately well drained soils are nearly level to sloping and have grayish mottles in the B horizon.

In this great soil group the somewhat poorly drained soils are level to gently sloping. They have more prominent mottles that are nearer the surface than those in moderately well drained Gray-Brown Podzolic soils. Also, their A horizon is grayer.

Some soils in the county are Gray-Brown Podzolic soils that intergrade toward Red-Yellow Podzolic soils. They developed under deciduous forest in a warm, humid, temperate climate. They have a strongly developed profile that is deeper and has somewhat stronger chroma in the lower B horizon than the profile of typical Gray-Brown Podzolic soils that were derived from similar material.

These intergrades have a thin, dark-colored A1 horizon, in undisturbed areas, and a light-colored—generally gray, pale-brown, or light yellowish-brown—eluviated A2 horizon. They have a textural B horizon that is higher in clay content than the A1 and A2 horizons and generally contains more clay than the underlying layers. Eluviation of clay from the A horizon, and possibly a clayey residue derived from the weathering of minerals in place, has contributed to this clay enrichment. Chroma is high in the B horizon, and strong brown and yellowish brown are the most common colors. Grayish coatings of silt commonly occur on the more prominent ped faces in the upper part of the B horizon. Structure in the B horizon generally is moderate or strong, subangular blocky.

Normally, these intergrades are strongly acid or very strongly acid in the lower A horizon and well into the B horizon. The lower part of the B horizon generally is strongly acid to slightly acid. Base saturation in the lower A horizon and in an appreciable part of the B horizon is between 20 and 35 percent, but it increases to 35 percent or more in the lower B horizon.

RED-YELLOW PODZOLIC SOILS

Red-Yellow Podzolic soils have a thin organic and organic-mineral A1 horizon unless they have been plowed. The A2 horizon is light colored and bleached, and it is underlain by a red, yellowish-red, or yellowish-brown B horizon. The B horizon contains more clay than either the A or the C horizon. Leaching has removed most of the exchangeable bases from the solum. Base saturation is generally less than 35 percent. Weathering has produced clays that are mostly in the kaolinite or mixed group.

SOLS BRUNS ACIDES

Sols Bruns Acides are acid, but they do not have the accumulated clay in the B horizon that characterizes the Gray-Brown Podzolic and the Red-Yellow Podzolic soils. Sols Bruns Acides are very strongly leached. Their principal horizons are the A1, B, and C horizons. In these soils there is little or no accumulation of clay in the B horizon. Generally, the soils are low in fertility, though in places where they are medium textured and have a thick root zone, they are productive if adequately limed and fertilized. The Sols Bruns Acides have been described by Baur and Lyford (*3*).

BRUNIZEMS

Brunizems, formerly called Prairie soils, developed under grass. They are dark colored and well drained to somewhat poorly drained. The dark-colored A horizon is more than 6 inches thick and has a relatively high content of organic matter. In most places the B horizon is brown or yellowish brown. The horizons are not sharply separated; their boundaries are gradual or diffuse. Transitional horizons generally are several inches thick. Brunizems lack the A2 horizon that is typical of Gray-Brown Podzolic soils and Planosols. Base saturation is normally above 50 percent .These soils have been described by Smith, Allaway, and Riecken (*7*).

HUMIC GLEY SOILS

Humic Gley soils are dark colored and developed in areas where the water table was periodically high. They occupy nearly level and depressional areas that are poorly or very poorly drained. The native vegetation was swamp forest or marsh grasses, or both. In these soils the surface horizon has a high or moderately high content of organic matter. Because of poor drainage, the subsoil is gleyed, mottled, and drab.

Humic Gley soils are less acid than the better drained soils nearby. In most places their surface horizon is neutral or slightly acid, and the lower part of their solum generally is neutral or mildly alkaline. The base-saturation percentage is high and increases with depth. In addition, the base exchange capacity is higher than in adjacent Gray-Brown Podzolic soils. Most Humic Gley soils in Ross County have a textural B horizon.

In Ross County the Warners soils are Humic Gley soils that intergrade toward Bog (organic) soils. They have the general morphological characteristics of Humic Gley soils, but their dark-colored A horizon developed in areas where the water table was high and organic material, or muck, accumulated. Warners soils are underlain by marl.

The characteristics of Humic Gley soils in Ohio have been discussed by Schafer and Holowaychuk (*5*).

PLANOSOLS

Planosols in Ross County have a B horizon that contrasts sharply with the A horizon in texture, structure, and consistence. In undisturbed areas there is a thin, very dark gray A1 horizon that has granular structure. The gray, relatively thick A2 horizon is mottled with yellowish brown or light yellowish brown in the lower part and has weak, platy structure or weak, fine, subangular structure.

The B horizon contains appreciably more clay than the A horizon. It has distinct or prominent mottling, and it is very firm when moist and plastic when wet. It either is massive or has weak, prismatic structure that breaks to weak, subangular blocky structure. Gray, platy, silty coatings cap the upper ends of the prismlike units.

BOG (ORGANIC) SOILS

Bog soils consist of peat or muck. These deposits are made up of partly decayed remains of plants that have been preserved in places that are saturated with water. The soils of this group formed under swamp or marsh vegetation in a humid or subhumid climate.

RENDZINA SOILS

Calcareous parent material dominates among the soil-forming processes in the Rendzina soils. These soils are dark colored and are shallow to calcareous material. Horizon differentiation is weak. The high base status of the parent material has greatly influenced soil devel-

opment. The Rendzina soils are less mature than soils that developed from similar but less limy material.

ALLUVIAL SOILS

Alluvial soils are on the flood plains of major streams and their tributaries. They are developing in recently deposited alluvium and may be frequently flooded and covered by new sediment. Little or no modification of the alluvium has taken place through soil-forming processes. Consequently, the soils lack discernible horizons, except for a weakly developed A1 horizon that contains an accumulation of organic matter. Some Alluvial soils have mottles in the lower part of the profile, which shows that they are moderately well drained or somewhat poorly drained, but they have been changed little otherwise.

In Ross County the Alluvial soils have developed in alluvium that washed mainly from uplands and terraces underlain by calcareous drift of Wisconsin glacial age. A small part of the alluvium washed from local areas of Illinoian age. The profile characteristics of Alluvial soils are determined mainly by the kinds of sediment. Some variations in the profile are caused by stratification, or differential deposition, of alluvium of various textures. Soils of the Wallkill series consist of mineral alluvium over organic soil.

LITHOSOLS

Lithosols are characterized by weak horizon development. Their A horizon overlies freshly or imperfectly weathered masses of rock and rock fragments, commonly on steep slopes where geologic erosion has kept pace with soil development.

Current classification

The current sytem of classifying soils also consists of six categories. They are, beginning with the most inclusive, the order, the suborder, the great group, the subgroup, the family, and the series.

ORDER: Ten soil orders are recognized in the current system. They are Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. The properties used to differentiate the soil orders are those that tend to give broad climatic groupings of soils. Two exceptions are the Entisols and the Histosols, which occur in many different climates. Six of the soil orders are represented in Ross County—Entisols, Inceptisols, Mollisols, Alfisols, Ultisols, and Histosols.

SUBORDER: Each order is divided into suborders, primarily on the basis of those soil characteristics that seem to produce classes having the greatest genetic similarity. The suborders narrow the broad climatic range permitted in the orders. The soil properties used to separate suborders mainly reflect either the presence or absence of waterlogging or soil differences resulting from the climate or vegetation. The suborder is not shown in table 7 for the current classification system.

GREAT GROUP: Soil suborders are separated into great groups on the basis of uniformity in the kinds and sequence of major soil horizons and features. The horizons used to make separations are those in which clay, iron, or humus have accumulated. The features used are the self-mulching properties of clays, soil temperature, major differences in chemical composition (mainly calcium, magnesium, sodium, and potassium), and the like. The great group is not shown in table 7, but the name of the great group is the last word in the name of the subgroup.

SUBGROUP: Great groups are subdivided into subgroups, one representing the central (typic) segment of the group and others, called intergrades, that have properties of one great group and also one or more properties of another great group, suborder, or order. Subgroups may also be made in those instances where soil properties intergrade outside the range of any other great group, suborder, or order. The names of subgroups are derived by placing one or more adjectives before the name of the great group. An example is Typic Hapludalf (a typical Hapludalf).

FAMILY: Families are separated within a subgroup primarily on the basis of properties important to the growth of plants or to the behavior of soils where used for engineering. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, and thickness of horizons. An example of a family is the fine loamy, mixed, mesic family of Typic Hapludalf.

Defined in the following paragraphs are the six soil orders in Ross County.

Entisols are recent or young soils that have been only slightly modified from the geologic material in which they formed. The only modification is a weakly expressed A1 horizon that contains an accumulation of organic matter.

Inceptisols (from the Latin *inceptum*, or beginning) are mineral soils in which horizons have started to develop. These soils are more strongly developed than the Entisols, but they are less developed than the Mollisols, Alfisols, and Ultisols. The Inceptisols lack the horizon of clay accumulation that occurs in the Alfisols, Ultisols, and most Mollisols. Unlike the Mollisols, they do not have a mollic epipedon (a thick, dark-colored surface layer). In the Inceptisols of Ross County, weak development is evident in the subsoil, which either is gray and gleyed or has stronger structure or brighter color than the original material or has been leached of some carbonates.

Mollisols (from the Latin *mollis*, or soft) are soils that have a dark-colored surface layer more than 10 inches thick and that have a base saturation of more than 50 percent. The Mollisols in Ross County formed either in areas under prairie grass or in wet areas where the soil and percolating water were high in content of bases. All the Mollisols in this county have a B horizon that is either with or without an accumulation of clay.

Alfisols are mineral soils that have an argillic horizon in which the dominant chromas are less than 6. Also, base saturation generally exceeds 35 percent or increases to more than 35 percent within 50 inches below the top of the horizon of clay accumulation or at some point above a lithic contact. Alfisols do not have a mollic epipedon, but if the surface layer is plowed, it is light colored in most places and has color values of 4 or more.

Ultisols (from the Latin *ultimus*, or last, ultimate) are old, strongly weathered soils that have an argillic horizon. These soils either have dominant chromas of 6 or

more in the argillic horizon, or they have base saturation of less than 35 percent between the top of the argillic horizon and a depth of 50 inches, or between the top of that horizon and a depth 30 inches below the top of a fragipan, if one occurs. Many Ultisols have high chromas and low base saturation, but some do not. Most of them have a surface layer that is light colored when plowed.

Histosols (from the Greek *histos*, tissue) are soils high in organic-matter content that formed under very wet conditions. In Ross County the content of organic matter in these soils ranges from 50 to 90 percent. Criteria for defining suborders, great groups, subgroups, and families of Histosols have not been developed. Only the Carlisle and Willette soils are Histosols in this county.

In the following paragraphs the subgroups in each soil order represented in the county are defined, and the soil series in each subgroup are listed.

ENTISOLS

The Entisols in Ross County are in the subgroups Typic Udifluvents and Aquic Udifluvents.

Typic Udifluvents show little evidence of horizon development, except for a weakly expressed surface horizon. They have no gleyed horizons, lack mottles of low chroma within 20 inches of the surface, and lack a buried, dark-colored horizon within 24 inches of the surface. The Genesee and Pope soils are in this subgroup.

Aquic Udifluvents are like Typic Udifluvents but have grayish mottles (chromas of 2 or less) within 20 inches of the surface. Between the depths of 20 and 40 inches the dominant chromas are greater than 2. The Eel and Philo soils are of this subgroup.

INCEPTISOLS

In Ross County the Inceptisols are in the subgroups Histic Humaquepts, Aeric Fluventic Haplaquepts, Thapto-Histic Haplaquepts, Thapto-Mollic Haplaquepts, Typic Dystrochrepts, and Lithic Dystrochrepts.

Histic Humaquepts have a histic (organic) epipedon and, unless drained, are saturated with water at some period of the year. Below the epipedon the soils are dominantly gray. In Ross County the Warners soils are in this subgroup.

Aeric Fluventic Haplaquepts have textures as fine as, or finer than, loamy fine sand. Unless the soils are artificially drained, they are saturated with water at some period of the year. They are dominantly gray, having chromas of 2 or less throughout 50 to 80 percent of a cross section, and their organic-matter content decreases irregularly from the surface downward. The Stendal and Shoals soils are in this subgroup.

Thapto-Histic Haplaquepts are like Aeric Fluventic Haplaquepts, but they have a buried organic soil within 40 inches of the surface. The Wallkill soils are in this subgroup.

Thapto-Mollic Haplaquepts are like Aeric Fluventic Haplaquepts, but they have a buried, dark-colored, mineral soil within 40 inches of the surface. The Algiers soils are in this subgroup.

Typic Dystrochrepts have a light-colored surface layer and an unmottled B horizon. In these soils an accumulation of clay in the B horizon is missing, and the B horizon has low base saturation and lacks carbonates. The Berks, Dekalb, and Muskingum soils are in this subgroup.

Lithic Dystrochrepts are like Typic Dystrochrepts but have a lithic contact (bedrock) within 20 inches of the surface. The Colyer soils are in this subgroup.

MOLLISOLS

The Mollisols in this county are in the subgroups Typic Argiaquolls, Typic Haplaquolls, Eutrochreptic Rendolls, Typic Argiudolls, Fluventic Hapludolls, and Entic Hapludolls.

Typic Argiaquolls either are saturated with water at some period of the year or are artificially drained. These soils have a B horizon of clay accumulation in which the dominant chroma is 2 or less and typically is 1. They have a mollic epipedon 10 to 24 inches thick. The Brookston, Millsdale, and Westland soils are in this subgroup.

Typic Haplaquolls have a gleyed cambic horizon in which chroma is low. An argillic horizon is lacking. The mollic epipedon is less than 24 inches thick. In Ross County the Bonpas soils are in this subgroup.

Eutrochreptic Rendolls have neither an argillic nor a calcic horizon, but they have a cambic horizon (a B horizon lacking an accumulation of clay) that is less than 8 inches thick. The soils contain material in which the calcium carbonate equivalent is more than 40 percent. Rodman soils are in this subgroup.

Typic Argiudolls have an argillic horizon in which the dominant chromas are greater than 2. Typically, the base saturation is more than 80 percent throughout. The soils have a mollic epipedon 20 inches or less thick. In Ross County the Lorenzo, Warsaw, and Wea soils are in this subgroup.

Fluventic Hapludolls have a mollic epipedon more than 20 inches thick, and they lack an argillic horizon. The only soils in this subgroup in Ross County, the Ross soils, have a cambic horizon underlying the mollic epipedon.

Entic Hapludolls lack both a cambic and an argillic horizon, and they have a mollic epipedon less than 20 inches thick. The Abscota soils are in this subgroup.

ALFISOLS

The Alfisols in Ross County are in the subgroups Typic Fragiaqualfs, Aeric Fragiaqualfs, Aeric Ochraqualfs, Typic Hapludalfs, Aquic Hapludalfs, Lithic Hapludalfs, Mollic Hapludalfs, Typic Fragiudalfs, and Aquic Fragiudalfs.

Typic Fragiaqualfs either are saturated with water at some period of the year or are artificially drained, and they have a fragipan in the subsoil. Dominant chromas in the subsoil are 2 or less. Above the fragipan there is an argillic horizon. In Ross County the Clermont soils are in this subgroup. These soils contain an accumulation of clay in the fragipan.

Aeric Fragiaqualfs are like Typic Fragiaqualfs, but in the upper part of the argillic horizon, above the fragipan, they have a thin layer in which chromas of 2 or less are not dominant. In this layer mottles with chromas of 2 or less are interspersed about equally with those of 2 or more. In Ross County the Avonburg soils are in

this subgroup. Natural drainage is better in these soils than it is in Typic Fragiaqualfs.

Aeric Ochraqualfs either are saturated with water at some period of the year or are artificially drained. They have an argillic horizon and lack a fragipan. They have a light-colored surface layer and a mottled subsoil in which colors with chromas of 2 or less account for slightly more than half of the matrix. Brighter mottles are evident. The Bartle, Crosby, Henshaw, McGary, Sleeth, and Taggart soils are in this subgroup.

Typic Hapludalfs have an argillic horizon that is free of mottles and has chromas of 2 or less in the upper 10 inches. These soils lack a fragipan. They have a light-colored surface layer in which color values are 4 or more. The Alexandria, Alford, Alvin, Casco, Fox, Kendallville, Loudonville, Markland, Mentor, Miami, Milton, Ockley, Pekin, Pike, Thackery, and Uniontown soils are in this subgroup.

Aquic Hapludalfs are like Typic Hapludalfs, but they have mottles with chromas of 2 or less within 10 inches of the top of the argillic horizon. In this part of the argillic horizon, the dominant colors have chromas of more than 2. The Cardington and Celina soils are in this subgroup.

Lithic Hapludalfs are like Typic Hapludalfs, but they have a lithic contact of hard bedrock within 20 inches of the surface. The Ritchey soils are in this subgroup.

Mollic Hapludalfs are like Typic Hapludalfs, but they have a darker colored surface layer. The plow layer, or its equivalent after the material in the original surface layer is mixed to a depth of 7 inches, has a color value of 3 or less when moist. The Neotoma soils are in this subgroup.

Typic Fragiudalfs have a fragipan, and they are free of mottles having chromas of 2 or less within the upper 10 inches of the argillic horizon, which occurs above the fragipan. In the soils of Ross County that are placed in this subgroup, the fragipan contains an accumulation of clay. These are the Rainsboro soils.

Aquic Fragiudalfs are like Typic Fragiudalfs, but they have mottles with chromas of 2 or less within 10 inches of the top of the argillic horizon. In this part of the argillic horizon, the dominant colors have chromas of more than 2. The Rossmoyne soils are in this subgroup.

ULTISOLS

The Ultisols in Ross County are in the subgroups Typic Fragiaquults, Typic Fragiudults, Aquic Hapludults, Paraquic Hapludults, and Alfic Hapludults.

Typic Fragiaquults have a fragipan, and they have dominant chromas of 2 or less in all horizons between the fragipan and the A1 or the Ap horizon. The Tyler soils are in this subgroup.

Typic Fragiudults have a fragipan and, above it, an argillic horizon. They have no mottles with chromas of 2 or less in the upper 10 inches of the argillic horizon. The Monongahela soils are in this subgroup.

Aquic Hapludults have an argillic horizon, and in the upper 10 inches of this horizon, there are mottles with chromas of 2 or less. These soils have base saturation of less than 35 percent to a depth of at least 50 inches below the top of the argillic horizon. The Cruze, Fawcett, Latham, and Rarden soils are in this subgroup.

Paraquic Hapludults are like Aquic Hapludults, but the upper 10 inches of their argillic horizon is free of mottles with chromas of 2 or less. Mottles such as these, however, occur between the depths of 10 and 20 inches below the top of the argillic horizon. The Cana and Coolville soils are in this subgroup.

Alfic Hapludults have an agillic horizon that lacks mottles with chromas of 2 or less within 20 inches of its top. In these soils base saturation increases to more than 35 percent within 50 inches of the top of the argillic horizon. The Hickory, Negley, Parke, and Wellston soils are in this subgroup. The Hickory, Negley, and Parke soils are not Typic Hapludults, because of an increase in base saturation to more than 35 percent within 50 inches of the top of the argillic horizon. Wellston soils have sufficiently low base saturation and, in this respect, meet the requirements for Typic Hapludults.

HISTOSOLS

Soils classified as Histosols have not been placed in great groups, subgroups, and families. In Ross County these are the Carlisle and Willette soils.

Descriptions of the Soil Series

This subsection describes each soil series in the county and the profile of a soil representative of the series. The section "Descriptions of the Soils" also describes the soil series, but in language that is easier for the layman to understand. Also in that section is a description of each mapping unit, including the land types in the county. These mapping units are shown on the large soil map.

A number of the soils for which technical descriptions are given were sampled in the field, and the samples of the individual horizons were analyzed in the laboratory. Each soil that was sampled is identified by a symbol consisting of the letters RO plus a characterization number (example, RO–6). The symbol is listed in the paragraph just before the profile description and in table 8 in the subsection "Laboratory Data," which follows this subsection.

The color of each horizon is described in words, such as yellowish brown, but it can also be indicated by symbols for the hue, value, and chroma, such as 10YR 5/4. These symbols, called Munsell color notations (*9*), are used by soil scientists to evaluate the color of the soil precisely. For the profiles described, the names of the colors and the color symbols are for moist soils unless stated otherwise.

Abscota series, calcareous variant

The calcareous variants from the normal Abscota soils are moderately coarse textured and well drained. These soils developed in nearly neutral to calcareous stream alluvium that washed mainly from soils underlain by glacial drift of Wisconsin age. They lie on first bottoms and typically are along the inner side of meanders in the major streams, principally the Scioto River and Paint Creek. These variants occur closely with the Genesee soils, but they contain considerably more sand and less silt and clay than those soils.

Typical profile of Abscota sandy loam, calcareous variant, in a cultivated area (near the Scioto River, 200 yards

east of the north end of Kilgore Bridge, on U.S. Highway Nos. 35 and 50):

A11—0 to 4 inches, very dark grayish-brown (10YR 3/2) sandy loam; single grain (structureless) except in topmost inch, which has weak, medium, platy structure; friable; weakly calcareous; abrupt, smooth boundary.

A12—4 to 13 inches, very dark brown (10YR 2/2) sandy loam; very weak, coarse, subangular blocky structure; friable; contains a few rounded pebbles up to 3 inches in diameter; calcareous; abrupt, smooth boundary.

C—13 to 44 inches +, brown (10YR 5/3), calcareous medium sand; single grain; loose; contains minor lenses of loamy medium sand, coarse sand, and sand and gravel.

The dark-colored surface (A) horizon ranges from 10 to 16 inches in thickness. In some places the A11 horizon is loamy sand and the A12 horizon is sand or loamy sand. In places there are thin lenses of silt loam or fine sandy loam in the A12 horizon. The A horizon is dark brown (10YR 3/3) in some places. The profile is weakly to moderately calcareous to a depth of more than 40 inches.

Alexandria series

The Alexandria series consists of well-drained soils that developed in moderately fine textured, calcareous glacial till on moraines of Wisconsin age. The till is generally clay loam or silty clay loam in texture and contains many angular sandstone fragments of local origin. Slopes range from undulating to steep. Alexandria soils are in the same drainage sequence as the moderately well drained Cardington soils.

Typical profile of Alexandria silt loam, 18 to 25 percent slopes, moderately eroded, in a cultivated field (Huntington Township, 100 yards north of the intersection of the Twin Township line and Black Run Road):

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

B1t—6 to 9 inches, dark yellowish-brown (10YR 4/4) silty clay loam; brown (10YR 5/3) silty coatings; moderate, medium, subangular blocky structure; firm; very strongly acid; clear, smooth boundary.

B21t—9 to 16 inches, dark-brown (10YR 4/3) light silty clay; brown (10YR 5/3) silty coatings; strong, medium, subangular blocky structure; firm; pebbles and fragments of sandstone, shale, or glacial erratics make up 10 percent of mass; very strongly acid; clear, smooth boundary.

B22t—16 to 20 inches, dark yellowish-brown (10YR 4/4) light clay; dark-brown (10YR 4/4) clay coatings; moderate, medium, subangular blocky structure; firm; coarse skeleton as in B21 horizon; strongly acid; clear, smooth boundary.

B23t—20 to 24 inches, dark yellowish-brown (10YR 4/4) light clay; dark grayish-brown (10YR 4/2) clay skins on peds; weak, medium, subangular blocky structure; very firm; coarse skeleton as in B21 horizon; neutral; gradual, wavy boundary.

B3t—24 to 28 inches, dark yellowish-brown (10YR 4/4) light clay; dark grayish-brown (10YR 4/2) clay skins and flows; weak, coarse, subangular blocky structure; firm; coarse skeleton as in B21 horizon; neutral; gradual, wavy boundary.

C1—28 to 34 inches, yellowish-brown (10YR 5/4) silty clay loam; thin grayish-brown (10YR 5/2) coatings; very weak, coarse, subangular blocky structure; firm; glacial till; coarse skeleton about 20 percent; calcareous; mildly alkaline.

C2—34 inches +, brown (10YR 5/3) silty clay loam; massive; firm; glacial till; calcareous.

The till is of loam texture in some places, principally in the western part of the early Wisconsin glacial area. Here, the Alexandria soils have B2 and B3 horizons that are coarser textured than in the profile described. The B horizon ranges from heavy silty clay loam to light silty clay or light clay. In forested areas that have never been cleared, the soils have thin O, A1, and A2 horizons. The depth to the C horizon ranges from 27 to 40 inches. Alexandria soils are medium acid or strongly acid in the A horizon and are strongly or very strongly acid in the upper B horizon. The pH increases with depth in the lower B horizon.

Alford series

In the Alford series are well-drained soils that developed from a thick deposit of windblown silt, or loess, of Wisconsin age. These soils are inextensive and occur only on the unglaciated Allegheny Plateau. They lie on the crests of low hills along the eastern side of the Scioto River valley south of Richmondale. The loess ranges from 4 to 8 feet in thickness. Presumably it was originally calcareous but now is acid because of leaching. It is underlain by a buried soil, or paleosol.

The Alford soils are similar to the Pike soils in the upper solum, but the entire solum of Alford soils formed in loess, whereas that of Pike soils formed in loess over loamy, gravelly materials. In Ross County the Alford soils occur closely with the Latham soils.

Typical profile of Alford silt loam, 6 to 12 percent slopes, moderately eroded, in a cultivated field (Jefferson Township, seven-sixteenths of a mile east-northeast of the junction of Watson and Whiskey Run Roads):

Ap—0 to 9 inches, brown (10YR 5/3) silt loam; moderate, medium, granular structure; friable; medium acid; abrupt, smooth boundary.

A2—9 to 13 inches, yellowish-brown (10YR 5/6) silt loam; weak, fine, subangular blocky structure; friable; strongly acid; clear, smooth boundary.

B1t—13 to 18 inches, brown (7.5YR 5/4) silty clay loam; thin, dark-brown (10YR 4/3) clay coatings; moderate, medium, subangular blocky structure; friable; strongly acid; gradual, smooth boundary.

B21t—18 to 29 inches, brown (7.5YR 5/4) silty clay loam; dark-brown (7.5YR 4/4) clay coatings; moderate, medium, subangular blocky structure; firm; strongly acid; gradual, smooth boundary.

B22t—29 to 36 inches, strong-brown (7.5YR 5/6) heavy silt loam to light silty clay loam; dark-brown (7.5YR 4/4) clay coatings, but not as abundant as in B21 horizon; weak, medium, subangular blocky structure; firm; strongly acid; gradual, smooth boundary.

B3t—36 to 48 inches, yellowish-brown (10YR 5/4) silt loam; thin, dark-brown (10YR 4/3) clay coatings; weak, coarse, subangular blocky structure; firm; strongly acid to medium acid; gradual, smooth boundary.

C1—48 to 87 inches, yellowish-brown (10YR 5/4) and light yellowish-brown (10YR 6/4) silt loam; contains a few dark-brown (10YR 4/3) clay skins in upper 15 inches; massive; firm; slightly acid to neutral; clear, smooth boundary.

C2—87 to 94 inches, pale-brown (10YR 6/3) silt loam; massive; firm; slightly acid; clear, smooth boundary.

C3—94 to 98 inches, mottled light yellowish-brown (10YR 6/4) and strong-brown (7.5YR 5/6) silty clay; massive; firm; medium acid.

The thickness of the solum is fairly uniform, but the thickness of the C horizon varies with that of the loess. In general, the stronger the slope, the thinner is the loess. The B horizon ranges from heavy silt loam to light silty clay loam in texture. These soils are medium acid or strongly acid in the A horizon, strongly or very strongly acid in the upper and middle parts of the B horizon, and strongly acid to slightly acid in the lower B horizon. The entire profile is leached.

Algiers series

In the Algiers series are somewhat poorly drained soils that occur with the very poorly drained Westland and Bonpas soils on low glacial terraces of late Wisconsin age. Algiers soils consist of recent alluvium 14 to 24 inches thick over a dark-colored buried soil. The alluvium was washed principally from soils underlain by late Wisconsin glacial drift. The Algiers soils also occur closely with the Genesee and Eel soils of the bottom lands. Genesee and Eel soils lack the dark-colored buried soil that characterizes the Algiers soils.

Typical profile of Algiers silt loam in a cultivated field (Buckskin Township, 1½ miles east of Lyndon on Buckskin Creek):

A—0 to 18 inches, dark grayish-brown (10YR 4/2) to grayish-brown (10YR 5/2) fine silt loam; moderate, coarse, granular structure; friable; slightly acid; abrupt, smooth boundary.
IIAb—18 to 28 inches, black (10YR 2/1) silty clay loam; strong, fine, subangular blocky structure; firm; slightly acid; gradual, wavy boundary.
IIBb—28 to 37 inches +, olive-gray (5Y 4/2) light silty clay mottled with reddish yellow (7.5YR 6/8); moderate, coarse, prismatic structure that breaks to moderate, coarse, subangular blocky structure; very firm; slightly acid.

This is the profile of an Algiers soil that formed in 18 inches of recent alluvium deposited over Westland silty clay loam. The IIBb horizon is the B horizon of the Westland soil.

The A horizon of Algiers soils generally is silt loam, but locally it is loam or silty clay loam. In thickness the A horizon ranges from 14 to 24 inches. These soils are slightly acid or neutral throughout the solum.

Alvin series

The Alvin series consists of well-drained soils that formed in windlaid sand of Wisconsin glacial age. The sand grains are of uniform size and were deposited on terraces of both Wisconsin and Illinoian ages. The Alvin soils occur closely with the Fox soils on terraces of Wisconsin age and with the Pike and Rainsboro soils on terraces of Illinoian age. They are deeper to calcareous material than the Fox soils; they are coarser textured than the Parke and Pike soils.

Typical profile of Alvin fine sandy loam, 0 to 2 percent slopes, in a cultivated field (Jefferson Township, NW¼ sec. 4, 1 mile NW. of Richmondale):

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) fine sandy loam; weak, medium, granular structure; friable; slightly acid; abrupt, smooth boundary.
A3—8 to 11 inches, brown (7.5YR 5/4) fine sandy loam; weak, coarse, subangular blocky structure; slightly hard when dry; medium acid; abrupt, smooth boundary.
B1—11 to 16 inches, brown (7.5YR 4/4) fine sandy loam; hard when dry; weak; coarse, subangular blocky structure; strongly acid; abrupt, smooth boundary.
B21t—16 to 20 inches, strong-brown (7.5YR 5/6) sandy clay loam; very thin, dark-brown (7.5YR 4/4) clay coatings on peds; weak, coarse, subangular blocky structure; firm; strongly acid; gradual, smooth boundary.
B22t—20 to 29 inches, dark-brown (7.5YR 4/4) sandy clay loam; weak, coarse, subangular blocky structure; firm; strongly acid; gradual boundary.
B23t—29 to 35 inches, dark-brown (7.5YR 4/4) sandy clay loam, weak, coarse, subangular blocky structure; firm when moist, sticky when wet; very strongly acid; gradual boundary.
B31t—35 to 44 inches, dark-brown (7.5YR 4/4) heavy fine sandy loam; weak, coarse, subangular blocky structure; firm; very strongly acid; gradual boundary.
B32—44 to 60 inches, dark-brown (7.5YR 4/4) fine sandy loam; massive; friable; strongly acid; diffuse boundary.
C1—60 to 70 inches, dark-brown (7.5YR 5/4) loamy sand; massive; friable; medium acid.
C2—70 to 94 inches, brown (10YR 5/3) medium and fine sand; single grain; loose; strongly acid.
IIC3—94 to 108 inches, stratified yellowish-brown (10YR 5/4) loamy fine sand (single grain) and pale-brown (10YR 6/3) silt loam (massive); strongly acid.

Locally, the A horizon is very fine sandy loam or sandy loam. The B2 horizon is medium acid or strongly acid. The underlying material, below a depth of 60 inches, ranges from strongly acid to neutral.

Avonburg series

The Avonburg series consists of somewhat poorly drained soils that have a moderately distinct fragipan. These soils developed in 24 to 48 inches of silty material underlain by weathered, moderately fine textured glacial till of Illinoian age. They occupy wide, nearly level to gently undulating ridgetops on the glaciated Allegheny Plateau.

Avonburg soils are in the same drainage sequence as the well drained Hickory soils, the moderately well drained Rossmoyne soils, and the poorly drained Clermont soils, and they occur closely with those soils.

Typical profile of Avonburg silt loam, 0 to 2 percent slopes, in a cultivated field (Huntington Township, on the summit of Sulfur Lick Flat, 2½ miles south of U.S. Highway No. 50, 1 mile west of Camelin Hill Road):

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium and fine, granular structure; friable; strongly acid; abrupt, smooth boundary.
A2—8 to 12 inches, yellowish-brown (10YR 5/4) silt loam; very dark grayish-brown (10YR 3/2) coatings on structural units; moderate, fine, granular structure; friable; many fine concretions; very strongly acid; smooth boundary.
B1—12 to 16 inches, pale-brown (10YR 6/3) silt loam; common, prominent, strong-brown (7.5YR 5/8) mottles; thin, continuous, gray (10YR 5/1) silty films on ped surfaces; moderate, medium, subangular blocky structure; very strongly acid; clear, smooth boundary.
B21t—16 to 23 inches, strong-brown (7.5YR 5/8) silty clay loam; common, medium, distinct mottles of light yellowish brown (10YR 6/4); continuous gray (7.5YR 5/1) clay films on ped surfaces; moderate, medium, subangular blocky structure; firm; very strongly acid; gradual, wavy boundary.
B22t—23 to 32 inches, strong-brown (7.5YR 5/6) silty clay loam; common, medium, distinct mottles of light brownish gray (10YR 6/2); continuous gray (7.5YR

5/1) clay films 0.1 to 5 millimeters thick; a few patches of grayish-brown (10YR 5/2) silty films on ped surfaces; moderate, medium, subangular blocky structure; firm; very strongly acid; gradual, wavy boundary.

Bx1—32 to 40 inches, light yellowish-brown (10YR 6/4) light silty clay loam; common, distinct,, strong-brown (7.5YR 5/6) mottles; moderate, thin, platy structure; firm; slightly brittle; thin, light-gray (10YR 7/2) coatings on platy peds; very strongly acid; clear, wavy boundary.

IIBx2—40 to 54 inches, mottled strong-brown (7.5YR 5/6), pale-brown (10YR 6/4), and light brownish-gray (10YR 6/2) light clay loam; weak, platy structure that breaks to weak, subangular blocky structure; firm; slightly brittle; very strongly acid; gradual, wavy boundary.

IIB3—54 to 76 inches, distinctly mottled strong-brown (7.5YR 5/8), light yellowish-brown (10YR 6/4), and gray (10YR 6/1) light clay loam; weak, medium and coarse, subangular blocky structure; firm; thin, gray (10YR 5/1) clay films on peds; very strongly acid; gradual, wavy boundary.

The texture of the B2 horizon, which developed in loess, ranges from fine silt loam to silty clay loam. The depth to the fragipan ranges from 24 to 36 inches. In the fragipan the textures are clay loam, silty clay loam, and heavy loam. Below the fragipan the glacial till is leached clay loam or clay. Below the Ap horizon the profile is strongly or very strongly acid to the middle or lower part of the fragipan. The pH then increases with depth, and the B3 horizon is very strongly acid to medium acid.

Bartle series

The Bartle series consists of silty, somewhat poorly drained soils that developed in noncalcareous glacial lacustrine deposits. Their B2t horizon is mainly silty clay loam, though strata of loam or sandy loam occur in most places. Bartle soils lie south of the glaciated area of late Wisconsin age and are on nearly undissected low terraces in the side valleys of the Scioto River and Paint Creek. The terraces are slightly above the flood plains.

The Bartle soils are in the same drainage sequence as the moderately well drained Pekin soils and the well drained Mentor soils, and they occur closely with those soils. They have a thinner solum than the Taggart soils and contain less gravel in the lower part of the solum. The parent material of Bartle soils is considerably more acid than that of Henshaw soils.

Typical profile of Bartle silt loam, 0 to 2 percent slopes (Paint Township, ¼ mile north of Falls Road, 1½ miles west of Bainbridge):

Ap—0 to 7 inches, grayish-brown (10YR 5/2) smooth silt loam; moderate, medium, granular structure; friable; a few small, hard, dark concretions; slightly acid; abrupt boundary.

A2—7 to 12 inches, light brownish-gray (10YR 6/2) silt loam; a few, fine, distinct mottles of yellowish brown (10YR 5/6); some peds are coated with grayish brown (10YR 5/2); weak, medium, subangular blocky structure; friable; numerous small, hard, dark concretions; medium acid; smooth, clear to gradual boundary.

B1—12 to 16 inches, grayish-brown (2.5Y 5/2) fine silt loam; many, fine, distinct mottles of light olive brown (2.5Y 5/4); a few silty ped coatings of grayish brown (2.5Y 5/2); weak to moderate, fine, subangular blocky structure; firm; a few small, dark concretions; strongly acid; smooth, clear to gradual boundary.

B21t—16 to 20 inches, grayish-brown (2.5Y 5/2) coarse silty clay loam; many, medium, distinct mottles of yellowish brown (10YR 5/6); a few clay coatings of grayish brown (10YR 5/2); a few small, dark concretions; weak, medium, subangular blocky structure; firm; strongly acid; clear, smooth boundary.

B22t—20 to 27 inches, light brownish-gray (2.5Y 6/2) fine silt loam; many, medium, distinct mottles of yellowish brown (10YR 5/6); about 50 percent of the mass has chromas of 2 or less; very weak, coarse, subangular blocky structure; firm; slightly brittle; strongly acid; clear, smooth boundary.

B31—27 to 36 inches, strong-brown (7.5YR 5/6) silt loam; distinct, pale-brown (10YR 6/3) mottles; massive; friable; strongly acid; clear, smooth boundary.

B32—36 to 52 inches, gray (10YR 6/1) silt loam; many, coarse, distinct mottles of strong-brown (7.5YR 5/6); massive; firm to friable; strongly acid; clear, smooth boundary.

C1—52 to 60 inches, brownish-yellow (10YR 6/8) fine silt loam; many, coarse, distinct mottles of light gray (N 6/0); massive; firm; free water at depth of 52 inches; medium acid.

C2—60 to 68 inches +, gray (N 5/0) silt loam to very fine sandy loam; massive; firm, slightly acid.

The B2t horizon ranges from heavy silt loam to medium silty clay loam. In the lower horizons the texture is variable; it is dominantly silt loam but is loam, clay loam, or sandy in some places. In many areas the lower horizons are slightly brittle. The upper solum is very strongly acid or strongly acid.

Berks series

Soils of the Berks series are moderately sloping to steep, light colored, very acid, and well drained. These soils have a solum of very stony or channery silt loam. They lack a textural B horizon but have a cambic B horizon that is more than 50 percent coarse fragments larger than 2 millimeters across. Most of the fragments are fine-grained sandstone. The Berks soils are in both the glaciated and the unglaciated parts of the Allegheny Plateau.

These soils occur near the Muskingum, Dekalb, Wellston, and Neotoma soils, but they contain more coarse fragments in their B horizon than those soils. They are not so sandy as the Dekalb soils, and they contain less clay in their B horizon than the Wellston soils. The A1 horizon of the Berks soils is thinner and lighter colored than that of the Neotoma soils.

Typical profile of a Berks very stony silt loam in a forested area (Colerain Township, NE¼ sec. 26, 0.2 mile northwest of the intersection of Swamp and Swamp Ridge Roads):

O1—½ inch to 0, black (N 2/0), very fine organic material of the mor type, dark brown (7.5YR 3/2) when dry; strongly acid.

A1—0 to 1 inch, dark grayish-brown (10YR 4/2) very stony silt loam; weak, fine and medium, granular structure; friable; very strongly acid; abrupt, smooth boundary.

A2—1 to 11 inches, pale-brown (10YR 6/3) very stony silt loam; weak, very fine, subangular blocky structure; friable; 15 to 20 percent is a coarse skeleton of small sandstone fragments; very strongly acid; gradual boundary.

B1—11 to 15 inches, pale-brown (10YR 6/3) channery silt loam; fine, distinct, yellowish-brown (10YR 5/4) coatings; very weak, fine, subangular blocky structure; firm; 20 to 30 percent is a coarse skeleton

of small sandstone fragments; very strongly acid; gradual boundary.

B2—15 to 22 inches, strong-brown (7.5YR 5/6) very channery silt loam; weak, fine and medium, subangular blocky structure; firm; a few, thin, discontinuous clay films in pores and surrounding pebbles; 50 to 60 percent is a coarse skeleton of sandstone fragments; strongly to very strongly acid; diffuse to gradual boundary.

B3—22 to 34 inches, yellowish-brown (10YR 5/4) very channery loam to very fine sandy loam; very weak, fine and medium, subangular blocky structure; friable; a few discontinuous clay films on pebbles and peds; 80 to 90 percent is a coarse skeleton of sandstone fragments; strongly to very strongly acid.

R—34 inches, fairly solid but fractured bedrock; friable sandy material occurs in some cracks; bedrock is fine-grained sandstone of the Logan formation.

The solum ranges from 24 to 40 inches in thickness. The nonskeletal upper B horizon is 5 to 8 inches thick. In the skeletal part of the B horizon, the content of channery fragments ranges from 50 to 85 percent. The fragments are mostly flat pieces of sandstone and siltstone, ¼ to 1½ inches thick and 1 to 6 inches across. The solum is strongly acid to extremely acid throughout.

Bonpas series

The Bonpas series consists of dark-colored, very poorly drained soils that developed from calcareous glacial lacustrine silt, as well as small lenses of silty clay loam and sand, of late Wisconsin age. These soils occur in nearly level and depressional areas, mainly in the northeastern part of the county. They are in the same drainage sequence as the somewhat poorly drained Henshaw soils and the moderately well drained or well drained Uniontown soils.

Typical profile of Bonpas silty clay loam in a cultivated field (Colerain Township, NE¼ sec. 5, 2 miles north and ½ mile east of Hallsville):

A1p—0 to 7 inches, very dark gray (10YR 3/1) silty clay loam; strong, medium and coarse, granular structure; friable; medium acid; abrupt, smooth boundary.

A12—7 to 18 inches, black (10YR 2/1) silty clay loam; strong, fine and medium, subangular blocky structure; firm when moist, plastic when wet; slightly acid; clear, wavy boundary.

B1g—18 to 24 inches, very dark grayish-brown (2.5Y 3/2) silty clay loam mottled with light olive brown (2.5Y 5/4); moderate, medium, angular blocky structure; firm when moist, plastic when wet; neutral; gradual, smooth boundary.

B21g—24 to 32 inches, dark-gray (10YR 4/1) silty clay loam mottled with yellowish brown (10YR 5/8); moderate, coarse, prismatic structure that breaks to moderate, medium, angular blocky structure; firm when moist, plastic when wet; neutral; gradual, smooth boundary.

B22g—32 to 66 inches, mottled brown (10YR 5/3) and gray (10YR 5/1) silty clay loam; weak, coarse, subangular blocky structure; firm when moist, plastic when wet; few small pebbles (erratics); neutral; diffuse, smooth boundary.

B3—66 to 72 inches, mottled yellowish-brown (10YR 5/6) and grayish-brown (10YR 5/2) coarse silty clay loam to fine silt loam; massive; firm; mildly alkaline.

C3—72 to 82 inches, yellowish-brown (10YR 5/6) and dark grayish-brown (2.5YR 4/2) silt loam stratified with thin lenses of sand; calcareous; strongly alkaline.

The A1 horizon normally is slightly thicker and darker colored in depressional areas than it is in more nearly level areas. In texture the gleyed B horizon ranges from heavy silt loam to silty clay loam or clay loam. The C horizon ranges from silt loam to silty clay loam. The depth to the C horizon generally ranges between 60 and 80 inches, but in places it is as little as 48 inches. Lenses of fine and medium sand, 8 to 15 inches thick, are common in the C horizon. The A horizon is slightly acid or medium acid, but the pH increases with depth.

Brookston series

The Brookston series consists of dark-colored, very poorly drained soils that developed over highly calcareous loam glacial till of Wisconsin age. These soils occur throughout the Wisconsin glacial till area, but they are more extensive on the till plains than on the moraines. They are in the same drainage sequence as the somewhat poorly drained Crosby soils, the moderately well drained Celina soils, and the well drained Miami soils.

Typical profile of Brookston silty clay loam in a cultivated field (Green Township, NE¼ sec. 12):

A1p—0 to 7 inches, black (10YR 2/1) silty clay loam; moderate, medium, granular structure; friable; slightly acid to neutral; abrupt, smooth boundary.

A12—7 to 12 inches, very dark gray (10YR 3/1) silty clay loam; moderate, very fine and fine, subangular blocky structure; firm; slightly acid to neutral; clear, wavy boundary.

B21tg—12 to 16 inches, mottled very dark gray (10YR 3/1) and light olive brown (2.5Y 5/4) silty clay loam; moderate, fine and medium, subangular blocky structure; firm; very dark gray clay films; neutral; few, small, dark concretions; gradual, smooth boundary.

B22tg—16 to 20 inches, dark grayish-brown (10YR 4/2) clay loam; many, medium, distinct, light yellowish-brown (10YR 6/4) mottles and dark-gray (10YR 4/1) clay films; moderate, medium, subangular blocky structure; firm; neutral; clear, wavy boundary.

B23tg—20 to 36 inches, grayish-brown (10YR 5/2) clay loam; many, medium, prominent, yellowish-brown (10YR 5/6) mottles and dark-gray (10YR 4/1) clay films on ped surfaces; moderate, medium, subangular blocky structure; firm when moist, plastic when wet; neutral; diffuse boundary.

B3g—36 to 50 inches, mottled yellowish-brown (10YR 5/8) and light brownish-gray (10YR 6/2) clay loam; weak, medium, subangular blocky structure; firm; neutral; clear wavy boundary.

C—50 to 62 inches, mottled gray (10YR 6/1) and yellowish-brown (10YR 5/8) silt loam (glacial till); massive; firm; moderately alkaline; calcareous.

The dark-colored mollic epipedon (Ap or A1 and upper B horizons) ranges from 10 to 17 inches in thickness. In places in the gleyed B horizon, there are thin layers of silty clay. The depth to the C horizon ranges from 36 to 65 inches. The upper part of the solum is medium acid to neutral, but below 12 to 24 inches the pH increases with depth.

Cana series

The Cana series consists of moderately well drained and well drained soils that occur on uplands in both the Illinoian and the Wisconsin glacial areas of the Allegheny Plateau. These soils developed from calcareous glacial drift of Illinoian age, 18 to 42 inches thick, that is underlain by residuum that weathered from acid clay shale. In small areas on the smoother slopes, the drift was capped by a thin mantle of silty material, or loess,

apparently of Wisconsin age. The Cana soils occur with the Rossmoyne, Hickory, Colyer, and Latham soils.

Typical profile of Cana silt loam, 6 to 12 percent slopes, in a cultivated field (RO–58; Buckskin Township, 400 yards west-southwest of intersection of Turkey Ridge and Edginton Roads):

Ap—0 to 7 inches, dark-brown (10YR 4/3) smooth silt loam; weak to moderate, medium, granular structure; friable; medium acid; abrupt, smooth boundary.

A2—7 to 14 inches, dark-brown (10YR 4/3) silt loam; strong, medium and coarse, granular structure; slightly firm; strongly acid; clear, smooth boundary.

B1—14 to 18 inches, yellowish-brown (10YR 5/6) silty clay loam; dark yellowish-brown (10YR 4/4) clay coatings on peds; strong; fine, subangular blocky structure: slightly firm; strongly to very strongly acid; abrupt, smooth boundary.

IIB21t—18 to 21 inches, yellowish-brown (10YR 5/6) gritty silty clay loam; common, medium, distinct mottles of dark brown (7.5YR 4/4) and pale brown (10YR 6/3); strong, fine and medium, subangular blocky structure; firm; a few soft, dark concretions and small pebbles; thin, continuous, brown (10YR 5/3) clay coatings on peds; very strongly acid; diffuse, smooth boundary.

IIB22t—21 to 29 inches, yellowish-brown (10YR 5/6) clay loam; common, medium, distinct mottles of pale brown (10YR 6/3) and light brownish gray (10YR 6/2); moderate, medium, subangular blocky structure; firm; common, black, soft concretions; thin, patchy, dark yellowish-brown (10YR 4/4) clay films; very strongly acid; abrupt, smooth boundary.

IIIB23t—29 to 40 inches, mottled light brownish-gray (2.5Y 6/2) and yellowish-brown (10YR 5/6) clay; weak, fine, subangular blocky structure; firm when moist, plastic when wet; extremely acid; gradual, smooth boundary.

IIIB3—40 to 47 inches, mottled light brownish-gray (10YR 6/2), dark yellowish-brown (10YR 4/4), and strong-brown (7.5YR 5/6) clay; weak, medium, platy structure; firm when moist, plastic but nonsticky when wet; extremely acid; abrupt, wavy boundary.

IIIC—47 to 53 inches, slightly weathered dark-gray (10YR 4/1) Sunbury shale; extremely acid.

In most areas having slopes of more than 18 percent, the A horizon developed from till instead of from loess. The texture of the upper B horizon that formed in till ranges from clay loam and silty clay loam to light clay. Just below the contact of the upper B horizon with shale-derived material, the texture changes abruptly to clay, which has a clay content of more than 50 percent. In areas where the overlying material is of Wisconsin age, the depth to residuum derived from shale ranges from 20 to 36 inches. The depth to underlying shale ranges between 36 and 50 inches. Generally, the depth to shale decreases with increasing slope. The A horizon is neutral to medium acid. The pH decreases with depth, and the lower solum is very strongly acid or extremely acid. In the upper solum the pH values are slightly higher in areas of Wisconsin till than they are in areas of Illinoian till.

Cardington series

The Cardington series consists of moderately well drained soils that generally developed from calcareous, moderately fine textured glacial till of Wisconsin age. The till is clay loam or silty clay loam in texture and contains many subangular sandstone fragments of local origin. In some places where slopes generally are 12 percent or less, the upper part of the solum developed in loess.

Like the well-drained Alexandria soils and the somewhat poorly drained Crosby soils, with which they occur in the same drainage sequence, the Cardington soils are only in the valleys of Paint Creek and some of its tributaries. Here, they lie along the lower valley walls. The Cardington soils have lower base status than the Celina soils, and they formed in till having a lower content of carbonates.

Typical profile of Cardington silt loam, 2 to 6 percent slopes, in a cultivated field (Paxton Township, 350 yards east of Jones Levee Road and 500 yards southeast of Baum Hill Road):

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; friable; strongly acid; abrupt, smooth boundary.

A3—7 to 10 inches, yellowish-brown (10YR 5/4) heavy silt loam; peds coated with brown (10YR 5/3); moderate, fine, subangular blocky structure; firm; very strongly acid; clear, smooth boundary.

B1—10 to 13 inches, dark yellowish-brown (10YR 4/4) silty clay loam; peds coated with brown (10YR 5/3); moderate, fine, subangular blocky structure; firm; very strongly acid; clear, smooth boundary.

B2t—13 to 21 inches, dark yellowish-brown (10YR 4/4) silty clay loam or silty clay that is faintly mottled with light brownish gray (10YR 6/2); peds coated with brown (10YR 5/3) clay films; moderate, fine, subangular blocky structure; firm; very strongly acid; clear, wavy boundary.

B3t—21 to 29 inches, yellowish-brown (10YR 5/4) clay loam that is faintly mottled with light brownish gray (10YR 6/2); dark-brown (10YR 4/3) clay coatings on ped surfaces; weak, medium, subangular blocky structure; firm; contains many small pebbles (mostly erratics); slightly acid; abrupt, wavy boundary.

C—29 to 52 inches, yellowish-brown (10YR 5/4) clay loam till high in sandstone content; firm, compact; calcareous.

In some places, especially in the western part of the early Wisconsin drift area, the Cardington soils developed in loam till and their B horizon is less clayey than in the profile described. In texture the B horizon ranges from heavy silty clay loam to light silty clay. The thickness of the soil over calcareous till ranges from 27 to 40 inches. These Cardington soils are medium acid to very strongly acid in the A horizon and are strongly acid to extremely acid in the upper part of the B horizon. The pH values increase with depth in the lower part of the B horizon.

Carlisle series

In the Carlisle series are very poorly drained organic soils that are 42 or more inches thick over mineral material. The organic material consists of muck, or muck underlain by peat, and was formed largely by the decomposition of trees, grasses, and sedges. Normally, it overlies gray calcareous clay or silty clay that varies in thickness and, in turn, is underlain by marly gravel that grades to stratified, calcareous gravel and sand.

The Carlisle soils occur only on gravel and sand terraces of Wisconsin age. They are associated with the Willette, Wallkill, Warners, and Westland soils.

Typical profile of Carlisle muck in a cultivated field (Colerain Township, NE¼ sec. 7):

1—0 to 6 inches, black (N 2/0), very friable, nearly loose, granular muck; neutral to mildly alkaline; plowed.
2—6 to 13 inches, black (N 2/0) rather compact but friable muck; breaks out in fairly large chunks; contains some partly decomposed plant remains (reeds and sedges); neutral to slightly acid.
3—13 to 30 inches, black (7.5YR 2/1) relatively compact but friable, fibrous muck; breaks out in fairly large chunks; massive; contains abundant, partly decomposed plant remains; layer is less firm, less compact, and more fibrous in lower 10 inches; medium acid.
4—30 to 50 inches, dark grayish-brown (10YR 4/2) to very dark grayish-brown (10YR 3/2), fibrous, macerated peat; massive; medium acid.
IIC1—50 to 63 inches, gray, calcareous, very firm clay.
IIC2—63 to 70 inches, marly, calcareous gravel and sand.

The combined thickness of the organic layers over mineral material ranges from 42 to more than 60 inches.

Casco series

The Casco series consists of steep, light-colored soils that developed from calcareous gravel and sand of Wisconsin age. These soils occupy well-drained uplands and terrace escarpments. They have a well-developed textural and color profile, and their A, B, and C horizons are well defined.

The Casco soils are shallower over sand and gravel than the Fox soils and have thinner horizons. The A1, or the Ap, horizon of Casco soils is lighter colored than that of Lorenzo soils.

Typical profile of a Casco loam (Springfield Township, SW¼ sec. 1):

Ap—0 to 6 inches, dark-brown (10YR 4/3) loam; weak, medium, granular structure; friable; relatively high in content of coarse sand and fine gravel; neutral; abrupt, smooth boundary.
B1—6 to 9 inches, dark-brown (10YR 4/3) coarse clay loam; weak, fine, subangular blocky structure; friable when moist, moderately plastic and sticky when wet; neutral; clear, wavy boundary.
B2t—9 to 12 inches, dark-brown (7.5YR 4/4) clay loam; common, distinct, fine streaks of very dark brown (10YR 2/2); weak, medium, subangular blocky structure; firm when moist, plastic and sticky when wet; neutral; clear, wavy boundary.
B3—12 to 15 inches, dark-brown (10YR 4/3) sandy clay loam; weak, medium, subangular blocky structure; firm to friable when moist, plastic and sticky when wet; neutral; abrupt, irregular boundary.
IIC—15 to 20 inches +, pale-brown (10YR 6/3) and yellowish-brown (10YR 5/4), stratified, loose gravel and sand; calcareous.

The texture of the A horizon ranges from loam to gravelly loam. In some places the B horizon is light clay. The solum ranges from 12 to 24 inches in thickness. The upper solum is neutral to medium acid, but the pH increases with depth.

Celina series

The Celina series consists of moderately well drained soils that developed in a mantle of windblown silt, 6 to 18 inches thick, over highly calcareous loam glacial till of late Wisconsin age. These soils are in the same drainage sequence as the well-drained Miami soils, the somewhat poorly drained Crosby soils, and the very poorly drained Brookston soils, and they occur closely with those soils.

The Celina soils have a higher base status than the Cardington soils, and they formed in till having a higher content of carbonates. Although the Celina soils resemble the Miami soils in the A horizon, they commonly have a fainty mottled B1 horizon and are more drab colored in the B2 and lower horizons.

Typical profile of Celina silt loam, 2 to 6 percent slopes, in a cultivated field (Buckskin Township, 4 miles south of Greenfield):

Ap—0 to 6 inches, dark-brown (10YR 4/3) or dark grayish-brown (10YR 4/2) smooth silt loam; moderate, medium, granular structure; friable; slightly acid to neutral; abrupt, smooth boundary.
A2—6 to 12 inches, yellowish-brown (10YR 5/4) silt loam; moderate, coarse, granular structure; friable; medium acid; clear, wavy boundary.
B1t—12 to 17 inches, dark yellowish-brown (10YR 4/4) silty clay loam; moderate, medium, subangular blocky structure; firm; contains a few small pebbles and some grit; medium acid; gradual, smooth boundary.
B21t—17 to 21 inches, yellowish-brown (10YR 5/4) clay loam slightly mottled with light yellowish brown (10YR 6/4); strong, medium and coarse, subangular blocky structure; firm when moist, plastic and sticky when wet; contains a few small pebbles and grit; medium acid; gradual, smooth boundary.
B22t—21 to 24 inches, yellowish-brown (10YR 5/4) clay loam mottled with pale brown (10YR 6/3); peds coated with dark-brown (7.5YR 4/4) clay films; moderate, coarse, subangular blocky structure; firm when moist, plastic and sticky when wet; many small pebbles; slightly acid; clear, wavy boundary.
B3—24 to 28 inches, yellowish-brown (10YR 5/4) clay loam mottled with pale brown (10YR 6/3); some dark-brown (7.5YR 4/4) clay films; more gritty and pebbly than horizon above; weak, coarse, subangular blocky structure; firm; neutral; abrupt, wavy boundary.
C—28 to 36 inches, yellowish-brown (10YR 5/4), firm, compact, calcareous loam till; massive (structureless); moderately alkaline.

In places the overlying mantle of loess is as much as 18 inches thick. Mottling begins at a depth of about 18 inches. In thickness the B horizon ranges from 10 to 30 inches and the solum ranges from 18 to 36 inches. The B22 horizon ranges from silty clay loam and clay loam to light silty clay. The depth to calcareous till is 18 to 36 inches and varies considerably within short distances. Except in areas limed, the A horizon is slightly acid to medium acid. The B1 and upper B2 horizons are medium acid to very strongly acid, but the lower B2 horizon is slightly acid or neutral.

Clermont series

The Clermont series consists of nearly level, poorly drained soils that have a moderately fine textured B2 horizon over a weak fragipan. These soils lie on the glaciated Allegheny Plateau and developed in 2 to 4 feet of loess underlain by weathered, moderately fine textured glacial till of Illinoian age. The fragipan generally formed both in loess and in material weathered from till. In some places where the loess mantle is thinnest, however, it formed entirely in till.

The Clermont soils are in the same drainage sequence as the well drained Hickory soils, the moderately well drained Rossmoyne soils, and the somewhat poorly drained Avonburg soils, and they occur closely with those soils.

Typical profile of Clermont silt loam in a pastured area (on Camelin Hill Road, 2½ miles south of U.S. Highway No. 50):

Ap—0 to 6 inches, grayish-brown (10YR 5/2) silt loam; common, fine, faint mottles of dark grayish brown (10YR 4/2); moderate, medium, granular structure; friable; numerous, small, dark-brown (7.5YR 3/2) concretions; strongly acid; abrupt, smooth boundary.

A2g—6 to 9 inches, pale-brown (10YR 6/3) silt loam; common, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium and coarse, granular structure; friable; numerous, small, dark-brown (7.5YR 3/2) concretions; strongly acid; clear, smooth boundary.

B1g—9 to 14 inches, light brownish-gray (10YR 6/2) fine silt loam; many, prominent, yellowish-brown (10YR 5/6) mottles; weak, fine, subangular blocky structure; friable; few, small, dark-brown (7.5YR 3/2) concretions; very strongly acid; smooth boundary.

B21tg—14 to 18 inches, light-gray (10YR 6/1) silty clay loam; many, medium, distinct mottles of yellowish brown (10YR 5/6) and pale brown (10YR 6/3); weak to moderate, fine, subangular blocky structure; firm; few, thin, gray (10YR 5/1) clay films on ped surfaces; very strongly acid; gradual, wavy boundary.

B22tg—18 to 29 inches, grayish-brown (10YR 5/2) fine silty clay loam; many, medium, distinct mottles of yellowish brown (10YR 5/4) and strong brown (7.5YR 5/6); moderate, medium, subangular blocky structure; very firm; thin gray (10YR 5/1) clay films on ped surfaces; very strongly acid; gradual, wavy boundary.

Bx1—29 to 38 inches, grayish-brown (10YR 5/2) silty clay loam; common, dark yellowish-brown (10YR 4/4) and light yellowish-brown (10YR 6/4) mottles; weak, thick, platy structure that breaks to very weak, medium, subangular blocky structure; firm and slightly brittle; few, very dark brown (10YR 2/2) stains in lower part; very strongly acid; abrupt, wavy boundary.

Bx2—38 to 54 inches, light brownish-gray (10YR 6/2) and light yellowish brown (10YR 6/4) silty clay loam; common, yellowish-brown (10YR 5/6) mottles; weak, thick, platy structure that breaks to very weak, medium to coarse, subangular blocky structure; firm and slightly brittle; common, very dark brown (10YR 2/2) stains; strongly acid; gradual, wavy boundary.

IIB3—54 to 70 inches, mottled yellowish-brown (10YR 5/6), light brownish-gray (10YR 6/2), and dark yellowish-brown (10YR 4/4) clay loam; very weak, coarse, subangular blocky structure; firm; few, very dark-brown (10YR 2/2) stains; gradual boundary.

IIC—70 inches, mottled yellowish-brown (10YR 5/6), gray (10YR 6/1), and pale-brown (10YR 6/3) clay loam; massive; firm; strongly acid in upper part, but acidity decreases with depth.

The A horizon is only silt loam. The Bx horizon ranges from clay loam to silty clay loam. Less than 40 percent of the matrix in the B horizon has chromas of more than 2. The depth to acid shale or sandstone, or both, ranges from 6 to 20 feet. Clermont soils are medium acid or strongly acid in the A horizon and are strongly acid or very strongly acid in the B horizon. Below a depth of 70 inches, the acidity decreases with depth until calcareous glacial till is reached.

Colyer series

The Colyer series consists of shallow, light-colored, well-drained soils that developed in residuum weathered from black carbonaceous shale of the Ohio or the Sunbury formation. These soils are on hillsides and have a weakly developed textural profile. They occur in both the glaciated and the unglaciated parts of the Allegheny Plateau, but in the glaciated part they occupy only small areas in which glacial drift is lacking. The Colyer soils occur principally with the Latham, Rarden, and Cana soils.

Typical profile of Colyer shaly silt loam, 25 to 75 percent slopes, under forest in the Illinoian glaciated area (Twin Township, 1 mile south of Concord School on Owl Creek Road, 300 yards north-northwest of house):

A1—0 to 1 inch, very dark brown (10YR 2/2) shaly silt loam; moderate, fine, granular structure; friable; high in organic-matter content; roots abundant; very strongly acid; clear, wavy boundary.

A2—1 to 4 inches, dark grayish-brown (10YR 4/2) shaly silt loam; moderate, coarse, granular structure; friable; contains a few shale fragments up to one-half inch across; roots abundant; extremely acid; gradual, smooth boundary.

B1—4 to 7 inches, dark grayish-brown (10YR 4/2) shaly silty clay loam; weak to moderate, medium, subangular blocky structure; friable; about 25 percent is coarse skeleton of black shale fragments; roots common; extremely acid; gradual, smooth boundary.

B2—7 to 10 inches, brown (10YR 5/3) shaly silty clay loam to silty clay; weak to moderate, medium, subangular blocky structure; firm when moist, plastic but nonsticky when wet; about 50 percent is coarse skeleton of black shale fragments up to 1½ inches across; roots common; extremely acid; gradual, smooth boundary.

B3—10 to 17 inches, brown (10YR 5/3) very shaly clay to silty clay; weak, medium, subangular blocky structure; firm when moist, plastic but nonsticky when wet; blocks of black shale make up 75 to 85 percent of horizon; roots common; extremely acid; gradual, wavy boundary.

R—17 to 20 inches +, dominantly slightly weathered, black Ohio shale.

In small areas the A horizon is silty and stone free and presumably developed from loess. In some places the A horizon is shaly silty clay loam and is thicker than that described. The content of shale fragments is more than 25 percent, by volume, below a depth of 4 to 5 inches and is more than 50 percent, by volume, below a depth of 10 inches. In many patches on southwest-facing slopes, the profile is more deeply and more strongly developed than the one described. Here, the subsoil is strong brown and clayey, and the profile somewhat resembles that of a Rarden soil. The depth to shale bedrock ranges from 10 to 20 inches. Colyer soils are very strongly acid or extremely acid throughout.

Coolville series

In the Coolville series are moderately well drained soils that developed from a mantle of loess, generally 18 to 30 inches thick, underlain by residuum that weathered from acid clay shale and thin interbedded sandstone. These soils occupy ridgetops on the unglaciated Allegheny Plateau.

The Coolville soils are in the same drainage sequence as the well-drained Latham and Rarden soils and the somewhat poorly drained Fawcett soils. Coolville soils developed in a thicker mantle of loess than the Rarden soils. They are more mildly sloping than Rarden soils and have a faintly mottled B2 horizon. In the Coolville soils the B2 horizon is less mottled than it is in the Fawcett soils.

Typical profile of Coolville silt loam, 2 to 6 percent slopes, in a cultivated field (Twin Township, 2 miles north of Nipgen, 100 yards east of State Highway 772):

Ap—0 to 7 inches, brown (10YR 5/3) silt loam; weak, medium, granular structure; friable; abundant roots; strongly acid to medium acid; abrupt, smooth boundary.

A3—7 to 9 inches, strong-brown (7.5YR 5/6) light silty clay loam; weak to moderate, fine, subangular blocky structure; friable; abundant roots; strongly to very strongly acid; clear, wavy boundary.

B1—9 to 13 inches, strong-brown (7.5YR 5/6) silty clay loam; strong, fine, subangular blocky structure; firm; plentiful roots; very strongly acid; clear, wavy boundary.

B21t—13 to 21 inches, yellowish-brown (10YR 5/4) fine silty clay loam; few, fine, faint mottles of light yellowish brown (10YR 6/4) in lower part; moderate, fine and medium, subangular blocky structure; firm; few roots; thin, patchy, dark yellowish-brown (10YR 4/4) clay films; very strongly acid; clear, wavy boundary.

IIB22t—21 to 36 inches, yellowish-red (5YR 4/8) clay; many, medium, distinct mottles of pinkish gray (5YR 7/2); weak, thick, platy structure that breaks to moderate, coarse, angular blocky structure; very firm; few roots; thin, continuous, reddish-brown (10YR 4/4) clay films; very strongly acid; gradual, wavy boundary.

IIC—36 inches +, pale-brown (10YR 6/3) clay shale; many, medium, prominent mottles of light gray (10YR 7/1) and yellowish red (5YR 4/6); gray on faces of aggregates; very strongly acid.

The solum ranges from 36 to 48 inches in thickness. The loess in which the A and the upper B horizons developed is 18 to 30 inches thick. The upper B horizon is medium to fine silty clay loam. In texture the lower B horizon, which was derived mainly from shale, is clay or silty clay. Here, the clay content ranges from 44 to 70 percent. Coolville soils are medium acid or strongly acid in the A horizon and are very strongly acid or extremely acid in the B horizon.

Crosby series

In the Crosby series are somewhat poorly drained soils that developed in a mantle of wind-deposited silt, 6 to 18 inches thick, over highly calcareous loam glacial till of Wisconsin age. These soils are in the same drainage sequence as the well drained Miami soils, the moderately well drained Celina soils, and the very poorly drained Brookston soils. Locally, Crosby soils are called gray clay land.

Typical profile of Crosby silt loam, 0 to 2 percent slopes, in a cultivated field (Green Township, NE¼ sec. 16):

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

A2—8 to 12 inches, grayish-brown (10YR 5/2) silt loam; common, fine, distinct mottles of dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/4); weak, medium, platy structure that breaks to moderate, medium, granular structure; friable; common, dark concretions; medium acid; clear, wavy boundary.

B1tg—12 to 17 inches, grayish-brown (2.5Y 5/2) silty clay loam; common, medium, distinct mottles of yellowish brown (10YR 5/4); moderate, fine and medium, subangular blocky structure; firm; a few small pebbles; strongly acid; gradual, wavy boundary.

B21tg—17 to 24 inches, dark-brown (10YR 4/3) silty clay loam; common, medium, distinct mottles of yellowish brown (10YR 5/4); ped faces coated with dark grayish-brown (10YR 4/2) clay films; moderate, fine and medium, subangular blocky structure; firm; a few small pebbles; medium acid; gradual, smooth boundary.

B22tg—24 to 32 inches, yellowish-brown (10YR 5/6) clay loam; common, medium and fine, distinct mottles of brown (10YR 5/3) and very dark gray (10YR 3/1); weak, medium, subangular blocky structure; prominent very dark gray clay films; firm; slightly acid.

B3—32 to 38 inches, mottled grayish-brown (10YR 5/2), dark grayish-brown (10YR 4/2), yellowish-brown (10YR 5/6), and dark-brown (10YR 4/3) light clay loam; nearly massive; firm; mildly alkaline, some spots effervesce with HCl.

C—38 to 52 inches, yellowish-brown (10YR 5/4) loam mottled with brownish yellow (10YR 6/6) and dark yellowish brown (10YR 4/4); massive; firm; calcareous till.

In some places the B horizon is heavy silty clay loam, light clay, or silty clay. Within short distances the depth to calcareous till ranges from 18 to 40 inches. On the Allegheny Plateau, particularly on the wide, flat hilltops underlain by Berea sandstone and on the side slopes underlain by Cuyahoga sandstone and shale, the till from which the Crosby soils developed has a higher content of sandstone and shale and a lower content of limestone and calcium carbonate than that in other areas. In these areas on the plateau, the soils are deeper than average to calcareous till and have a slightly less clayey B horizon. Except in limed areas, Crosby soils are slightly acid to strongly acid in the A horizon. They are very strongly acid to medium acid in the B1 and the upper B2 horizons.

Cruze series

In the Cruze series are well drained and moderately well drained soils on the unglaciated Allegheny Plateau. These soils developed in colluvium that washed or rolled from the Colyer, Latham, Muskingum, Berks, Neotoma, and Dekalb soils, all of which were derived from shale and sandstone bedrock. Typically, the Cruze soils lie at the base of steep slopes or on colluvial-alluvial fans at the mouth of small drainageways. They have a well-developed textural and color profile and a moderately thick solum.

The Cruze soils are similar to the Latham soils but have weaker horizonation and have lower chroma in the upper B horizon.

Typical profile of Cruze silt loam, 6 to 12 percent slopes, moderately eroded, in an idle area (Huntington Township, 1½ miles north-northwest of Denver, 800 yards northwest of the intersection of Hartwood and Robinson Roads, 50 yards southwest of Hartwood Road):

Ap—0 to 6 inches, yellowish-brown (10YR 5/4) silt loam; brown (10YR 5/3) coatings on peds; weak, medium, granular structure; friable; roots common; very strongly acid; abrupt, smooth boundary.

B1—6 to 9 inches, yellowish-brown (10YR 5/8) silty clay loam; a few brown (10YR 5/3) coatings on peds; moderate, fine, subangular blocky structure; friable; few roots; very strongly acid; clear, wavy boundary.

B21t—9 to 11 inches, strong-brown (7.5YR 5/6) silty clay loam faintly mottled with pale brown (10YR 6/3); moderate, medium, subangular blocky structure; firm; few roots; a few small sandstone fragments, up to 1 inch across, make up about 10 percent of mass; abrupt, wavy boundary.

B22t—11 to 17 inches, light yellowish-brown (10YR 6/4) shaly silty clay or silty clay loam mottled with

strong brown (7.5YR 5/6) and brown (10YR 5/3); moderate, medium, subangular blocky structure; firm; sandstone fragments, up to 3 inches across, make up about 25 percent of mass; very strongly acid; gradual, wavy boundary.

B23t—17 to 24 inches, strong-brown (7.5YR 5/6) shaly silty clay; common, medium, distinct mottles of pale brown (10YR 6/3) and gray (10YR 6/1); very weak, medium, subangular blocky structure; firm; about 50 percent is coarse skeleton consisting largely of fine-grained sandstone and some conglomerate fragments ¼ to 6 inches across; very strongly acid; abrupt, smooth boundary.

B3—24 to 31 inches, mottled yellowish-brown (10YR 5/6) and gray (10YR 6/1) silty clay that contains a few thin sandstone fragments; very weak, coarse, angular blocky structure; very firm; extremely acid; diffuse, wavy boundary.

C—31 to 60 inches +, gray (10YR 6/1), and in a few places light yellowish-brown (2.5Y 6/4), silty clay; massive; very firm; extremely acid.

Undisturbed areas in forest have a dark-colored A1 horizon 2 to 3 inches thick. The content of loose stone fragments in the solum ranges from 10 to 40 percent. The depth to material derived from interbedded clay shale and sandstone ranges from 20 to 50 inches. Cruze soils are slightly acid to very strongly acid in the A horizon. Underlying bedrock occurs at a depth greater than 5 feet.

Dekalb series

Soils of the Dekalb series are moderately sloping to steep, strongly acid to extremely acid, light colored, and well drained. These soils have a solum of fine sandy loam or loam. They have a cambic horizon, but a textural B horizon is lacking. Dekalb soils occur only in the extreme southeastern corner of the county and on the higher knobs northeast of Chillicothe.

These soils are near the Wellston, Muskingum, and Neotoma soils. They are sandier than the Wellston and Muskingum soils. They have a thinner, lighter colored A1 horizon than the Neotoma soils and lack an argillic horizon.

Typical profile of a Dekalb fine sandy loam in a forested area (Jefferson Township, NW¼ sec. 12):

O1—2 inches to 1 inch, recently fallen leaves, which cover 30 to 50 percent of soil surface.

O2—1 inch to 0, dark-brown (7.5YR 3/2) matted mor and some grayish sand grains.

A1—0 to 1 inch, dark-gray (10YR 4/1) fine sandy loam; weak, medium, granular structure; friable; about 10 percent is coarse skeleton consisting of channery fragments of sandstone; roots abundant; extremely acid; clear, wavy boundary.

A2—1 to 12 inches, light yellowish-brown (10YR 6/4) fine sandy loam; a few blotches of brownish yellow (10YR 6/8); very weak, coarse, granular structure; friable; about 10 percent is coarse skeleton consisting of channery fragments of sandstone; roots common; very strongly acid; diffuse, smooth boundary.

B1—12 to 21 inches, light yellowish-brown (10YR 6/4) channery fine sandy loam; a few ped interiors are yellowish brown (10YR 5/6); weak, coarse, granular structure or very fine, subangular blocky structure; friable; about 20 percent is coarse skeleton consisting of channery fragments of sandstone; few roots; very strongly acid; diffuse, smooth boundary.

B21—21 to 36 inches, light yellowish-brown (10YR 6/4) channery fine sandy loam; many ped interiors are strong brown (7.5YR 5/8); weak to moderate, medium, subangular blocky structure; friable; about 25 percent is coarse skeleton consisting of channery fragments of sandstone; roots are rare; strongly acid; diffuse, smooth boundary.

B22—36 to 44 inches, yellowish-red (5YR 5/8) channery coarse loam; a few ped interiors are brownish yellow (10YR 6/6); moderate, medium, subangular blocky structure; friable; 30 to 40 percent is coarse skeleton consisting of channery fragments of sandstone; no roots; strongly acid; gradual, wavy boundary.

C—44 inches +, mostly fractured, coarse-grained sandstone; brownish-yellow (10YR 6/8) very channery sandy loam coats rock surfaces; soil material extends to a considerable depth in rock fractures; bedrock and rock fragments throughout profile are Sharon conglomerate of Pottsville formation; strongly acid.

The B horizon ranges from fine sandy loam to loam in texture. The depth to the C horizon ranges from 24 to 50 inches. These soils are strongly acid to extremely acid throughout the solum.

Eel series

The Eel series consists of moderately well drained soils on first bottoms, generally at the base of upland or terrace slopes. These soils developed in medium-textured, slightly acid to calcareous alluvium that washed mainly from soils underlain by calcareous Wisconsin glacial drift.

The Eel soils are in the same drainage sequence as the well-drained Genesee soils and the somewhat poorly drained Shoals soils. They resemble the Philo soils but are less acid and are less stony in their lower horizons.

Typical profile of Eel silt loam in a pastured area (along the north bank of Deer Creek, about one-fourth mile west of the junction of Deer Creek and the Scioto River):

Ap—0 to 7 inches, dark-brown (7.5YR 3/2) silt loam; strong, medium, granular structure; friable; mildly alkaline to neutral; abrupt, smooth boundary.

C1—7 to 24 inches, dark grayish-brown (10YR 4/2) silt loam faintly mottled with grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) in the lower part; weak, very fine, subangular blocky structure; friable; mildly alkaline to neutral; diffuse boundary.

C2—24 to 42 inches, dark grayish-brown (10YR 4/2) silt loam to light silty clay loam with distinct, olive-brown (2.5Y 4/4) mottles; weak, coarse, subangular blocky structure; firm; mildly alkaline; abrupt, wavy boundary.

IIC3—42 to 50 inches +, calcareous gravel and sand.

In places the A horizon is fine sandy loam, loam, or silty clay loam. In many places the profile shows stratification through the control section. A few areas are underlain by limestone bedrock at a depth of less than 40 inches. The Eel soils are slightly acid to mildly alkaline.

Fawcett series

In the Fawcett series are somewhat poorly drained soils that developed in a 12- to 24-inch deposit of loess over a buried soil derived from acid clay shale and thin layers of sandstone of the Cuyahoga formation. These soils occupy nearly level to somewhat depressional areas on ridgetops on the unglaciated Allegheny Plateau.

The Fawcett soils are in the same drainage sequence as the well drained Latham and Rarden soils and the

moderately well drained Coolville soils, and they occur closely with those soils. They are mottled nearer the surface than the Coolville soils and are more strongly mottled in the B2 horizon. Fawcett soils are similar to the Cruze soils but have upper horizons that developed in loess and are more poorly drained.

Typical profile of Fawcett silt loam in an area of undisturbed pasture (Huntington Township, 2 miles east of high school):

A1—0 to 4 inches, grayish-brown (10YR 5/2) silt loam; moderate, medium, granular structure; friable; medium acid; abrupt, smooth boundary.

A2—4 to 8 inches, yellowish-brown (10YR 5/6) fine silt loam; moderate, fine, subangular blocky structure; friable; no stones or grit; very strongly acid; clear, smooth boundary.

B1t—8 to 12 inches, yellowish-brown (10YR 5/6) silty clay loam; few, fine, distinct mottles of brown (10YR 6/3); moderate, fine, subangular blocky structure; firm; no stones or grit; very strongly acid; clear, wavy boundary.

B21t—12 to 17 inches, light brownish-gray (10YR 6/2) silty clay loam; wavy, medium, prominent mottles of yellowish brown (10YR 5/6); strong, fine and medium, subangular blocky structure; firm; very strongly acid; abrupt, smooth boundary.

IIB22tg—17 to 22 inches, light-gray (2.5Y 7/2) fine silty clay loam; many, medium, prominent mottles of yellowish brown (10YR 5/6) and grayish brown (2.5Y 5/2); moderate, medium, subangular blocky structure; firm; grayish parts are more silty and less clayey than brownish parts; contains a few flat sandstone fragments as much as 2 or 3 inches across; very strongly acid; gradual, smooth boundary.

IIB23tg—22 to 36 inches, grayish-brown (10YR 5/2) channery silty clay; many, medium, distinct mottles of yellowish brown (10YR 5/4) and light brownish gray (10YR 6/2); weak, medium, angular blocky structure; firm; some thin platy sandstone fragments as much as 2 inches across; very strongly acid; abrupt, smooth boundary.

IIB24t—36 to 39 inches, brownish-yellow (10YR 6/6) channery silty clay; many, medium, prominent mottles of light brownish gray (2.5Y 6/2); weak, medium, angular blocky structure; firm; channery fragments make up 30 to 40 percent of horizon, by volume, and consist of sandstone and weathered clay shale; shale fragments are in various stages of weathering; soil material is slippery when rubbed between the fingers and is plastic but not very sticky when wet (crumbly); very strongly acid; clear, smooth boundary.

IIC1—39 to 44 inches, mostly weathered clay shale, but a few thin lenses of sandstone; the weathered clay shale is brownish-yellow (10YR 6/6) silty clay that has many coarse, prominent mottles of light brownish gray (2.5Y 6/2); weak, medium, angular blocky structure; firm; very strongly acid; clear, smooth boundary.

IIC2—44 to 50 inches, pale-olive (5Y 6/3), weathered clay shale and thin beds of fine-grained sandstone (Cuyahoga formation); very strongly acid.

Undisturbed areas have an O1 horizon of leaf mold and forest litter, 1 or 2 inches thick, and an A1 horizon of very dark grayish-brown (10YR 3/2), friable silt loam 2 or 3 inches thick. If cultivated, these horizons are mixed into the Ap horizon. The A horizon is only silt loam. Some low-lying areas are covered with 1 to 12 inches of light-colored silty material that washed from higher areas of Coolville soils. Generally, that part of the solum developed in silt ranges from 12 to 24 inches in thickness. In the lower B2 and the C horizons, the silty clay generally has a clay content of 40 to 60 percent. But in areas where sandstone lenses are abundant in the C horizon, the B2 horizon is less clayey than in the profile described. Fawcett soils are neutral to very strongly acid in the A horizon and are strongly acid to extremely acid in the B and C horizons.

Fox series

In the Fox series are well-drained soils that developed on deposits of calcareous gravel and sand of Wisconsin glacial age. These soils are mainly on terraces (glacial outwash plains and valley trains) but locally are also on kames, eskers, and parts of moraines on uplands. Fox silt loams formed in 12 to 18 inches of silty material over gravel and sand, whereas the coarser textured Fox soils formed in loamy material over gravel and sand.

On terraces the Fox soils occur with the Thackery, Sleeth, Westland, Wea, Warsaw, and Ockley soils. On uplands they occur principally with the Kendallville soils, though in a few places they are close to the Miami, Lorenzo, and Rodman soils. Fox silt loams resemble the Ockley soils but are not so deep to parent material.

Typical profile of Fox silt loam, 0 to 2 percent slopes, in a cultivated area (Green Township, SW¼ sec. 8):

Ap—0 to 8 inches, dark-brown (10YR 4/3) silt loam; weak, fine and medium, granular structure; friable; slightly acid; abrupt, smooth boundary.

A2—8 to 12 inches, brown (7.5YR 5/4) silt loam; weak, fine, subangular blocky structure; friable; medium acid; clear, wavy boundary.

IIB1—12 to 17 inches, dark-brown (7.5YR 4/4) loam; weak, fine and medium, subangular blocky structure; friable; contains small pebbles; strongly acid; clear, smooth boundary.

IIB21t—17 to 30 inches, dark-brown (7.5YR 4/4) clay loam to sandy clay loam; moderate, medium and coarse, subangular blocky structure; firm; some small pebbles; strongly acid; clear, smooth boundary.

IIB22t—30 to 38 inches, dark-brown (7.5YR 4/4) to strong-brown (7.5YR 5/6) sandy clay loam; moderate, medium and coarse, subangular blocky structure; firm when moist, plastic and sticky when wet; numerous igneous pebbles; medium acid; abrupt, wavy and irregular boundary.

IIIC—38 to 50 inches +, light brownish-gray (10YR 6/2) and grayish-brown (10YR 5/2), loose, calcareous gravel and sand.

The solum is 24 to 42 inches thick; it decreases in thickness with increasing slope. The A horizon is silt loam, gravelly loam, loam, or sandy loam. In some places the B2 horizon is sandy clay or light clay. In places the B2 horizon is brown (7.5YR 4/2), reddish brown (5YR 4/4), or dark reddish brown (5YR 3/3), and in places there are thin layers of strong brown or yellowish red (5YR 4/6–5/6). Irregular tongues of material from the B2 horizon may extend 12 to 24 inches into the C horizon. On kames, eskers, and moraines the underlying gravel and sand generally are not so well sorted or stratified as they are on terraces. The Fox soils are neutral to medium acid in the A horizon. The acidity is strongest in the B1 or the upper B2 horizon, but the lower B2 horizon is medium acid to neutral.

Genesee series

The Genesee series consists of well-drained soils that developed in slightly acid or moderately acid alluvium ranging from fine sandy loam to silty clay loam in texture. The alluvium washed principally from soils on

uplands and terraces underlain by calcareous Wisconsin glacial drift.

The Genesee soils are in the same drainage sequence as the moderately well drained Eel soils and the somewhat poorly drained Shoals soils. They occur closely with those soils and with the Ross and Algiers soils. The Genesee soils have a darker surface layer than the Ross soils. They developed in alluvium from calcareous glacial drift and are less acid than the Pope soils, which developed in alluvium from sandstone and acid shale.

Typical profile of Genesee silt loam in a cultivated area (Union Township, just north of the junction of State Highways 104 and 207):

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

C1—8 to 38 inches, dark grayish-brown (10YR 4/2) silt loam; weak, coarse, angular blocky structure; friable; neutral; clear, smooth boundary.

C2—38 to 48 inches, dark-brown (7.5YR 4/2) silt loam; weak, medium, subangular blocky structure; friable; mildly alkaline.

The A horizon is fine sandy loam, silt loam, or light silty clay loam. Color of the A horizon ranges from brown to dark brown. The lighter colors generally occur along small drainageways where most of the alluvium washed from adjoining eroded soils on uplands. In some places, particularly along the larger streams, there are layers of sandy loam or loamy sand at various depths, and the profile shows stratification. Some areas, indicated by symbol on the soil map, contain enough gravel to interfere with cultivation. In places the profile is brown (7.5YR 5/4, 10YR 5/3). In some areas in the extreme western part of the county, limestone bedrock is at a depth of slightly less than 40 inches. Generally, the Genesee soils are neutral or slightly acid, but in some places they are weakly calcareous below a depth of 15 to 30 inches.

Henshaw series

In the Henshaw series are somewhat poorly drained soils that developed from calcareous lacustrine material deposited by glaciers of Wisconsin age. In most places the deposits are dominantly silty, but small lenses of sandy material are fairly common.

The Henshaw soils are in the same drainage sequence as the well drained or moderately well drained Ugontown soils and the dark-colored, poorly drained Bonpas soils. The parent material of both the Henshaw and the McGary soils consists of lacustrine deposits. That of the Henshaw soils is dominantly silty, however, and that of the McGary soils is clayey. In the Henshaw soils the B horizon is not so fine textured as it is in the McGary soils, and the profile is leached of carbonates to a greater depth.

Typical profile of Henshaw silt loam in an area of permanent pasture (Colerain Township, NW¼ sec. 3):

A1—0 to 5 inches, dark-brown (10YR 4/2) silt loam; strong, medium, granular structure; friable; neutral; clear, smooth boundary.

A2—5 to 9 inches, brown (10YR 5/3) silt loam; common, fine, distinct mottles of yellowish brown (10YR 5/8); weak, thick, platy structure breaking to weak, medium, angular blocky structure; angular blocky peds break with pressure to weak, medium, granular peds; friable; contains films of dark-brown (10YR 4/2) silt loam in old root channels; strongly acid; clear, smooth boundary.

A3—9 to 13 inches, brown (10YR 5/3) fine silt loam; many, medium, distinct mottles of yellowish brown (10YR 5/8); weak, fine and medium, subangular blocky structure; friable; very strongly acid; gradual, smooth boundary.

B1t—13 to 18 inches, grayish-brown (10YR 5/2) coarse silty clay loam; many, prominent, yellowish-brown (10YR 5/8) mottles; weak, fine, subangular blocky structure; firm; contains a few, small, dark concretions; very strongly acid; gradual, smooth boundary.

B2t—18 to 36 inches, grayish-brown (10YR 5/2) silty clay loam; many, coarse, prominent mottles of yellowish brown (10YR 5/8); weak, fine, subangular blocky structure; firm; strongly acid; gradual, smooth boundary.

B3t—36 to 43 inches, mottled gray (10YR 6/1) and strong-brown (7.5YR 5/6) fine silty clay loam; very weak, coarse, angular blocky structure; very firm; dark-gray (N 4/0) clay on some ped faces and in some old root channels; slightly acid; gradual, wavy boundary.

C—43 to 60 inches +, mottled gray (10YR 5/1), yellowish-brown (10YR 5/8), and olive-brown (2.5YR 4/4) silt loam; massive; compact but friable; contains thin lenses of very fine sandy loam; mildly calcareous.

The solum ranges from 30 to 50 inches in thickness. Mottling occurs just below the Ap or the A1 horizon. The B2 horizon is light to medium silty clay loam or clay loam. In some places the C horizon is silty clay loam, and in places there are thin layers of sandy loam or loamy sand in this horizon. Generally, the carbonate content in the C horizon is lowest in the sandy material and is highest in the silty material.

Hickory series

The Hickory series consists of well-drained soils that developed on calcareous glacial till of Illinoian age. In most places the entire solum formed in till, but in some of the smoother areas the upper part of the solum formed in loess. Hickory soils occur closely with the moderately well drained Rossmoyne soils, the somewhat poorly drained Avonburg soils, and the poorly drained Clermont soils.

Typical profile of Hickory silt loam, 12 to 18 percent slopes, moderately eroded, in a pastured area (Colerain Township, SE¼ sec. 12):

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; friable; slightly acid; abrupt, smooth boundary.

A2—7 to 11 inches, brownish-yellow (10YR 6/6) silt loam; weak, medium, platy structure that breaks to medium and coarse, granular structure; friable; medium acid to strongly acid; clear, wavy boundary.

B1t—11 to 20 inches, yellowish-brown (10YR 5/6) silty clay loam; moderate, fine, subangular blocky structure; firm; strongly acid; gradual, smooth boundary.

B21t—20 to 27 inches, yellowish-brown (10YR 5/6) silty clay loam; strong, medium, subangular blocky structure; firm; contains some small, soft, dark concretions; very strongly acid to strongly acid; gradual, smooth boundary.

B22t—27 to 41 inches, yellowish-brown (10YR 5/6) silty clay loam; moderate, coarse, subangular blocky structure; firm; contains some small, soft, dark concretions; less clayey and more silty than horizon above; strongly acid; gradual, wavy boundary.

B3—41 to 72 inches, yellowish-brown (10YR 5/6) loam that is faintly mottled with pale brown (10YR 6/3) and brownish yellow (10YR 6/6); weak, coarse, subangular blocky structure; firm; numerous small, soft, dark concretions; strongly acid; abrupt, wavy boundary.

C—72 to 90 inches +, compact, yellowish-brown (10YR 5/4) silt loam or loam; calcareous glacial till of Illinoian age; weak, coarse, subangular blocky structure; moderately alkaline.

The part of the solum developed in loess ranges from 0 to 12 inches in thickness. The depth to calcareous till ranges from 6 to 10 feet.

Kendallville series

In the Kendallville series are well-drained soils that occupy kames, eskers, and parts of moraines in glacial areas of both Late and Early Wisconsin ages. These soils developed in a thin layer of silty material overlying 18 to 36 inches of loamy outwash underlain by calcareous glacial till. The overlying material and the till are the same glacial age. In the Late Wisconsin area, the till is loam in texture; in the Early Wisconsin area, it normally is clay loam. The A horizon of these soils developed in silty material; the B1 and B2 horizons, in material weathered from loamy outwash; and the B3 horizon, in till.

The Kendallville soils occur principally with the Fox and Miami soils in the late Wisconsin glacial area and with the Fox and Alexandria soils in the Early Wisconsin area.

Typical profile of Kendallville silt loam, 2 to 6 percent slopes, in a cultivated field (Green Township, center of NE¼ sec. 28):

Ap—0 to 9 inches, brown (10YR 4/3) silt loam; weak, medium and fine, granular structure; friable; neutral; abrupt, smooth boundary.

B1—9 to 13 inches, brown (7.5YR 4/4) coarse silty clay loam; some thin brown (10YR 5/3) clay coatings on peds; moderate, fine, subangular blocky structure; friable; slightly acid to medium acid; clear, smooth boundary.

IIB21t—13 to 17 inches, dark-brown (7.5YR 4/4) clay loam; moderate, fine, subangular blocky structure; firm; medium acid; clear, smooth boundary.

IIB22t—17 to 24 inches, dark-brown (7.5YR 4/4) gravelly clay loam to clay; reddish-brown (5YR 4/3) clay coatings; weak, medium, subangular blocky structure; firm; about 15 percent consists of rounded erratic pebbles less than 1 inch in diameter; strongly acid; clear, smooth boundary.

IIB23t—24 to 31 inches, dark-brown (7.5YR 4/4) gravelly clay loam; weak, coarse, subangular blocky structure; firm; coarse skeleton as in horizon above; strongly acid; clear, wavy boundary.

IIB24t—31 to 37 inches, dark-brown (7.5YR 4/4) heavy sandy clay loam; dark-brown (7.5YR 4/2) clay coatings on peds; about 15 percent consists of erratic pebbles less than 1 inch in diameter; weak, coarse, subangular blocky structure; firm; medium acid; abrupt, wavy boundary.

IIIB3t—37 to 42 inches, brown (10YR 5/3) clay loam; weak, medium and coarse, subangular blocky structure; firm; slightly acid; clear, wavy boundary.

IIIC—42 to 52 inches, light olive-brown (2.5Y 5/4) to brown (10YR 5/3) loam; massive; firm; calcareous glacial till.

In some areas the A horizon is gravelly. The depth to calcareous till generally ranges from 24 to 36 inches but, in a few places, is as much as 42 inches.

Latham series

The Latham series consists of sloping to very steep, well-drained soils of the uplands that developed on acid clay shale and thin layers of interbedded sandstone. These soils have a somewhat weakly developed textural profile, for the high content of clay in the B horizon is considered to be inherited rather than developed. However, their color profile is moderately well developed, and their A, B, and C horizons are distinct. Latham soils are most extensive on the unglaciated Allegheny Plateau, but they also occur locally on hillsides free of glacial drift in the Wisconsin and the Illinoian glacial areas.

The Latham soils occur closely with the Rarden, Coolville, and Fawcett soils and, in places, with the Colyer, Muskingum, and Cana soils. Latham soils are finer textured in the B and C horizons than the Muskingum soils, and their C horizon is from clay shale instead of from sandstone. They are slightly shallower than the Rarden soils; their B horizon is somewhat thinner and less well developed than that of Rarden soils; and they have a variegated grayish and reddish C horizon in which shades of gray are dominant.

Typical profile of a Latham silt loam in an undisturbed area (Franklin Township, Scioto Trail State Forest, North Trail Road, about 1 mile north of carpentry shop):

A0—1 inch to 0, dark-brown matted humus.

A1—0 to 3 inches, dark-brown (10YR 4/3) silt loam; moderate, medium, granular structure; friable; very strongly acid; clear, wavy boundary.

A2—3 to 7 inches, yellowish-brown (10YR 5/6) silt loam; moderate, medium, granular structure; friable; very strongly acid; clear, wavy boundary.

B1—7 to 11 inches, yellowish-brown (10YR 5/6) light silty clay loam; weak to moderate, medium, subangular blocky structure; friable; very strongly acid; clear, wavy boundary.

IIB21t—11 to 17 inches, yellowish-brown (10YR 5/6) silty clay loam; weak to moderate, coarse, subangular blocky structure; firm; thin discontinuous clay films on peds; few sandstone fragments; very strongly acid; clear, wavy boundary.

IIB3t—17 to 25 inches, strong-brown (7.5YR 5/6) clay; a few, medium, distinct mottles of light brownish gray (10YR 6/2) and brown (10YR 5/3); weak, coarse, angular blocky structure; very firm; thin discontinuous clay films on vertical and horizontal ped surfaces; few to common, partly weathered shale fragments; very strongly acid; diffuse, wavy boundary.

IIC—25 to 40 inches, light brownish-gray (10YR 6/2) and yellowish-red (5YR 5/6) clay shale; plastic when wet; very weak, coarse, prismatic structure; very firm; very strongly acid.

The solum ranges from 18 to 40 inches in thickness. The A1 horizon is 1 to 3 inches thick and ranges from dark grayish brown (10YR 4/2) to dark brown (10YR 4/3) or very dark grayish brown (10YR 3/2) in color. The B horizon is silt loam or silty clay loam in the upper part and is fine silty clay loam, silty clay, or clay in the lower part. In this horizon the content of coarse fragments is less than 30 percent. The color of the B horizon is dominantly yellowish brown (10YR 5/6) but ranges to strong brown (7.5YR 5/6) and light olive brown (2.5YR 5/6). The depth to heavy clay ranges from 10 to 18 inches. In the lower B horizon the clay

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content is 35 to 55 percent. These soils are strongly acid to extremely acid throughout the solum. In most places, however, the pH is less than 5.0.

Lorenzo series

The Lorenzo series consists of steep or very steep, dark-colored, well-drained soils that developed from calcareous gravel and sand of Wisconsin glacial age. These soils are on kames and kame moraines in the uplands and on terrace escarpments. They occur only in coves and on north-facing (mainly northeast-facing) slopes. Although the Lorenzo soils are shallow to sand and gravel, they have a well-developed textural and color profile. Presumably, they developed under hardwood forest.

In areas where the parent material is of late Wisconsin age, the Lorenzo soils occur with the Fox, Warsaw, and Rodman soils. Where the parent material is of Early Wisconsin age, Lorenzo soils occur with the Warsaw, Negley, Fox, and Parke soils. The Lorenzo soils have a darker A horizon than the Casco soils, and they are shallower and have thinner horizons than the Warsaw soils.

Typical profile of a Lorenzo soil in a forested area having slopes of 25 to 35 percent (Paxton Township, 3 miles west of Bainbridge, 1 mile south of U.S. Highway No. 50):

A11—0 to 3 inches, very dark brown (7.5YR 3/2) loam; strong, fine, crumb structure; friable; slightly acid; abrupt, smooth boundary.

A12—3 to 6 inches, very dark brown (10YR 2/2) fine loam or coarse clay loam; strong, coarse, granular structure; friable; slightly acid; gradual, wavy boundary.

B1—6 to 10 inches, dark-brown (10YR 4/3) clay loam; some dark-brown (10YR 3/3) coatings on peds; moderate, fine and medium, subangular blocky structure; friable; slightly acid; gradual, smooth boundary.

B21t—10 to 14 inches, dark-brown (10YR 4/3) clay loam; many dark-brown (10YR 3/3) clay films around peds; moderate, medium, subangular blocky structure; friable; neutral; abrupt, smooth boundary.

B22t—14 to 19 inches, dark-brown (7.5YR 4/4) fine clay loam; a few very dark brown (10YR 3/2) clay films; weak, coarse, subangular blocky structure; firm when moist, plastic and sticky when wet; neutral; gradual boundary.

B3—19 to 21 inches, dark-brown (7.5YR 4/4) sandy clay loam; very few films as in horizon above; very weak, coarse, subangular blocky structure; friable; mildly alkaline, some free carbonates; abrupt, wavy boundary.

IIC2—21 to 30 inches +, loose, clean, calcareous gravel and sand.

The A1 horizon ranges from 5 to 9 inches in thickness. The depth to calcareous gravel and sand ranges from 10 to 24 inches. These soils are neutral to medium acid in the A horizon. The pH remains constant or increases with depth.

Loudonville series

The Loudonville series consists of well-drained soils that developed from thin deposits of loess and glacial till over residuum weathered from sandstone bedrock. These soils are inextensive and occur only in Wisconsin glacial areas on the Allegheny Plateau.

The Loudonville soils resemble the Cana soils in the A and the upper B horizons, but they are underlain by sandstone, whereas Cana soils are underlain by clay shale.

Typical profile of Loudonville silt loam, 6 to 12 percent slopes, in a cultivated field (Union Township, 200 yards southeast of the intersection of Burma Road and Egypt Pike):

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) silt loam; strong, coarse, granular structure; friable; slightly acid; gradual, smooth boundary.

B1—6 to 11 inches, dark-brown (10YR 4/3) silt loam; very dark grayish-brown (10YR 3/2) coatings on peds; moderate, fine, subangular blocky structure; friable; sandstone fragments, up to 6 inches across, make up about 10 percent of the soil mass; medium acid; clear, wavy boundary.

B21t—11 to 21 inches, dark-brown (7.5YR 4/3) clay loam; brown (10YR 5/3) coatings on peds; weak to moderate, fine, subangular blocky structure; firm; about 25 percent is coarse skeleton consisting of sandstone fragments up to 6 inches across; derived from till; strongly acid; clear, smooth boundary.

IIB22t—21 to 29 inches, yellowish-brown (10YR 5/6) flaggy loam; a few pale-brown (10YR 6/3) mottles; weak, coarse, subangular blocky structure; firm; 45 percent is coarse skeleton consisting of sandstone fragments up to 10 inches across; very strongly acid; gradual, smooth boundary.

IIB23t—29 to 36 inches, yellowish-brown (10YR 5/6) flaggy clay loam; a few brown (10YR 5/3) clay flows; very weak, coarse, subangular blocky structure; firm; 45 percent is coarse skeleton consisting of sandstone fragments up to 10 inches across; very strongly acid; clear, smooth boundary.

IIB3—36 to 40 inches, strong-brown (7.5YR 5/8) very flaggy clay loam; a few, dark, yellowish-brown (10YR 4/4) mottles; very weak, coarse, subangular blocky structure; firm; about 85 percent is coarse skeleton of sandstone fragments; strongly acid; abrupt boundary.

R—40 inches +, fine-grained sandstone bedrock.

The B horizon ranges from loam to clay loam or silty clay loam. The depth to a horizon having a coarse skeleton of more than 50 percent is 20 to 40 inches. In places there is a thin lens of grayish clay overlying the IIB3 horizon.

Markland series

The Markland series consists of well drained or moderately well drained soils that developed over calcareous lacustrine clay and silty clay of Wisconsin glacial age. These soils lie on dissected terraces and are leached of free carbonates to a depth of 20 to 40 inches. In most places their A horizon apparently developed from loess.

The Markland soils are in the same drainage sequence as the somewhat poorly drained McGary soils, and they occur with them. Markland soils have finer textured B and C horizons than the Henshaw soils, and they are leached of free carbonates to a lesser depth. They have thinner horizons and are less deeply leached and weathered than the Pekin soils.

Typical profile of Markland silt loam, 2 to 6 percent slopes, in an undisturbed area (Jefferson Township, NE¼ sec. 11):

A1—0 to 3 inches, dark grayish-brown (10YR 4/2) silt loam; strong, medium and coarse, granular structure; friable; medium acid; abrupt, smooth boundary.

A2—3 to 7 inches, light yellowish-brown (2.5Y 6/4) silt loam; weak, coarse, angular blocky structure that breaks to weak, very fine, subangular blocky structure; friable; compact; root channels filled with

dark grayish-brown (10YR 4/2) silt loam; strongly acid; clear, smooth boundary.

IIB1t—7 to 14 inches, yellowish-brown (10YR 5/4) silty clay loam; few, fine, faint mottles of pale brown (10YR 6/3); moderate, medium, subangular blocky structure; firm; very strongly acid; gradual, smooth boundary.

IIB21t—14 to 19 inches, yellowish-brown (10YR 5/6) silty clay; common, fine, distinct mottles of light yellowish brown (10YR 6/4); weak to moderate, medium and coarse, subangular blocky structure; very firm; very strongly acid; gradual, smooth boundary.

IIB22t—19 to 25 inches, brown (10YR 5/3) silty clay; common, fine, faint mottles of pale brown (10YR 6/3) and grayish brown (10YR 5/2); weak prismatic structure that breaks to moderate, coarse, angular blocky structure; very firm; medium acid; gradual, smooth boundary.

IIB23t—25 to 34 inches, yellowish-brown (10YR 5/8) silty clay; common, fine, distinct mottles of dark yellowish brown (10YR 4/4), grayish brown (10YR 5/2), and light yellowish brown (10YR 6/4); weak platy structure that breaks to weak, coarse, angular blocky structure; very firm; neutral; abrupt, smooth boundary.

IIC—34 to 44 inches, light brownish-gray (10YR 6/2) clay; common, fine, distinct mottles of brown (10YR 5/3) and yellowish brown (10YR 5/8); very firm, laminated; calcareous; contains concretions of white lime; mildly alkaline.

The upper part of the solum that developed from loess ranges from 6 to 15 inches in thickness. The texture of the IIB2 horizon, which developed from lacustrine material, is silty clay or clay. These soils are slightly acid to strongly acid in the A horizon and are medium acid to very strongly acid in the upper B horizon.

McGary series

In the McGary series are somewhat poorly drained soils on dissected terraces that developed over calcareous lacustrine clay and silty clay of Wisconsin glacial age. These soils have been leached of free carbonates to a depth of 20 to 40 inches. In most places the uppermost 10 to 14 inches of the McGary soils developed in loess.

These soils occur closely with the well drained or moderately well drained Markland soils. They resemble the Bartle soils but have thinner horizons and are much less deeply leached of carbonates. The McGary soils formed from finer textured parent material than the Bartle and Henshaw soils; they are finer textured in the B horizon and are less deeply leached of carbonates.

Typical profile of McGary silt loam, 0 to 2 percent slopes, in an undisturbed area (Jefferson Township, SE¼ sec. 1):

A1—0 to 3 inches, dark grayish-brown (10YR 4/2) fine silt loam; strong, fine and medium, granular structure; friable; slightly acid; abrupt, smooth boundary.

A2—3 to 6 inches, light yellowish-brown (10YR 6/4) fine silt loam; common, fine, faint mottles of grayish brown (10YR 5/2); strong, fine and medium, granular structure; friable; strongly acid; clear, smooth boundary.

A3—6 to 9 inches, light brownish-gray (10YR 6/2) fine silt loam; many, fine, prominent mottles of light yellowish brown (2.5Y 6/4) and yellowish brown (10YR 5/8); weak to moderate, fine, subangular blocky structure; friable; very strongly acid; clear, wavy boundary.

B1g—9 to 13 inches, light brownish-gray (2.5Y 6/2) silty clay loam; many, medium, prominent mottles of yellowish brown (10YR 5/8) and dark yellowish brown (10YR 4/4); moderate, medium, subangular blocky structure; firm; numerous small, dark concretions; very strongly acid; gradual, smooth boundary.

IIB21tg—13 to 22 inches, grayish-brown (2.5Y 5/2) silty clay loam; many, coarse, prominent mottles of yellowish brown (10YR 5/8) and brownish yellow (10YR 6/6); moderate, fine, subangular blocky structure; firm; a few dark concretions; very strongly acid; gradual, smooth boundary.

IIB22tg—22 to 31 inches, grayish-brown (2.5Y 5/2) silty clay; many, coarse, prominent mottles of yellowish brown (10YR 5/8), and strong brown (7.5YR 5/6); weak, fine, subangular blocky structure; firm; strongly acid; gradual boundary.

IIB3tg—31 to 37 inches, light brownish-gray (10YR 6/2) silty clay; common, coarse, prominent mottles of brown (10YR 5/3) and yellowish brown (10YR 5/6); very weak, fine, subangular blocky structure; very firm when moist, plastic but only slightly sticky when wet; strongly acid; clear, smooth boundary.

IIC1—37 to 50 inches, grayish-brown (10YR 5/2) silty clay; common, coarse, prominent mottles of yellowish brown (10YR 5/8); weak, thick, platy structure that breaks to weak, medium and coarse, angular blocky structure; very firm when moist, plastic but only slightly sticky when wet; mildly calcareous.

IIC2—50 to 60 inches, laminated, calcareous clay and silty clay; colors similar to those in IIC1 horizon.

The thickness of the upper part of the solum that formed in loess ranges from 6 to 15 inches. In the lower B horizon, which formed in lacustrine material, the texture is clay or silty clay. The surface and interior of peds in the B horizon are dominantly gray or grayish brown. These soils are medium acid to very strongly acid in the upper B horizon and, in some places, are neutral in the lower B horizon. Calcareous lacustrine clay or silty clay is at a depth of 20 to 40 inches.

Mentor series

The Mentor series consists of well-drained soils on undissected or slightly dissected glacial terraces. These soils developed from acid lacustrine silt or sand, or both, of Wisconsin age. The lacustrine material lies south of the Late Wisconsin glacial border and is in side valleys along the Scioto River and Paint Creek.

The Mentor soils occur near the Pekin and Bartle soils.

Typical profile of Mentor very fine sandy loam, 2 to 6 percent slopes, in a cultivated area (Jefferson Township, 3 miles northeast of Richmondale, 200 yards north of the junction of Little Salt Creek and the Middle Fork of Salt Creek):

Ap—0 to 8 inches, brown (10YR 4/3) very fine sandy loam; moderate, medium, granular structure; friable; slightly acid; abrupt, smooth boundary.

A2—8 to 14 inches, light yellowish-brown (10YR 6/4) very fine sandy loam; weak, very fine, subangular blocky structure; friable; medium acid; clear, smooth boundary.

B1—14 to 17 inches, yellowish-brown (10YR 5/4) very fine sandy loam; moderate to weak, fine, subangular blocky structure; friable; strongly acid; clear, smooth boundary.

B21t—17 to 22 inches, yellowish-brown (10YR 5/6) fine silt loam; weak, fine, subangular blocky structure; firm; strongly acid; clear, smooth boundary.

B22t—22 to 32 inches, yellowish-brown (10YR 5/8) coarse silty clay loam; weak, medium, subangular blocky structure; firm; strongly acid; gradual, wavy boundary.

B23—32 to 58 inches, dark yellowish-brown (10YR 4/4) fine silt loam; weak, coarse, subangular blocky structure; firm; strongly acid; gradual, wavy boundary.
C1—58 to 78 inches, yellowish-brown (10YR 5/4) silt loam; medium acid.
C2—78 to 90 inches, yellowish-brown (10YR 5/4) very fine sandy loam; medium acid.
C3—90 to 114 inches, yellowish-brown (10YR 5/4) silt loam; slightly acid.

The solum ranges from 48 to 72 inches in thickness. Because these soils developed from stratified materials, they show textural stratification throughout the B horizon. The B horizon is dominantly light silty clay loam, but in places it is loam, silt loam, or very fine sandy loam. This horizon is strongly acid or very strongly acid throughout.

Miami series

In the Miami series are undulating to steep, well-drained soils that developed in a mantle of loess over highly calcareous loam glacial till of Late Wisconsin age. The loess mantle generally is 6 to 16 inches thick, but in some places it has been mixed with the underlying till and cannot be recognized. The Miami soils occur in the central lowlands and in Late Wisconsin glacial areas on the Allegheny Plateau. They have been leached of free carbonates to a depth of 18 to 36 inches. Locally, severely eroded areas are called brown clay or red clay.

The Miami soils are in the same drainage sequence as the moderately well drained Celina soils, the somewhat poorly drained Crosby soils, and the very poorly drained Brookston soils, and they occur closely with them. Miami soils have higher base saturation than the Alexandria soils, and they formed in till having a higher content of carbonates.

Typical profile of Miami silt loam, 2 to 6 percent slopes, in a pastured area (RO–10; Concord Township, on Albert Mill Road, 1½ miles northwest of its junction with Morrison Road, 1½ miles southwest of Greenland):

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine and medium, granular structure; friable; some small pebbles and grit; slightly acid; abrupt, smooth boundary.
A2—6 to 9 inches, light yellowish-brown (10YR 6/4) silt loam; weak, thin, platy structure that breaks to moderate, fine, subangular blocky structure; friable; some pebbles and grit; medium acid; clear, smooth boundary.
IIB1—9 to 12 inches, yellowish-brown (10YR 5/4) silty clay loam; moderate, fine and medium, subangular blocky structure; firm; thin, discontinuous clay coatings on ped surfaces; strongly acid; clear, smooth boundary.
IIB21t—12 to 16 inches, dark-brown (10YR 4/3) light clay; strong, fine and medium, subangular blocky structure; firm when moist, plastic and sticky when wet; thin, continuous clay coatings on ped surfaces; strongly acid; gradual, smooth boundary.
IIB22t—16 to 20 inches, dark-brown (10YR 4/3) light clay; strong, medium and coarse, subangular blocky structure; firm when moist, plastic and sticky when wet; some pebbles; medium, continuous clay coatings on ped surfaces; medium acid; gradual, smooth boundary.
IIB23t—20 to 24 inches, dark-brown (10YR 4/3) and yellowish-brown (10YR 5/4) light clay; moderate, medium and coarse, subangular blocky structure; firm when moist, plastic and sticky when wet; pebbles and numerous shale fragments; moderate, discontinuous clay coatings on ped surfaces; slightly acid; abrupt, wavy boundary.
IIC2—24 to 48 inches, light yellowish-brown (10YR 6/4) and brown (10YR 6/3) loam till; weak, fine and medium, subangular blocky structure; friable; compact; rather numerous shale fragments; calcareous.
IIC3—48 inches +, light yellowish-brown (10YR 6/4) loam till; massive; compact; calcareous.

The thickness of the solum is 18 to 36 inches, and this varies considerably within short distances. The silty A horizon decreases in thickness with increasing slope. In texture the B2 horizon ranges from silty clay loam to light clay. In places the underlying till has a higher content of sandstone fragments and contains a lower percentage of free carbonates than normal. These places are underlain by sandstone bedrock. For example, west of the Scioto River valley are high, flat hilltops underlain by Berea sandstone, and in hills along the Allegheny Plateau the underlying bedrock is Cuyahoga shale and sandstone. In these places the soils are slightly deeper than normal and have a more friable, less clayey, and less sticky B2 horizon. Miami soils are neutral to strongly acid in the A horizon and are medium acid to very strongly acid in the upper B horizon.

Millsdale series

The Millsdale series consists of dark-colored, very poorly drained soils on terraces. The A and upper B horizons of these soils developed in glacial drift or outwash, and the lower B horizon developed in residual material weathered from dolomite bedrock. These inextensive soils occur closely with the Westland and Genesee soils.

Typical profile of Millsdale silty clay loam in a cultivated area (Deerfield Township, along the North Fork of Paint Creek, 200 yards southeast of Dogtown Road):

Ap—0 to 9 inches, black (10YR 2/1) to very dark gray (10YR 3/1) silty clay loam; moderate, coarse, granular structure; friable when moist, slightly plastic when wet; neutral; abrupt, smooth boundary.
B21tg—9 to 17 inches, very dark gray (10YR 3/1) fine silty clay loam; moderate, medium, subangular blocky structure; thin, continuous clay film on ped surfaces; firm when moist, slightly sticky and plastic when wet; neutral; gradual, smooth boundary.
B22tg—17 to 27 inches, dark-gray (10YR 4/1) silty clay; common, medium, distinct mottles of yellowish brown (10YR 5/6); moderate, medium and coarse, subangular blocky structure; firm when moist, plastic and sticky when wet; thin, continuous clay films on vertical ped surfaces; neutral; gradual, smooth boundary.
IIB3g—27 to 32 inches, dark-gray (10YR 4/1) silty clay loam mottled with olive (5Y 4/4) and light yellowish brown (10YR 6/4); weak, coarse, subangular blocky structure; firm when moist, plastic and sticky when wet; contains a few fragments of weathered limestone or dolomite; neutral to mildly alkaline; abrupt, wavy boundary.
IIR—32 inches +, limestone (dolomite) bedrock.

The gleyed B horizon ranges from fine silty clay loam to silty clay. The depth to solid dolomite bedrock ranges from 20 to 40 inches. These soils are neutral to medium acid in the A horizon.

Milton series

In the Milton series are well-drained soils that generally occupy uplands. These soils developed from a

thin deposit of calcareous Wisconsin glacial drift over dolomite bedrock. The drift ordinarily is till of Late Wisconsin age, but in a few places it is calcareous gravel and sand of either Late or Early Wisconsin age. Although the upper part of the solum developed from drift, the thin, clayey, very plastic and sticky lower B horizon was derived from the underlying dolomite.

The inextensive Milton soils occur principally with the Miami and Kendallville soils in the extreme western part of the county.

Typical profile of Milton silt loam, 2 to 6 percent slopes, in a cultivated area (1½ miles west-southwest of the junction of Rapid Forge and Taylor Roads):

Ap—0 to 8 inches, brown (10YR 5/3) silt loam; moderate, medium, granular structure; friable; neutral; abrupt, smooth boundary.

B1—8 to 12 inches, yellowish-brown (10YR 5/4) clay loam; moderate to strong, fine, subangular blocky structure; firm; a few small pebbles; medium acid; clear, smooth boundary.

B21t—12 to 16 inches, yellowish-brown (10YR 5/4) clay loam; thin clay films on peds; strong, medium, subangular blocky structure; firm; a few glacial pebbles up to 1 inch in diameter; very strongly acid; clear, smooth boundary.

B22t—16 to 21 inches, brown (7.5YR 5/4) clay loam; thin clay films of same color on peds; strong, medium, subangular blocky structure; firm; strongly acid; clear, wavy boundary.

B23t—21 to 24 inches, yellowish-brown (10YR 5/4) fine clay loam; dark yellowish-brown (10YR 4/4) clay films on peds; numerous, thin, black concretionary films on some ped surfaces; moderate, coarse, subangular blocky structure; firm when moist, very sticky when wet; no pebbles; strongly acid to medium acid; clear, somewhat wavy boundary.

IIB24t—24 to 28 inches, dark-brown (7.5YR 4/2) smooth clay; moderate, coarse, angular blocky structure; firm when moist, very sticky and plastic when wet; no glacial pebbles; slightly acid; abrupt, wavy boundary.

IIB3—28 to 34 inches, dark-brown (7.5YR 4/2) sandy clay surrounding fragments of weathered dolomite; massive; firm; calcareous; abrupt, wavy boundary.

R—34 to 42 inches, slightly to highly weathered dolomite that has a yellowish-brown surface and a gray interior; fragmented and fractured; some calcareous sandy loam material extends into cracks and surrounds fragments.

In a few areas the Milton soils are on terraces. Here, the upper part of the solum, including the middle to lower part of the B horizon, developed in outwash instead of till, and it contains more gravel than that of the typical soil. Hues in the B horizon range from 10YR to 5YR. In some places the B horizon is silty clay. In places the lower B horizon, derived from dolomitic limestone, is very fine clay. In other places it is loamy or sandy and has a high content of limestone fragments. In some areas the part of the solum that developed in till lies directly over limestone.

Monongahela series

The Monongahela series consists of moderately well drained soils that lie on high-level stream terraces in the unglaciated area of the Allegheny Plateau. These soils have a distinct fragipan. They developed in a mantle of silt, 20 to 40 inches thick, over medium-textured, channery alluvium of pre-Illinoian age. The silt probably was blown in as loess and is geologically younger than the underlying alluvium, which washed from uplands underlain by sandstone and acid shale. The fragipan formed in the lower part of the silt mantle and the upper part of the alluvium.

Monongahela soils occur chiefly with the somewhat poorly drained Tyler soils. They also occur with the Pope, Philo, and Cruze soils.

Typical profile of Monongahela silt loam, 2 to 6 percent slopes, in a cultivated area (RO–59; Huntington Township, 60 yards south-southwest of the intersection of Denver Road and Hartwood Road):

Ap—0 to 7 inches, dark-brown (10YR 4/3) smooth silt loam; brown (10YR 5/3) when crushed; moderate, fine and medium, granular structure; friable; free of grit and pebbles; very strongly acid; abrupt, smooth boundary.

A2—7 to 16 inches, yellowish-brown (10YR 5/4) smooth silt loam; a few brown (10YR 5/3) coatings; moderate, fine, subangular blocky structure; friable; very strongly acid; abrupt, smooth boundary.

B1t—16 to 21 inches, light yellowish-brown (10YR 6/4) silty clay loam that is mottled with yellowish brown (10YR 5/6); moderate, medium, subangular blocky structure; firm; dark concretionary material on some ped faces; very strongly acid; clear, smooth boundary.

B21t—21 to 24 inches, pale-brown (10YR 6/3) silty clay loam; common, fine, distinct mottles of light yellowish brown (10YR 6/4) and brown (10YR 5/3); moderate to strong, medium, subangular blocky structure; firm; a few dark concretionary stains on ped faces; very strongly acid; clear, smooth boundary.

Bx1—24 to 30 inches, pale-brown (10YR 6/3) light silty clay loam; many, medium, distinct mottles of yellowish brown (10YR 5/8) and light gray (2.5Y 7/2); moderate, medium, subangular blocky structure; very firm; brittle; a few dark concretionary stains on ped faces; very strongly acid; clear, smooth boundary.

Bx2—30 to 37 inches, light brownish-gray (10YR 6/2) light silty clay loam; many, medium, distinct, mottles of yellowish brown (10YR 5/6) and light yellowish brown (10YR 6/4); light brownish-gray and light yellowish-brown material is silty clay that occurs as coatings; primary structure is polygonal; polygons are about 1 foot across, are coated with brownish gray, and break to weak, coarse, subangular blocky units; very firm; brittle; very strongly acid; clear, smooth boundary.

IIBx3—37 to 49 inches, light yellowish-brown (10YR 6/4) light silty clay loam; many, medium, faint mottles of light brownish gray (10YR 6/2) and pale brown (10 YR 6/3); light brownish-gray ped coatings; very weak, medium, subangular blocky structure; extremely firm; brittle; and compact; many dark concretionary coatings on ped faces; extremely acid; clear lower boundary.

IIBx4—49 to 63 inches, yellowish-brown (10YR 5/4) channery silty clay loam; common, medium, faint mottles of pale brown (10YR 6/3) and light yellowish brown (10YR 6/4); sandstone fragments up to 3 inches across; very weak, medium, subangular blocky structure; extremely firm and compact; extremely acid; gradual, wavy boundary.

C—63 to 90 inches, yellowish-brown (10YR 5/4) channery clay loam; massive; firm; compact; extremely acid.

Above the fragipan the B horizon is fine silt loam or silty clay loam. The depth to the fragipan ranges from 18 to 30 inches. In the fragipan the texture is light silty clay or clay loam. These soils are medium acid to very strongly acid in the Ap or the A1 horizon and are very strongly acid or extremely acid in the rest of the

solum. The base saturation percentage decreases with depth.

Muskingum series

The Muskingum series consists of sloping to very steep, light-colored, well-drained soils that formed over sandstone. These soils have a moderately thick solum. Although their textural profile is rather weakly developed, their color profile is well developed and their A, B, and C horizons are distinct. Muskingum soils are most extensive on the unglaciated Allegheny Plateau, but they also occur locally on driftfree hillsides in both the Wisconsin and the Illinoian glacial areas.

The Muskingum soils lie close to the Wellston, Berks, Neotoma, Rarden, and Loudonville soils, and in some places they are near the Monongahela soils. They are similar to the Latham soils in depth and in thickness and arrangement of horizons, but they have a less clayey, less plastic B horizon than the Latham soils, and their C horizon was derived from sandstone instead of clay shale. The Muskingum soils have an A horizon that is neither so thick nor so dark colored as that of Neotoma soils, and in the B horizon they lack the skeletal sandstone and shale of the Berks soils.

Typical profile of a Muskingum very stony silt loam in a forested area having slopes of 25 to 35 percent (Colerain Township, NE¼ sec. 36):

O1—thin layer of leaves, forest litter, and leaf mold.
A1—0 to 2 inches, light olive-brown (2.5Y 5/4) very stony silt loam; a few organic coatings of very dark grayish brown (2.5Y 3/2); weak, medium, granular structure, friable; extremely acid; gradual, smooth boundary.
A2—2 to 9 inches, yellowish-brown (10YR 5/4) very stony silt loam; weak, coarse and medium, granular structure; friable; a few small sandstone fragments; very strongly acid; clear, wavy boundary.
B1—9 to 15 inches, strong-brown (7.5YR 5/6) silt loam; weak, fine, subangular blocky structure; friable; 10 percent subangular fragments of sandstone; very strongly acid; gradual, smooth boundary.
B2—15 to 24 inches, strong-brown (7.5YR 5/6) channery fine silt loam; moderate, fine, subangular blocky structure; slightly firm; 20 percent sandstone fragments; very strongly acid; clear, irregular boundary.
C—24 to 32 inches, highly weathered fine-grained sandstone of Logan formation; the upper part of this horizon is strong-brown (7.5YR 5/8) skeletal silt loam and sandstone rock; the soil and rock materials grade into fresh bedrock at a depth of about 36 inches in this profile and at depths of 30 to 50 inches in the general area.

The thickness of the solum ranges from 20 to 36 inches, and that of the A1 horizon, from 1 to 3 inches. Generally, the lower 3- to 6-inch part of the B horizon is skeletal and is more than 50 percent coarse fragments, but this part of the B horizon is as much as 12 inches thick in places where the solum is more than 30 inches thick. Hues in the B horizon are 10YR and 7.5YR. The underlying bedrock is fine-grained sandstone or siltstone.

Negley series

The Negley series consists of sloping to very steep, well-drained soils that developed from calcareous gravel and sand of Illinoian or Early Wisconsin glacial age. In areas where the parent material is of Illinoian age, these soils lie on terrace escarpments and occur with the Parke and Pike soils. Where the parent material is of Early Wisconsin age, they occupy kames on uplands and occur with the Lorenzo, Fox, and Parke soils.

The Negley soils developed entirely from gravel and sand, whereas the upper solum of the Parke and Pike soils developed from loess. In the Negley soils the A horizon is everywhere coarser textured than silt loam. These soils contain more medium and coarse sands throughout than the Mentor soils.

Typical profile of Negley loam in a pastured area having slopes of more than 25 percent (Springfield Township, NE¼ sec. 30):

Ap—0 to 8 inches, dark-brown (7.5YR 4/2) loam; moderate, medium, granular structure; friable; slightly acid; smooth boundary.
A2—8 to 12 inches, brown (7.5YR 5/4) loam; moderate, coarse, granular structure; friable; medium acid; clear, smooth boundary.
B1t—12 to 20 inches, strong-brown (7.5YR 5/6) coarse clay loam or fine sandy clay loam; moderate, fine and medium, subangular blocky structure; firm; strongly acid; gradual, smooth boundary.
B21t—20 to 41 inches, strong-brown (7.5YR 5/6) coarse sandy clay loam; moderate, medium, subangular blocky structure; this horizon is more clayey than the one above; firm when moist, plastic and sticky when wet; strongly acid; gradual, smooth boundary.
B22t—41 to 53 inches, dark-brown (7.5YR 4/4) sandy clay loam; moderate, medium, subangular blocky structure; firm when moist, plastic and sticky when wet; strongly acid; gradual, smooth boundary.
B3—53 to 76 inches, dark-brown (7.5YR 4/4) sandy loam that contains enough clay to be plastic and sticky when wet; weak, medium to coarse, angular blocky structure; friable when moist; strongly acid ranging to slightly acid; abrupt, irregular boundary.
C—76 to 86 inches, clean, loose, stratified, calcareous sand and fine gravel of Illinoian age.

The B2 horizon ranges from sandy clay loam to clay loam in texture. The depth to the C horizon is 6 to 8 feet.

Neotoma series

The Neotoma series consists of steep or very steep, dark-colored, well-drained soils that developed in residuum from fine-grained sandstone. These soils occur only in coves and on north-facing (mainly northeast-facing) slopes. They are most extensive in the unglaciated part of the Allegheny Plateau, but they also occur on some driftfree hillsides in the Illinoian glacial area on the plateau. Although the textural profile of Neotoma soils is rather weakly developed, the solum is relatively thick, the color profile is well defined, and the A, B, and C horizons are distinct.

The Neotoma soils occur principally with the Muskingum soils and, to a lesser extent, with the Latham soils. Unlike the Muskingum soils, they have an argillic horizon, but they lack the A2 horizon of those soils. Also, the A1 horizon in Neotoma soils is considerably thicker and darker colored than the one in Muskingum soils, and it is relatively high in organic-matter content, pH value, and bases.

Typical profile of a Neotoma very stony silt loam in a forested area having slopes of more than 25 percent

(Colerain Township, SW¼NE¼ sec. 26, one-half mile northeast of the intersection of Swamp and Swamp Ridge Roads):

O1—1 inch to 0, a uniform layer of leaf litter, primarily from a mixed stand of mesophytic trees; this layer varies in thickness with the seasons and is thickest in autumn after the leaves fall.

A1—0 to 6 inches, very dark grayish-brown (10YR 3/2) very stony silt loam; moderate and strong, fine and medium, granular structure; friable; abundant fine roots; about 25 percent is coarse skeleton consisting of channery fragments of sandstone; slightly acid; clear, wavy boundary.

A3—6 to 9 inches, dark-brown (10YR 4/3) channery silt loam; moderate, medium, granular structure; friable; fine roots plentiful; about 30 percent is coarse skeleton consisting of flagstones and channery fragments of sandstone; medium acid; clear, smooth boundary.

B1—9 to 15 inches, yellowish-brown (10YR 5/6) channery silt loam; a few pale-brown (10YR 6/3) vesicular coatings on a few peds; weak, fine, subangular blocky structure; large roots; about 35 percent is coarse skeleton consisting of channery fragments and flagstones of sandstone; medium acid; gradual, smooth boundary.

B21t—15 to 22 inches, brown (7.5YR 5/4) channery silt loam; weak, fine and medium, subangular blocky structure; friable; large roots plentiful; about 45 percent is coarse skeleton consisting of flagstones and stony fragments of sandstone; common, thin, discontinuous clay films in old root channels, on sand grains, and on ped surfaces; medium acid; gradual, smooth boundary.

B22t—22 to 30 inches, yellowish-brown (10YR 5/4 to 5/6) very channery silt loam; weak, fine, subangular blocky structure; friable; few larger roots; about 50 percent is coarse skeleton consisting of sandstone fragments; a few, thin, discontinuous clay films in old root channels, on sand grains, and on ped surfaces; strongly acid; gradual, smooth boundary.

B3—30 to 40 inches, yellowish-brown (10YR 5/4) very flaggy loam; very weak, fine, subangular blocky structure; friable; a few larger roots; about 70 percent is coarse skeleton consisting of flagstones of sandstone; very few, thin clay films on sand grains and ped surfaces; strongly acid; diffuse, wavy boundary.

C1—40 to 50 inches, yellowish-brown (10YR 5/6) very flaggy loam; massive; loamy material occurs as coating on rock fragments; friable; very few larger roots; about 90 percent is coarse skeleton consisting mainly of flagstones of sandstone; very strongly acid; diffuse, wavy boundary.

R—50 inches +, acid sandstone with some fractures that decrease in number with increasing depth; a slightly weathered zone occurs on the surface of some fragments.

The main variations are in the thickness, darkness, and organic-matter content of the A1 horizon and in the thickness and stoniness of the solum. The A1 horizon ranges from 6 to 10 inches in thickness. In color it ranges from very dark grayish brown (10YR 3/2) or dark brown (10YR 3/3) to black (10YR 2/1). The solum is 30 to 60 inches thick. It has a content of coarse fragments ranging from 15 to 50 percent in the upper part, and up to 80 percent in the lower 1 to 2 feet.

Ockley series

The Ockley series consists of nearly level to gently undulating, well-drained soils on outwash terraces. These soils developed in 12 to 24 inches of silty material over stratified, calcareous gravel and sand of Late Wisconsin glacial age. The two kinds of material are the same geologic age. Gravel and sand outwash lies at a depth of more than 40 but generally less than 60 inches.

The Ockley soils are in the same drainage sequence as the moderately well drained Thackery soils, the somewhat poorly drained Sleeth soils, and the very poorly drained Westland soils, and they occur with those soils. They also occur with the Fox, Wea, and Warsaw soils.

Typical profile of Ockley silt loam, 0 to 2 percent slopes, in a cultivated area (Springfield Township, SW¼NW¼ sec. 32):

Ap—0 to 8 inches, brown (10YR 5/3) silt loam; moderate, medium, granular structure; friable; slightly acid; abrupt, smooth boundary.

A2—8 to 12 inches, strong-brown (7.5YR 5/6) silt loam; weak, fine and medium, angular blocky structure; friable; medium acid; clear, wavy boundary.

B1—12 to 17 inches, dark-brown (7.5YR 4/4) loam; weak, fine and medium, subangular blocky structure; friable; medium acid; gradual, smooth boundary.

B21t—17 to 30 inches, dark-brown (7.5YR 4/4) sandy clay loam; moderate, medium, subangular blocky structure; firm when moist, plastic and sticky when wet; contains many glacial pebbles; medium acid; gradual, smooth boundary.

B22t—30 to 42 inches, dark-brown (7.5YR 4/4) sandy clay loam; moderate, medium and coarse, subangular blocky structure; firm when moist, plastic and sticky when wet; many small pebbles of limestone and a considerable amount of coarse sand; medium acid; abrupt, wavy to irregular boundary.

IIB3—42 to 48 inches, strong-brown (7.5YR 5/6) sandy loam; massive; neutral.

IIC—48 to 56 inches, light brownish-gray (10YR 6/2) and grayish-brown (10YR 5/2), loose, stratified gravel and sand; calcareous.

Undisturbed areas have thin, dark-colored O1 and A1 horizons. If cultivated, these horizons are mixed into the plow layer. In some places the B horizon is heavy loam or clay loam. In places there are moderate to thick, continuous clay coatings on ped surfaces in the B2 horizon. Generally, the depth to gravel and sand ranges from 42 to 60 inches. These soils are medium acid to very strongly acid in the B1 and upper B2 horizons and are slightly acid or neutral in the lower B horizon.

Parke series

In the Parke series are well-drained soils that developed in 20 to 40 inches of loess over calcareous gravel and sand outwash of Illinoian or Early Wisconsin age. The loess is thought to be of Wisconsin age and was deposited after the gravel and sand had been weathered. In areas where the underlying material is of Illinoian age, the Parke soils lie mainly on terraces but are also on kames and moraines in the uplands. Where the material is of Early Wisconsin age, the soils are only on kames and moraines. Calcareous gravel and sand are at a depth of 12 to 18 feet.

In the Illinoian glacial areas, these soils are in the same drainage sequence as the moderately well drained Rainsboro soils, and they occur closely with them. They also occur with the Negley, Pike, and Taggart soils. The upper solum of the Parke soils developed in loess 20 to 40 inches thick, whereas that of the Pike soils de-

veloped in loess more than 40 inches thick. In Early Wisconsin glacial areas, the Parke soils occur with the Fox soils.

Typical profile of Parke silt loam, 2 to 6 percent slopes, in a cultivated field (Liberty Township, SE¼ sec. 7):

Ap—0 to 7 inches, dark-brown (10YR 4/3) smooth silt loam; weak to moderate, medium, granular structure; friable; no grit or pebbles; slightly acid; abrupt, smooth boundary.

A2—7 to 10 inches, brown (7.5YR 4/2) smooth silt loam; moderate, medium, granular structure; friable; no grit or pebbles; strongly acid; clear, wavy boundary.

B21t—10 to 21 inches, brown (7.5YR 4/4) smooth silty clay loam; moderate, fine, subangular blocky structure; friable; no grit or pebbles; very strongly acid; clear, smooth boundary.

IIB22t—21 to 30 inches, dark yellowish-brown (10YR 4/4) loam; more sandy than horizon above; weak, coarse, subangular blocky structure; firm; a few dark stains; a few, small, quartzite pebbles; very strongly acid; clear, smooth boundary.

IIB23t—30 to 39 inches, strong-brown (7.5YR 5/6) light clay loam; weak, coarse, subangular blocky structure; firm when moist, plastic and sticky when wet; contains many, small, glacial pebbles up to 1 inch in diameter; very strongly acid; clear, smooth boundary.

IIB24t—39 to 53 inches, strong-brown (7.5YR 5/6) sandy clay loam; weak, coarse, subangular blocky structure; firm when moist, plastic and sticky when wet; very strongly acid; gradual, smooth boundary.

IIB25—53 to 68 inches, strong-brown (7.5YR 5/6) sandy clay to sandy clay loam; weak, coarse, subangular blocky structure; firm when moist, plastic and sticky when wet; medium acid.

The upper solum, which developed from silt, generally ranges between 20 and 40 inches in thickness. Undisturbed areas in forest have an O1 and an A1 horizon. The O1 horizon consists of dark-colored, decomposing leaves and forest litter about 1 inch thick. The A1 horizon is very dark grayish-brown, friable silt loam that is 2 or 3 inches thick and has a high content of organic matter. If cultivated, these horizons are mixed into the plow layer.

In some places there is a B1 horizon, the thickness of which varies with that of the upper solum. In the part developed from loess, the B horizon typically is light silty clay loam but it ranges to heavy silt loam. In the part developed from outwash, the B horizon is heavy loam, clay loam, and sandy clay loam, and there are thin layers of sandy clay in some places. Hues are 10YR and 7.5YR in the upper solum and range from 10YR to 5YR in the lower solum. The depth to calcareous gravel and sand ranges from 12 to 18 feet. These soils are slightly acid to strongly acid in the A horizon. Below the A horizon they are medium acid or strongly acid to a depth of more than 72 inches.

Pekin series

In the Pekin series are moderately well drained soils on nearly undissected terraces. These soils developed from acid lacustrine material of Wisconsin glacial age. In texture the lacustrine material ranges from silt to fine and very fine sand. Pekin soils occur in side valleys south of the Late Wisconsin glacial boundary. They are in the same drainage sequence as the well-drained Mentor soils and the somewhat poorly drained Bartle soils, and they occur with those soils.

Typical profile of Pekin silt loam, 2 to 6 percent slopes, in a cultivated area (Jefferson Township, SE¼ sec. 26):

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; a few very dark grayish-brown (10YR 3/2) coatings; weak, medium and coarse, granular structure; friable; medium acid; abrupt, smooth boundary.

A2—7 to 14 inches, yellowish-brown (10YR 5/4) silt loam; weak, very fine, subangular blocky structure; friable; old root channels contain dark grayish-brown (10YR 4/2) silt loam; medium acid; clear, smooth boundary.

B1t—14 to 18 inches, yellowish-brown (10YR 5/6) fine silt loam; a few, fine, faint mottles of brown (10YR 5/3); moderate to weak, fine, subangular blocky structure; friable; strongly acid; clear, smooth boundary.

B21t—18 to 24 inches, pale-brown (10YR 6/3) fine silt loam; common, fine, distinct mottles of yellowish brown (10YR 5/4); weak, fine, subangular blocky structure; firm; light yellowish brown (10YR 6/4) when crushed; a few small, soft, dark concretions; very strongly acid; gradual, smooth boundary.

B22t—24 to 31 inches, yellowish-brown (10YR 5/4) and pale-brown (10YR 6/3) coarse silty clay loam; light brownish-gray (10YR 6/2) coatings; weak, medium, subangular blocky structure; very firm; a few dark concretions; very strongly acid; gradual, wavy boundary.

B23t—31 to 42 inches, dark yellowish-brown (10YR 4/4) light silty clay loam; light brownish-gray (10YR 6/2) coatings; weak, coarse, subangular blocky structure; very firm; slightly brittle; a few dark concretions in ped interiors; very strongly acid; gradual, wavy boundary.

B24t—42 to 60 inches, dark yellowish-brown (10YR 4/4) light silty clay loam; grayish-brown (10YR 5/2) coatings; very weak, coarse, subangular blocky structure; very firm; a few dark concretions in ped interiors; very strongly acid; diffuse, wavy boundary.

B3—60 to 78 inches, yellowish-brown (10YR 5/4) light silty clay loam; a few, fine, faint mottles of pale brown (10YR 6/3); massive; strongly acid; gradual, wavy boundary.

C1—78 to 94 inches, yellowish-brown (10YR 5/4) and pale-brown (10YR 6/4) silt loam; massive or laminated; medium acid.

C2—94 to 114 inches, yellowish-brown (10YR 5/4) and pale-brown (10YR 6/3) silt loam; massive or laminated; medium acid to slightly acid.

The texture of the B horizon ranges from fine silt loam to silty clay loam. Hues range from 10YR to 5YR in the B horizon. In many places the profile shows evidence that the original parent material was stratified. The depth to the C horizon is generally 60 to 80 inches. These soils are neutral to medium acid in the A horizon and are strongly acid or very strongly acid in the B horizon.

Typical profile of Pekin silt loam, over clay, 2 to 6 percent slopes, in a cultivated field (Jefferson Township, SW¼ sec. 34):

Ap—0 to 7 inches, dark-brown (10YR 4/3) smooth silt loam; moderate, fine, granular structure; friable; slightly acid; abrupt, smooth boundary.

A2—7 to 13 inches, yellowish-brown (10YR 5/4) silt loam; weak to moderate, medium and coarse, granular structure; friable; medium acid; clear, wavy boundary.

B1—13 to 23 inches, dark-brown (7.5YR 4/4) fine silt loam; pale-brown (10YR 6/3) coatings on ped faces; weak,

medium, subangular blocky structure; friable; medium acid; clear, wavy boundary.

B21t—23 to 30 inches, yellowish-brown (10YR 5/4) silty clay loam; common, fine, faint mottles of dark brown (7.5YR 4/4) to brown (7.5YR 5/4); moderate, medium, subangular blocky structure; firm; some dark stains in lower part; strongly acid; gradual, wavy boundary.

B22t—30 to 35 inches, brown (7.5YR 5/4) and dark-brown (7.5YR 4/4) silty clay loam; moderate, medium, subangular blocky structure; firm; some dark stains and soft concretions; strongly acid; gradual, wavy boundary.

B31—35 to 43 inches, yellowish-brown (10YR 5/4) fine silt loam; many, fine, distinct mottles of light brownish gray (10YR 6/2) and strong brown (7.5YR 5/6); very weak, coarse, subangular blocky structure; firm; compact; dark stains and small, soft concretions are common; strongly acid; clear, smooth boundary.

IIB32—43 to 48 inches, yellowish-brown (10YR 5/4) heavy silty clay loam; common, fine, faint mottles of yellowish brown (10YR 6/4); moderate, medium, subangular blocky structure; firm; strongly acid; clear, smooth boundary.

IIB33—48 to 54 inches, dark yellowish-brown (10YR 4/4) silty clay; common, fine, distinct mottles of pale brown (10YR 6/3); strong, coarse, angular blocky structure; very firm; strongly acid; clear, smooth boundary.

IIB34—54 to 64 inches, dark yellowish-brown (10YR 4/4) silty clay; many, medium, distinct mottles of light yellowish brown (10YR 6/4); strong, very coarse, angular blocky structure; very firm; medium acid; clear, wavy boundary.

IIC1—64 to 70 inches, dark-brown (10YR 4/3) silty clay; platy structure along varves, breaking to strong, very coarse, angular blocky structure; very firm; slightly acid; abrupt, wavy boundary.

IIC2—70 to 86 inches, brown (10YR 5/3), pale brown (10YR 6/3, and very pale-brown (10YR 7/3), laminated clay; very firm; calcareous.

The IIB and IIC horizons were derived from clayey lacustrine material. The IIB horizon is at a depth ranging from 30 to 50 inches.

Philo series

The Philo series consists of moderately well drained soils that developed from strongly acid or very strongly acid, medium-textured stream alluvium. The alluvium washed mainly from unglaciated areas of acid sandstone and shale.

The Philo soils are in the same drainage sequence as the well-drained Pope soils and the somewhat poorly drained Stendal soils, and they occur with them. Philo soils are considerably more acid than the Eel soils.

Typical profile of Philo silt loam in an undisturbed area (one-half mile northeast of the junction of North Ridge and Stony Creek roads):

A11—0 to 2 inches, very dark brown (10YR 3/3) silt loam; moderate, medium, granular structure; friable; very strongly acid; abrupt, wavy boundary.

A12—2 to 6 inches, dark-brown (10YR 4/3) silt loam; brown (10YR 5/3) when crushed; weak, medium and coarse, granular structure; friable; very strongly acid; clear, wavy boundary.

C1—6 to 16 inches, brown (10YR 5/3) silt loam; weak, medium, subangular blocky structure; friable; very strongly acid; clear, smooth boundary.

C2—16 to 20 inches, brown (10YR 5/3) silt loam; common, fine, faint mottles of pale brown (10YR 6/3); weak, medium, subangular blocky structure; friable; very strongly acid; clear, smooth boundary.

C3—20 to 26 inches, pale-brown (10YR 6/3) silt loam; many, medium, prominent mottles of yellowish brown (10YR 5/6); weak, coarse, subangular blocky structure; firm; very strongly acid; clear, smooth boundary.

C4—26 to 32 inches, pale-brown (10YR 6/3) silt loam; many, medium and coarse, prominent mottles of yellowish brown (10YR 5/6); weak, coarse, subangular blocky structure; firm; many, small, dark concretions in yellowish-brown material; very strongly acid; clear, smooth boundary.

C5—32 to 46 inches, yellowish-brown (10YR 5/8) silt loam; common, medium, prominent mottles of light brownish gray (2.5Y 6/2); weak, coarse, subangular blocky structure; firm; many, small, dark concretions; very strongly acid.

The texture through the control section is stratified silt loam, loam, coarse silty clay loam, and, in some places, fine sandy loam. Channery fragments make up as much as 30 percent of individual strata, by volume. In Philo soils, channery variant, channery fragments of sandstone and shale amount to 50 to 80 percent of the soil mass below the surface horizon. The depth to mottling ranges from 14 to 30 inches. These soils are strongly acid to extremely acid below the A horizon.

Pike series

The Pike series consists of well-drained soils on glacial terraces. These soils developed in loess, 40 to more than 60 inches thick, over leached gravelly and sandy outwash of Illinoian age. The leached material is underlain by calcareous gravel and sand.

The A and B horizons of the Pike soils are from loess apparently of Wisconsin age. Underlying these horizons is a deeply weathered buried soil, or paleosol, that developed from sand and gravel.

Pike soils are in the same drainage sequence as the somewhat poorly drained and poorly drained Taggart soils, and they occur closely with them. They also occur with the Parke and Negley soils. The Pike soils have a thicker upper solum than the Parke soils.

Typical profile of Pike silt loam, 0 to 2 percent slopes, in a cultivated area (RO–6; Springfield Township, SE¼ sec. 26):

Ap—0 to 10 inches, dark-brown (10YR 4/3) smooth silt loam; weak, fine and medium, granular structure; very friable; very strongly acid; abrupt, smooth boundary.

A2—10 to 14 inches, yellowish-brown (10YR 5/4) smooth silt loam; weak, fine and medium, subangular blocky structure; friable; strongly acid; gradual, smooth boundary.

B1—14 to 20 inches, brown (7.5YR 4/4) smooth fine silt loam; weak, fine and medium, subangular blocky structure; friable; very strongly acid; diffuse, smooth boundary.

B21—20 to 30 inches, strong-brown (7.5YR 5/6) coarse silty clay loam; moderate, medium, subangular blocky structure; firm; thin, discontinuous clay coatings on ped surfaces; very strongly acid; gradual, smooth boundary.

B22t—30 to 39 inches, brownish-yellow (10YR 6/6) fine silt loam; strong brown (7.5YR 5/8) on ped surfaces; ped surfaces also have some dark staining; weak, coarse, prismatic structure that breaks to weak, coarse, subangular blocky structure; friable; thin, discontinuous clay coatings on ped surfaces; very strongly acid; diffuse, wavy boundary.

B31—39 to 56 inches, variegated dark-brown (7.5YR 4/4), brownish-yellow (10YR 6/8), yellowish-brown (10YR 5/6), and pale-brown (10YR 6/3) silt loam; weak,

very coarse, subangular blocky structure; friable; strongly acid; clear, smooth boundary.

IIA2b—56 to 79 inches, brown (10YR 5/3) and light yellowish-brown (10YR 6/4) loam; moderate, thick, platy structure that breaks to weak, fine, subangular blocky structure; very firm; medium acid; gradual, smooth boundary.

IIA2b—56 to 79 inches, brown (10YR 5/3) and light yellow-clay loam; moderate, fine, subangular blocky structure; firm when moist, sticky and moderately plastic when wet; medium acid.

IIB22b—89 to 104 inches, yellowish-red (5YR 5/8) clay loam; firm when moist, sticky when wet; medium acid.

IIB23b—104 to 110 inches, yellowish-red (5YR 5/6) sandy clay loam that contains a considerable amount of gravel; firm when moist, sticky when wet; medium acid.

IIB24b—110 to 132 inches, dark-brown (7.5YR 4/4) sandy clay loam that contains a considerable amount of gravel; firm when moist, sticky when wet; medium acid.

IIB3b—132 to 200 inches, dark-brown (10YR 4/3) sandy loam; friable; slightly acid.

IICb—200 inches +, calcareous gravel and sand.

The part of the solum that developed from loess generally ranges from 40 to 75 inches in thickness. The loess had a high content of very fine sand. In forested areas there are thin, dark-brown O1 and A1 horizons. In some places the B21 horizon is heavy silt loam and the B22 horizon is silty clay loam. The IIA and IIB horizons may contain an appreciable amount of fine gravel, mostly quartzite, quartz, sandstone, and basalt. The depth to calcareous gravel and sand is 15 to 20 feet. This variation in depth results in wide differences in thickness of the IIB horizon. The Pike soils are medium acid to very strongly acid throughout the solum.

Pope series

The Pope series consists of well-drained soils that developed from very strongly acid to medium acid, medium-textured stream alluvium. The alluvium washed mainly from unglaciated areas underlain by sandstone and acid shale, but some of it came from areas underlain by glacial drift of Illinoian age.

The Pope soils are in the same drainage sequence as the moderately well drained Philo soils and the somewhat poorly drained Stendal soils. In drainage and color the Pope soils are similar to the Genesee soils, which developed from nearly neutral to calcareous alluvium washed chiefly from areas of highly calcareous glacial drift of Wisconsin age.

Typical profile of Pope silt loam in an area once cultivated but now forested (Franklin Township, one-eighth mile west of the junction of Stony Creek Road and North Ridge Road):

A1—0 to 4 inches, very dark brown (10YR 3/3) silt loam, dark brown (10YR 4/3) when crushed; moderate, medium and coarse, granular structure; friable; few small channery fragments up to 2 inches across; medium acid; clear, wavy boundary.

C1—4 to 8 inches, brown (10YR 5/3) silt loam; dark grayish-brown (10YR 4/2) coatings; weak, fine, subangular blocky structure; friable; few small channery fragments up to 2 inches across; very strongly acid; clear, smooth boundary.

C2—8 to 12 inches, brown (10YR 5/3) silt loam; dark-brown (10YR 4/3) coatings; weak, medium, subangular blocky structure; friable; a few small channery fragments; very strongly acid; gradual, smooth boundary.

C3—12 to 25 inches, brown (10YR 5/3) fine silt loam; weak, medium, subangular blocky structure; firm; a few parts of this horizon contain many small channery fragments that are not continuous horizontally; very strongly acid; gradual, smooth boundary.

C4—25 to 36 inches, yellowish-brown (10YR 5/4) silt loam; massive; firm; about 15 percent is coarse material consisting of small channery fragments; very strongly acid; clear, smooth boundary.

IIC5—36 to 42 inches, light yellowish-brown (10YR 6/4) channery silt loam; massive; firm; very strongly acid.

The texture through the control section is stratified silt loam, loam, coarse silty clay loam, and fine sandy loam in some areas. Individual strata are as much as 30 percent channery fragments, by volume. The color ranges from brown to dark brown and dark grayish brown. Below the A horizon these soils are strongly acid or very strongly acid.

Typical profile of Pope soils, channery variant, in an area formerly cultivated but now idle (Paxton Township, 3 miles east of Bainbridge, 1½ miles southwest of the crossing of U.S. Highway No. 50 and the D. T. & I. RR.):

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) channery silt loam; about 40 percent is coarse skeleton consisting of flat sandstone fragments mostly 1 to 2 inches in diameter; strong, medium, granular structure; friable; strongly acid; abrupt, smooth boundary.

C1—8 to 14 inches, dark brown (7.5YR 4/2), channery silt loam; about 50 percent is coarse skeleton consisting of flat sandstone fragments, half or more of which are more than 2 inches across; fragments range up to 8 inches across; moderate, medium, granular structure; friable; strongly acid; gradual, smooth boundary.

C2—14 to 32 inches, brown (10YR 5/3) channery silt loam; about 75 percent is coarse skeleton consisting of flat sandstones mostly 2 to 6 inches across; massive; friable; very strongly acid; gradual, smooth boundary.

C3—32 to 40 inches, brown (10YR 5/3) channery sandy clay loam; 80 to 90 percent is coarse skeleton consisting of fragments as in horizon above; massive; firm; very strongly acid.

Rainsboro series

In the Rainsboro series are light-colored, moderately well drained soils on glacial terraces. These soils developed in loess 24 to 42 inches thick over outwash consisting of gravel and sand of Illinoian age. The loess is of Wisconsin age and was deposited after the original weathering of the gravel and sand outwash. The combined thickness of leached material is 12 to 18 feet.

Rainsboro soils are in the same drainage sequence as the well-drained Parke soils, and they occur with them. They also occur with the Taggart and Negley soils.

Typical profile of Rainsboro silt loam, 2 to 6 percent slopes, in a cultivated area (Harrison Township, SW¼ sec. 4, one-third mile northwest of Charleston):

Ap—0 to 7 inches, brown (10YR 5/3) silt loam; moderate, fine, granular structure; friable; strongly acid; abrupt, smooth boundary.

A2—7 to 13 inches, brown (10YR 5/3) silt loam; weak, fine, subangular blocky structure; friable; very strongly acid; clear, wavy boundary.

B1—13 to 20 inches, dark yellowish-brown (10YR 4/4) silt loam; few, fine, yellowish-brown (10YR 6/4) mot-

tles; weak, medium and fine, subangular blocky structure; friable; few dark-brown (10YR 2/2) concretions; very strongly acid; clear, wavy boundary.

B21t—20 to 26 inches, dark yellowish-brown (10YR 4/4) light silty clay loam; common, medium, distinct mottles of light yellowish brown (10YR 6/4); moderate, medium and coarse, subangular blocky structure; friable; thin, light brownish-gray (10YR 6/2) silty coats on some ped faces; few dark-brown (10YR 2/2) concretions; thin, dark-brown (10YR 4/3) coatings cover 50 to 75 percent of ped surfaces; very strongly acid; gradual, wavy boundary.

Bx1—26 to 35 inches, strong-brown (7.5YR 5/6) light silty clay loam; common, medium, distinct mottles of dark yellowish brown (10YR 4/4) and pale brown (10YR 6/3); weak, coarse, subangular blocky structure; firm, brittle, and compact; few to common, dark-brown (10YR 2/2), rounded concretions and patches on ped faces; thin, dark-brown (10YR 4/3) clay coatings on ped faces; very strongly acid; clear, wavy boundary.

IIBx2—35 to 48 inches, yellowish-brown (10YR 5/4) loam; common, medium, distinct mottles of dark yellowish brown (10YR 4/4) and pale brown (10YR 6/3); weak, thick, platy structure; firm; brittle; few to common, very dark brown (10YR 2/2), rounded concretions and patchy coatings on ped faces; very strongly acid; gradual, wavy boundary.

IIB22b—48 to 74 inches, yellowish-brown (10YR 5/6) light clay loam; many, medium, distinct mottles of dark yellowish brown (10YR 4/4), strong brown (7.5YR 5/8), and light gray (10YR 7/2); weak, coarse, subangular blocky structure; firm; strongly acid; gradual, wavy boundary.

IIB3b—74 to 102 inches +, strong-brown (7.5YR 5/8) sandy clay loam; many, medium, distinct mottles of yellowish brown (10YR 5/6) and light gray (10YR 7/1); massive (structureless) to very weak, coarse, subangular blocky structure; strongly acid.

Above the fragipan the B2 horizon ranges from heavy silt loam to silty clay loam. The fragipan is 20 to 26 inches below the surface and ranges from 12 to 26 inches in thickness. The depth to bright-colored mottling is 12 to 21 inches. Mottles in the fragipan commonly have chroma of 2 or 3. In the IIBx2 horizon the texture is loam, sandy clay loam, or clay loam. Below the fragipan the texture is sandy clay loam, clay loam, or loam. The depth to calcareous gravel and sand ranges from 12 to 18 feet. These soils are medium acid to very strongly acid in the A horizon, strongly acid or very strongly acid in the argillic horizon and fragipan, and medium acid or very strongly acid below the fragipan.

Rarden series

In the Rarden series are light-colored, well-drained soils of the uplands that developed on acid clay shale and thin layers of interbedded sandstone. These soils occupy sloping to steep hillsides on the unglaciated Allegheny Plateau. On the milder slopes their A horizon developed in loess.

The Rarden soils are in the same drainage sequence as the well drained Latham soils, the moderately well drained Coolville soils, and the somewhat poorly drained Fawcett soils. Normally, the Rarden and Latham soils are on hillsides, whereas the Coolville and Fawcett soils are on ridgetops. The solum of the Rarden soils is slightly thicker than that of the Latham soils, which ordinarily occupy steeper side slopes. In addition, Rarden soils have a redder, slightly thicker, better developed B2 horizon than the Latham soils and a thicker, more weathered B3 thorizon in which red is more dominant.

Typical profile of Rarden silt loam, 12 to 18 percent slopes, in a cultivated area (Huntington Township, 6 miles south of Chillicothe, 200 yards south of North Branch Indian Creek along Sullivan Road):

Ap—0 to 6 inches, brown (10YR 5/3) silt loam; moderate, medium, granular structure; very friable; very strongly acid; abrupt, smooth boundary.

A2—6 to 9 inches, yellowish-brown (10YR 5/4) silt loam; weak, medium, subangular blocky structure; friable; very strongly acid; clear, smooth boundary.

B1—9 to 12 inches, strong-brown (7.5YR 5/6) silty clay loam; moderate, medium, subangular blocky structure; firm; few small sandstone fragments; very strongly acid; clear, smooth boundary.

B21t—12 to 18 inches, yellowish-red (5YR 5/6) silty clay; strong, medium, angular blocky structure; very firm when moist, sticky when wet; thin, brown (7.5YR 5/4) clay films on ped faces; very strongly acid; gradual wavy boundary.

B22t—18 to 23 inches, yellowish-red (5YR 5/8) silty clay; few, distinct, light brownish-gray (10YR 6/2) mottles; strong, medium, angular blocky structure; very firm when moist, sticky when wet; thin, yellowish-red (5YR 4/6) clay films on ped faces; few sandstone channery fragments; very strongly acid; gradual, smooth boundary.

B31—23 to 29 inches, variegated yellowish-red (5YR 5/6) and light brownish-gray (10YR 6/2) silty clay; weak, coarse, angular blocky structure; very firm; a few dark-gray (10YR 4/1) shale fragments; very strongly acid; gradual, smooth boundary.

C—29 to 38 inches, variegated strong-brown (7.5YR 5/6) and light brownish-gray (10YR 6/2) clay with a few red (2.5YR 4/8) streaks; massive (structureless) but breaks along rock cleavage planes; very firm when moist, sticky when wet; common partially weathered shale fragments; very strongly acid; gradual, smooth boundary.

R—38 inches +, light brownish-gray (2.5YR 6/2), slightly weathered acid clay shale and thin layers of interbedded sandstone; the upper part has streaks of strong brown and red; these diminish with increasing depth, and the shale becomes grayer in color; very strongly acid.

The thickness of the solum commonly ranges from 2 to 3 feet. The A horizon is generally silt loam, but in some eroded areas it is silty clay loam. Color in the Ap horizon ranges to grayish brown (10YR 5/2), dark grayish brown (10YR 4/2) and dark yellowish brown (10YR 4/4). In uncultivated areas there is a 1- to 3-inch A1 horizon that is very dark grayish brown (10YR 3/2). In the B1 horizon the color ranges to yellowish brown (10YR 5/4 and 5/6) and brownish yellow (10YR 6/6). The B2 and B3 horizons are silty clay or clay, and in some places they have a maximum clay content of 60 percent or more. Base hues in the B2 horizon range from 5YR to 2.5YR; chromas from 6 to 8; and values from 4 to 6. The B3 and C horizons lack a dominant color and have a variegated pattern of reds, browns, grays, and yellows. In some places the B1 and B3 horizons are very thin or lacking. The grade of structure in the B2 horizon is moderate to strong. The Rarden soils are strongly acid to extremely acid.

Ritchey series

In the Ritchey series are well-drained soils that formed in a thin deposit of Wisconsin glacial drift underlain

by dolomite. A thin layer in the lower solum contains fragments of weathered or partly weathered dolomite. Ritchey soils are inextensive in Ross County.

Typical profile of a Ritchey silt loam in a pastured area (Paint Township, 3 miles west of Humboldt):

Ap—0 to 9 inches, brown (10YR 4/3) silt loam; moderate, medium, granular structure; friable; contains many small fragments of limestone; neutral; abrupt, smooth boundary.
B2t—9 to 15 inches, brown (10YR 5/3) heavy clay loam; weak, medium, subangular blocky structure; firm; contains many small fragments of limestone; neutral; abrupt, wavy boundary.
IIB3—15 to 20 inches, yellowish-brown (10YR 5/4) channery silt loam; massive; friable; the channery fragments are slightly weathered limestone; neutral to calcareous; abrupt, wavy boundary.
IIR—20 inches +, limestone (dolomite) bedrock.

The B2t horizon, which formed in glacial drift, ranges from silty clay loam or clay loam to light silty clay. The IIB3 horizon is silt loam to silty clay and is 2 to 5 inches thick. In total thickness the B horizon ranges from 4 to 14 inches. The content of channery fragments in the lower solum ranges from 5 to about 30 percent. Ritchey soils are neutral to medium acid in the A horizon. The pH increases with depth.

Rodman series

The Rodman series consists of steep, well-drained soils that developed from calcareous gravel and sand of Wisconsin glacial age. These soils lie on terrace escarpments and on kames, eskers, and parts of moraines on the uplands. They are underlain by gravel and sand at a depth of 4 to 12 inches.

The Rodman soils occur principally with the Fox, Lorenzo, and Negley soils.

Typical profile of a Rodman soil in an undisturbed area (on U. S. Highway No. 50, 1½ miles west of Bainbridge, 1,300 yards south of benchmark 736):

A11—0 to 3 inches, very dark brown (10YR 2/2) fine gravelly loam to sandy loam; moderate, fine, granular structure; friable; relatively high organic-matter content (6.7 percent); neutral to mildly alkaline; gradual, smooth boundary.
A12—3 to 9 inches, very dark grayish-brown (10YR 3/2) fine gravelly sandy loam; slightly lighter in color than A11 horizon; weak, fine, granular structure; friable; relatively high organic-matter content (4.8 percent); mildly alkaline; clear, wavy boundary.
C—9 to 21 inches, grayish-brown (10YR 5/2), loose, calcareous gravel and sand.

The A horizon ranges from black to very dark brown and very dark grayish brown. In places this horizon is gravelly loam, loam, or gravelly sandy loam. The Rodman soils are neutral to moderately alkaline and calcareous.

Ross series

The Ross series consists of well-drained soils that developed in neutral to alkaline, medium-textured alluvium of Wisconsin glacial origin. These soils occupy second bottoms or low terraces that generally lie above the Genesee soils on first bottoms. Ross soils are dark colored and have a relatively high content of organic matter. Their surface layer is thicker, darker colored, and richer in organic matter than that of the Genesee soils. The Ross soils occupy lower lying terraces than the Wea soils and lack the well-developed, clayey B horizon of those soils.

Typical profile of Ross silt loam in a cultivated area (Paxton Township, 1½ miles east-northeast of Bainbride on U.S. Highway No. 50, 300 yards north of benchmark 712):

Ap—0 to 7 inches, very dark gray (10YR 3/1) silt loam; moderate, medium, granular structure; organic-matter content 3.5 percent; mildly alkaline; abrupt, smooth boundary.
A12—7 to 11 inches, very dark gray (10YR 3/1) to black (10YR 2/1) loam, very dark brown (10YR 2/2) when crushed; organic-matter content 3.9 percent; strong, medium, granular structure; friable; neutral; clear, smooth boundary.
A13—11 to 14 inches, very dark gray (10YR 3/1) loam, very dark brown (10YR 2/2) when crushed; strong, medium, granular structure; friable; neutral; gradual, smooth boundary.
A3—14 to 30 inches, very dark grayish-brown (10YR 3/2) loam, dark brown (10YR 3/3) when crushed; moderate, medium, subangular blocky structure that breaks to moderate, very fine, subangular blocky structure; friable; neutral; clear, smooth boundary.
C1—30 to 38 inches, dark-brown (7.5YR 4/2) loam; very dark brown (10YR 3/2) coatings; weak, fine and medium, subangular blocky structure; friable; neutral; gradual, smooth boundary.
C2—38 to 47 inches, dark-brown (10YR 4/3) fine loam; moderate, medium, subangular blocky structure; friable; neutral; gradual, smooth boundary.
C3—47 to 57 inches, dark-brown (10YR 4/3) loam; weak, medium and coarse, subangular blocky structure; friable; mildly alkaline; calcareous; clear, smooth boundary.
IIC4—57 to 64 inches, light yellowish-brown (10YR 6/4) sand; loose; stratified; calcareous; contains many snail shells.

In some places the dark-colored surface horizon (mollic epipedon) is very dark brown, very dark grayish brown, dark brown, or dark gray. The minimum thickness of a horizon having chroma of 3.5 or darker is 20 inches; the maximum thickness is about 50 inches. The texture of the Ap or the A11 horizon is silt loam, loam, fine sandy loam, or light silty clay loam. In a few areas this horizon is gravelly. In the control section the textures may be silt loam, loam and light silty clay loam with thin lenses of sandy loam and fine sandy loam; in many places stratification is evident; and in some places the gravel content is 15 to 25 percent. These soils are slightly acid to mildly alkaline and, in some places, are weakly calcareous below a depth of about 20 inches.

Rossmoyne series

The Rossmoyne series consists of moderately well drained soils that have a fragipan. In these soils the upper solum developed from a 20- to 40-inch mantle of loess of apparent Wisconsin age. The lower solum developed from moderately fine textured glacial till of Illinoian age. The loess was deposited after the till had been leached and weathered, but the till is calcareous at a depth of 7 to 10 feet.

The Rossmoyne soils are in the same drainage sequence as the well-drained Hickory soils, the somewhat poorly drained Avonburg soils, and the poorly drained Clermont soils, and they occur with those soils. Because the Rossmoyne soils are so highly weathered and so deeply leached, they are readily distinguished from soils devel-

oped in glacial material of Wisconsin age. Their upper horizons, which developed in loess, are similar to the upper horizons of Hickory soils, but in the lower solum the Rossmoyne soils are mottled, whereas the Hickory soils show little or no mottling.

Typical profile of Rossmoyne silt loam, 2 to 6 percent slopes, in a cultivated area (2½ miles south of U.S. Highway No. 50 on Camelin Hill Road, in an area called Sulphur Lick Flat):

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

A21—8 to 13 inches, dark yellowish-brown (10YR 4/4) smooth silt loam; dark grayish-brown (10YR 4/2) coatings; moderate, medium and fine, granular structure; friable; slightly acid; clear, smooth boundary.

A22—13 to 16 inches, yellowish-brown (10YR 5/4) silt loam; a few dark grayish-brown (10YR 4/2) flows; moderate, very fine, subangular blocky structure; friable; medium acid; clear, smooth boundary.

B1—16 to 20 inches, yellowish-brown (10YR 5/6) silty clay loam; common, medium, distinct mottles of pale brown (10YR 6/3); moderate, fine, subangular blocky structure; firm; strongly acid; clear, smooth boundary.

B21t—20 to 27 inches, strong-brown (7.5YR 5/6) silty clay loam; common, medium, distinct mottles of light brownish gray (10YR 6/2); moderate, fine, subangular blocky structure; firm; very strongly acid; clear, smooth boundary.

Bx—27 to 38 inches, yellowish-brown (10YR 5/6) silty clay loam; common, medium, distinct mottles of pale brown (10YR 6/3) and light gray (10YR 7/2); moderate, medium and fine, subangular blocky structure; firm; very strongly acid; gradual, wavy boundary.

IIB21b—38 to 50 inches, yellowish-brown (10YR 5/6) silty clay; common, fine, distinct mottles of pale brown (10YR 6/3) and light gray (10YR 7/2); weak, fine, subangular blocky structure; firm; very strongly acid; gradual, smooth boundary.

IIB22b—50 to 71 inches, strong-brown (7.5YR 5/6) clay; few, fine, distinct mottles of brown (10YR 5/3); weak, fine, subangular blocky structure; very firm; very strongly acid; gradual, smooth boundary.

IIB3b—71 to 120 inches, yellowish-brown (10YR 5/6) clay loam; common, fine, distinct mottles of light yellowish brown (10YR 6/4) and light brownish gray (10YR 6/2); firm; massive; medium acid; gradual, wavy boundary.

IICb—120 inches +, loam glacial till of Illinoian age; calcareous.

The part of the solum that developed in loess generally is 20 to 40 inches thick; it decreases in thickness with increasing slope. In some places the B horizon above the fragipan is silt loam or light silty clay loam. The depth to the fragipan ranges from 20 to 32 inches. The fragipan is loam, clay loam, or silty clay loam and is marked with common to many mottles. In some places below the fragipan, the B horizon is clay loam. The depth to carbonates ranges from about 65 inches on the stronger slopes to as much as 120 inches on the milder slopes.

Shoals series

The Shoals series consists of somewhat poorly drained soils on flood plains. These soils developed in neutral to calcareous stream alluvium that washed mainly from soils underlain by glacial drift of Wisconsin age. The Shoals soils are in the same drainage sequence as the well drained Genesee soils and the moderately well drained Eel soils, and they occur with them. They also occur with the Fox and Ockley soils.

Typical profile of Shoals silt loam in a cultivated area (Liberty Township, SE¼ sec. 8, one-fourth mile west of Lancaster Road):

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; peds thinly coated with very dark grayish brown (10YR 3/2); moderate, medium, granular structure; friable; neutral to slightly acid; abrupt, smooth boundary.

C1—7 to 15 inches, dark grayish-brown (10YR 4/2) fine silt loam; common, fine, faint mottles of very dark gray (10YR 3/1); moderate, fine, subangular blocky structure; friable; neutral to slightly acid; clear, smooth boundary.

C2—15 to 23 inches, dark grayish-brown (10YR 4/2) fine loam; many, medium, prominent mottles of very dark gray (10YR 3/1) and strong brown (7.5YR 5/6); weak, coarse, prismatic structure breaking to weak, coarse, subangular blocky structure; firm; neutral to slightly acid; clear, smooth boundary.

C3—23 to 35 inches, dark-gray (10YR 4/1) loam; many, medium, prominent mottles of yellowish brown (10YR 5/6); weak, coarse, subangular blocky structure; firm; neutral; gradual, smooth boundary.

IIC4—35 to 49 inches, dark-gray (10YR 4/1) sandy loam; many, medium and coarse, prominent mottles of dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/6); massive; friable; neutral; abrupt, smooth boundary.

IIIC5—49 inches +, mottled yellowish-brown (10YR 5/6) and gray (10YR 5/1) gravelly loamy sand; calcareous.

Between the depths of 7 and 40 inches, these soils generally range from silt loam to silty clay loam in texture, but in a few places they are loam. Between the same depths they are slightly acid to mildly alkaline.

Sleeth series

The Sleeth series consists of somewhat poorly drained soils on glacial terraces. These soils developed over stratified, calcareous sand and gravel of Late Wisconsin age. The depth to gravel and sand is more than 40 inches but normally is less than 60 inches.

The Sleeth soils are in the same drainage sequence as the well drained Ockley soils, the moderately well drained Thackery soils, and the very poorly drained Westland soils, and they occur with those soils.

Typical profile of Sleeth silt loam in a cultivated area (Harrison Township, SE¼ sec. 17):

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine, granular structure; friable; slightly acid; abrupt, smooth boundary.

A2—7 to 12 inches, brownish-yellow (10YR 6/6) silt loam; many, medium, distinct mottles of light yellowish brown (2.5Y 6/4); moderate, fine, subangular blocky structure; friable; medium acid; clear, wavy boundary.

B1t—12 to 18 inches, yellowish-brown (10YR 5/4) silty clay loam; many, medium, distinct mottles of light yellowish brown (2.5Y 6/4); moderate, medium, subangular blocky structure; firm; contains a few small, soft, dark concretions; thin, intermittent, grayish-brown (10YR 5/2) clay coatings on ped surfaces; strongly acid; clear, smooth boundary.

B2t—18 to 32 inches, light brownish-gray (2.5Y 6/2) silty clay loam; many, medium, prominent mottles of yellowish brown (10YR 5/8); moderate, coarse, subangular blocky structure; contains abundant soft, dark concretions up to one-fourth inch in diameter; thin, continuous, dark grayish-brown (10YR 4/2)

clay coatings on ped surfaces; medium acid; abrupt, smooth boundary.

IIB3t—32 to 46 inches, light yellowish-brown (2.5Y 6/4) sandy clay loam; many, medium, distinct mottles of dark yellowish brown (10YR 4/4); massive; firm; contains rounded pebbles up to 1 inch in diameter; thin, patchy, dark grayish-brown (10YR 4/2) clay coatings; slightly acid to neutral; abrupt, irregular boundary.

IIC—46 inches +, yellowish-brown (10YR 5/4) loose gravel and sand outwash of Late Wisconsin age; calcareous.

Some areas along streams and at the base of eroded slopes are covered with 8 to 12 inches of light-colored silt loam or loam that washed from higher soils. In a few areas, mainly along Walnut Creek, the A horizon is loam or fine sandy loam. In texture the B horizon ranges from silty clay loam to sandy clay loam, clay loam, and heavy loam. The clay coatings on ped surfaces in the argillic horizon are gray, grayish brown, or dark grayish brown. The depth to loose gravel and sand ranges from 40 to 60 inches. These soils are neutral to medium acid in the A horizon and are medium acid to very strongly acid in the upper B horizon.

Stendal series

The Stendal series consists of somewhat poorly drained soils that lie on nearly level first bottoms, typically at the base of adjacent uplands or terraces. These soils developed from strongly acid or medium acid, medium-textured alluvium that washed mainly from unglaciated areas of acid sandstone and acid shale.

The Stendal soils are in the same drainage sequence as the well drained Pope soils and the moderately well drained Philo soils. In drainage and color the Stendal soils are similar to the Shoals soils, which developed from less acid alluvial material.

Typical profile of Stendal silt loam in a cultivated field (Franklin Township, 1¾ miles west of the junction of Sandy Road and Three Locks Road):

Ap—0 to 9 inches, brown (10YR 5/3) silt loam; weak, coarse, granular structure; friable; strongly acid; abrupt, smooth boundary.

C1—9 to 13 inches, light brownish-gray (10YR 6/2) fine silt loam; common, fine, distinct mottles of yellowish brown (10YR 5/4); weak, coarse, subangular blocky structure; firm; many, very small, soft, dark concretions; very strongly acid; gradual, smooth boundary.

C2—13 to 26 inches, light brownish-gray (10YR 6/2) fine silt loam; common, medium, prominent mottles of yellowish brown (10YR 5/6); massive; firm; many small, soft, dark concretions; very strongly acid; gradual, wavy boundary.

C3—26 to 34 inches, light brownish-gray (2.5Y 6/2) fine silt loam; many, medium and coarse, prominent mottles of yellowish brown (10YR 5/6); massive; friable; many, very soft, dark concretions; very strongly acid; diffuse, smooth boundary.

C4—34 to 48 inches, similar to C3 horizon, except that it has some gray (10YR 6/1), thin, silty mottles; strongly acid.

In some areas, indicated by symbol on the soil map, the A horizon contains enough gravel to interfere with cultivation. Between the depth of 10 and 40 inches, the texture ranges from heavy silt loam to light silty clay loam. Through the control section the dominant colors are gray, light brownish gray, and grayish brown, and there are common to many mottles of yellowish brown and olive brown or light olive brown. The control section is strongly acid or very strongly acid throughout.

Taggart series

The Taggart series consists of somewhat poorly drained soils that developed in loess 40 to 66 inches thick over leached and weathered glacial outwash of Illinoian age. The loess was deposited after the outwash had been weathered and leached. That part of the B horizon below the loess is thought to have formed in loamy outwash.

The Taggart soils are in the same drainage sequence as the well drained Pike soils and the moderately well drained Rainsboro soils. They have a much thicker solum and are more sandy and gravelly in the lower solum than the Bartle soils. The Taggart soils have higher base status than the Tyler soils, and they lack the strongly expressed fragipan of those soils.

Typical profile of Taggart silt loam, 0 to 2 percent slopes, in a cultivated area (on the north side of Hanna Road, ½ mile south and ¼ mile west of the junction of Hanna Road and U.S. Highway No. 50):

Ap—0 to 7 inches, grayish-brown (2.5Y 5/2) silt loam; weak, medium, granular structure; friable; medium acid; abrupt, smooth boundary.

A2—7 to 10 inches, light olive-brown (2.5Y 5/3) silt loam; common, fine, distinct mottles of yellowish brown (10YR 5/6); weak, thin, platy structure; friable; strongly acid; abrupt, smooth boundary.

Bg—10 to 16 inches, grayish-brown (2.5Y 5/2) silt loam; many, fine, prominent mottles of strong brown (7.5YR 5/8); weak, medium, subangular blocky structure; friable; thin, continuous, light brownish-gray (2.5Y 6/2) silty coatings on vertical surfaces; strongly acid; clear, smooth boundary.

B21tg—16 to 25 inches, grayish-brown (2.5Y 5/2) silty clay loam; many, medium, prominent mottles of strong brown (7.5YR 5/6); weak, coarse, prismatic structure that breaks to moderate, medium, subangular blocky structure; firm; thin, light olive-gray (5Y 6/2) silty coatings on prism faces; thin, discontinuous, dark grayish-brown (10YR 4/2) clay coatings on blocks inside prisms; strongly acid; clear, smooth boundary.

B22tg—25 to 50 inches, gray (10YR 5/1) silty clay loam; many, medium, prominent mottles of strong brown (7.5YR 5/8) and dark yellowish brown (10YR 4/4); weak, coarse, prismatic structure that breaks to weak, coarse, subangular blocky structure; firm; slightly brittle; thin, discontinuous, gray (5Y 5/1) to light-gray (5Y 6/1) silty coatings on prism faces; thin, continuous, dark grayish-brown (10YR 4/2) clay films on vertical faces of blocks inside the prisms; strongly acid; clear, wavy boundary.

IIB23tg—50 to 70 inches +, dark yellowish-brown (10YR 4/4) light clay loam; many, distinct, prominent mottles of yellowish brown (10YR 5/6) and gray (5Y 5/1); weak, medium, subangular blocky structure; friable; common fragments of disintegrated granite; medium acid; horizon extends to a depth of 15 feet and is more gravelly and less acid with increasing depth.

The B21 and B22 horizons are light to medium silty clay loam and have a clay content of 27 to 35 percent. The IIB horizon ranges from 4 to 15 feet in thickness and is gravelly clay loam, sandy clay loam, or clay loam in texture. These soils are strongly acid or very strongly acid in the upper B horizon and are medium acid or slightly acid below a depth of about 50 inches.

Typical profile of Taggart silt loam, wet, in a cultivated field (Franklin Township, 1 mile south of Higby School on Three Locks Road):

Ap—0 to 8 inches, light brownish-gray (10YR 6/2) silt loam; few to common, dark-brown (10YR 4/3) concretions; weak, fine and medium, granular structure; friable; medium acid to strongly acid; abrupt, smooth boundary.

A2g—8 to 15 inches, light-gray (10YR 7/2) silt loam; few, medium, distinct mottles of yellowish brown (10YR 5/6); weak, medium, platy structure; friable; very strongly acid to extremely acid; clear, irregular boundary.

B1g—15 to 23 inches, white (2.5Y 8/2) silty clay loam; common, medium, distinct mottles of yellowish brown (10YR 5/8); very weak, coarse, prismatic structure that breaks to weak, medium and coarse, subangular blocky structure; firm; very strongly acid; gradual, wavy boundary.

B21tg—23 to 48 inches, light brownish-gray (10YR 6/2) silty clay; common, medium, distinct mottles of yellowish brown (10YR 5/6); weak, coarse, prismatic structure; firm; few dark-brown (10YR 3/3) concretions; very strongly acid; gradual, wavy boundary.

IIB22tg—48 to 60 inches, gray (10YR 6/1) clay loam; common, medium, distinct mottles of yellowish brown (10YR 5/6); weak, coarse and very coarse, subangular blocky structure; firm; very strongly acid; gradual, wavy boundary.

IIB31—60 to 85 inches, light-gray (10YR 7/1) gravelly clay loam; common, distinct, yellowish-brown (10YR 5/6) mottles; massive; firm; very strongly acid.

IIB32—85 to 100 inches +, mottled strong-brown (7.5YR 5/8), dark yellowish-brown (10YR 4/4), and light brownish-gray (10YR 6/2) gravelly clay loam that grades to gravelly loam and sandy loam with depth; massive; firm; very strongly acid; calcareous or neutral sand below a depth of 15 to 20 feet.

Thackery series

In the Thackery series are moderately well drained soils on glacial terraces. These soils developed from stratified, calcareous sand and gravel of Wisconsin age. They are underlain by gravel and sand at a depth of more than 40 but generally less than 60 inches.

The Thackery soils are in the same drainage sequence as the well-drained Ockley soils, the somewhat poorly drained Sleeth soils, and the very poorly drained Westland soils, and they occur with those soils. They also occur with the Fox and Wea soils.

Typical profile of Thackery silt loam, 0 to 2 percent slopes, in a cultivated area (Green Township, center of NE¼ sec. 30):

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; friable; a few small pebbles; neutral; abrupt, smooth boundary.

A3—7 to 11 inches, brown (10YR 5/3) silt loam; dark grayish-brown (10YR 4/2) coatings on peds; weak to moderate, fine, subangular blocky structure; friable; contains a few small, soft, very dark brown concretions and small pebbles; slightly acid; clear, smooth boundary.

B1t—11 to 17 inches, brown (10YR 5/3) loam; a few dark grayish-brown (10YR 4/2) silty coatings; moderate, fine, subangular blocky structure; firm; many small pebbles and fine, soft, very dark grayish-brown (10YR 3/3) concretions; thin, intermittent clay coatings on ped surfaces; slightly acid; clear, smooth boundary.

B21t—17 to 23 inches, brown (10YR 5/3) clay loam; many, medium, distinct mottles of yellowish brown (10YR 5/6); moderate, fine, subangular blocky structure; firm; thin, continuous, dark-brown (10YR 4/3) clay coatings on ped surfaces; medium acid; clear, smooth boundary.

B22t—23 to 29 inches, brown (10YR 5/3) sandy clay loam; many, medium, distinct mottles of dark yellowish brown (10YR 4/4); weak, medium, subangular blocky structure; firm when moist, plastic and sticky when wet; thin, continuous, dark-brown (10YR 4/3) clay coatings on ped surfaces; medium acid; gradual, smooth boundary.

B23t—29 to 38 inches, grayish-brown (10YR 5/2) fine gravelly clay loam; many, medium, distinct mottles of yellowish brown (10YR 4/4); weak, medium, subangular blocky structure; firm when moist, plastic and sticky when wet; thin, patchy, brown (10YR 5/3) clay coatings; medium acid; clear, smooth boundary.

B3—38 to 45 inches, gray (10YR 5/1) gravelly sandy clay loam; many, medium, distinct mottles of light olive brown (2.5Y 5/4); very weak, coarse, subangular blocky structure; friable when moist, plastic and sticky when wet; neutral; clear, wavy boundary.

IIC1—45 to 49 inches, dark grayish-brown (10YR 4/2) fine gravelly loam; many, medium, distinct mottles of dark yellowish brown (10YR 4/4); massive; friable; fine gravel makes up 25 to 35 percent of mass; weakly calcareous with many white limestone ghosts; neutral to mildly alkaline; abrupt, wavy boundary.

IIC2—49 to 62 inches +, grayish-brown (10YR 5/2) sand and gravel; a few streaks of light yellowish brown (10YR 6/4); loose; calcareous.

The depth to mottling ranges from 15 to 28 inches. In places the B horizon is silty clay loam or heavy loam. The depth to loose gravel and sand ranges from 40 to 60 inches. Thackery soils are neutral to medium acid in the A horizon, medium acid to very strongly acid in the upper part of the B horizon, and slightly acid or neutral in the lower B horizon.

Tyler series

The Tyler series consists of somewhat poorly drained soils that have a well-defined fragipan. These soils occupy valley terraces on the unglaciated Allegheny Plateau. They developed from 18 to 42 inches of loess underlain by acid lacustrine material of silt loam or silty clay loam texture.

The Tyler soils are in the same drainage sequence as the moderately well drained Monongahela soils, and they occur with them. They resemble the Henshaw and Bartle soils in the upper part of the solum but have a distinct fragipan in the lower part.

Typical profile of Tyler silt loam in a pastured area (Huntington Township, one-half mile northwest of the junction of Blair Highway and Prussia Road, 100 yards west of Blair Highway):

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; friable; a few, small, black concretions; strongly acid; abrupt, smooth boundary.

A2—9 to 14 inches, light yellowish-brown (2.5Y 6/4) silt loam; common, fine, distinct mottles of brownish yellow (10YR 6/6); weak, medium, platy structure; friable; very strongly acid to strongly acid; clear, wavy boundary.

B2t—14 to 18 inches, pale-brown (10YR 6/3) silty clay loam; many, medium, distinct mottles of light yellowish brown (10YR 6/4); weak, medium, subangular blocky structure; firm; very strongly acid to strongly acid; clear, wavy boundary.

Bx1—18 to 23 inches, yellowish-brown (10YR 5/4) silty clay loam (moderate fragipan); light-gray (10YR 7/2) and pale-brown (10YR 6/3) ped coatings; pri-

mary structure is polygonal, and peds are up to 5 inches across; secondary structure is weak, coarse, subangular blocky; very firm; brittle; very strongly acid to strongly acid; clear, smooth boundary.

Bx2—23 to 28 inches, yellowish-brown (10YR 5/6) silty clay loam with fine silt loam ped interiors (moderate fragipan); gray (10YR 6/1) clay coatings on peds; polygonal structure with polygons up to 10 inches across; very firm and compact; brittle; very strongly acid; gradual, wavy boundary.

Bx3—28 to 34 inches, yellowish-brown (10YR 5/4) silty clay loam (moderate fragipan); fine silt loam ped interiors with gray (10YR 6/1), continuous clay coatings as much as ⅛ inch thick; primary structure is polygonal, the polygons up to 10 inches across and breaking into weak, medium, subangular blocky peds; very firm and compact; brittle; very strongly acid; clear, wavy boundary.

IIBx4—34 to 46 inches, light yellowish-brown (10YR 6/4) silty clay loam peds having thin, yellowish-brown (10YR 5/4) clay coatings; on polygonal surfaces there are light brownish-gray (10YR 6/2) coatings as much as ⅛ inch thick; composite texture is fine channery silty clay loam (strong fragipan); about 10 percent is coarse skeleton consisting of channery fragments of sandstone, up to 1 inch across; very weak polygonal structure; continuous coatings of clay from overlying horizons are in partings; very firm and compact; brittle; many, small, dark concretions and smears; very strongly acid; gradual, wavy boundary.

IIBx5—46 to 54 inches, light yellowish-brown (2.5Y 6/4) silty clay loam; numerous, small, dark concretions and smears; very firm when moist, extremely hard when dry (strong fragipan); numerous channery fragments of sandstone as in horizon above; massive; very strongly acid.

IIBx6—54 to 59 inches, light yellowish-brown (2.5Y 6/4) channery silty clay loam; many, small, dark concretions and smears; more numerous than in horizon above; massive; very strongly acid.

The depth to the fragipan ranges from 15 to 30 inches. The fragipan generally occurs in the original zone of contact between the loess and the underlying lacustrine material. However, the upper surface of the fragipan is above this contact in places where the loess was more than 30 inches thick. In most places the fragipan is mottled. The Tyler soils are strongly acid to extremely acid.

Uniontown series

In the Uniontown series are moderately well drained to well drained soils that developed from Late Wisconsin glacial deposits of calcareous lacustrine material. The deposits are dominantly silt loam to silty clay loam in texture, but there are minor lenses of sandy material in some places. Uniontown soils occur only in the Late Wisconsin glacial area.

These soils are in the same drainage sequence as the somewhat poorly drained Henshaw soils and the very poorly drained Bonpas soils. The Uniontown soils formed in more silty, less clayey lacustrine material than the Markland soils; their B horizon is not so fine textured as that of Markland soils; and they are leached to a greater depth. Uniontown soils are less acid than Alford soils, and they show stratification that is not evident in those soils. They have a thinner solum, are less acid, and are leached to a lesser depth than the Pekin soils.

Typical profile of Uniontown silt loam, 0 to 2 percent slopes, in a cultivated area (Springfield Township, NE¼ sec. 4):

Ap—0 to 7 inches, brown (10YR 4/3) silt loam; dark-brown (10YR 3/3) ped surfaces; moderate, medium, granular structure; friable; neutral; abrupt, smooth boundary.

A2—7 to 11 inches, brown (10YR 5/3) silt loam; weak to moderate, medium, granular structure; friable; slightly acid; clear, smooth boundary.

B1t—11 to 15 inches, dark yellowish-brown (10YR 4/4) fine silt loam; thin coatings of dark grayish-brown (10YR 4/2) on peds; weak, medium, subangular blocky structure; firm; slightly acid; clear, smooth boundary.

B21t—15 to 21 inches, dark yellowish-brown (10YR 4/4) silty clay loam; moderate, medium, subangular blocky structure; firm; thin, continuous, dark-brown (10YR 4/3) clay coatings on ped surfaces; medium acid; gradual, smooth boundary.

B22t—21 to 27 inches, yellowish-brown (10YR 5/6) coarse silty clay loam; common, fine, distinct mottles of grayish brown (10YR 5/2); weak, medium, subangular blocky structure; firm; thin, intermittent, dark-brown (10YR 4/3) clay coatings on ped surfaces; medium acid; gradual, wavy boundary.

B31—27 to 43 inches, brown (10YR 4/3) silty clay loam; few, fine, faint mottles of grayish brown (2.5Y 5/2); weak, medium and coarse, subangular blocky structure; very firm; medium acid; gradual, smooth boundary.

B32—43 to 60 inches, yellowish-brown (10YR 5/4) silty clay loam; common, fine, distinct mottles of dark gray (10YR 4/1); massive; very firm; slightly acid; abrupt, wavy boundary.

C—60 to 70 inches +, dark yellowish-brown (10YR 4/4) fine silt loam; massive; firm; compact; neutral to slightly alkaline.

Undisturbed areas in forest have an A1 horizon that is 2 to 3 inches thick and generally is dark colored. The texture of the B horizon ranges from heavy silt loam to silty clay loam. Stratification is evident in the solum, and some horizons have a high content of fine and very fine sand. The depth to mottling ranges from 15 to 30 inches. The depth to the C horizon is 40 to 70 inches. The C horizon ranges from silt loam to silty clay loam and is neutral or mildly alkaline (calcareous). In a few places there are small sandy lenses in the C horizon. These soils are neutral to medium acid in the A horizon, slightly acid to strongly acid in the upper B horizon, and slightly acid or neutral in the lower B horizon.

Wallkill series

In the Wallkill series are somewhat poorly drained soils that consist of recently deposited alluvium underlain by an organic soil. The alluvium, 10 to 30 inches thick, is light colored, and is slightly acid to mildly alkaline. The buried organic soil is Carlisle muck or Willette muck.

Typical profile of Wallkill silt loam in a pastured area (Colerain Township, SE¼ sec. 7):

Ap—0 to 12 inches, grayish-brown (10YR 5/2) silt loam; moderate, medium, granular structure; friable; slightly acid to neutral; clear, smooth boundary.

2—12 to 24 inches, black (10YR 2/1) granular muck; very friable; slightly acid; gradual, smooth boundary.

3—24 to 40 inches, very dark brown (10YR 2/2) fibrous muck; massive; firm; neutral.

The A horizon generally ranges from 10 to 30 inches in thickness. In places it contains common, fine, distinct mottles of pale brown (10YR 6/3).

Warners series

The Warners series consists of shallow, calcareous, very poorly drained soils that developed in a mixture of black muck and gray mineral material over gray marl. These soils occupy terraces in the Late Wisconsin glacial area of the county. Here, they occur closely with the Westland, Fox, and Carlisle soils.

Typical profile of Warners mucky silt loam in a pastured area (Green Township, 100 feet north of State Route 180, one-half mile east of its intersection with State Route 159):

1—0 to 9 inches, very dark gray (10YR 3/1), granular mucky silt loam; contains many small fragments of broken snail shells; calcareous; very friable; abrupt, smooth boundary.

2—9 to 13 inches, very dark gray (10YR 3/1) mucky silt loam; massive; friable; contains many snail shells and lime fragments; calcareous; abrupt, wavy boundary.

3—13 inches +, light-gray (10YR 7/2), silty, gritty marl; contains scattered snail shells and fibrous, decomposed plant remains; calcareous.

The dark-colored mucky layers range from 6 to 14 inches in total thickness over marl. Their color is very dark gray to black.

Warsaw series

The Warsaw series consists of dark-colored, well-drained soils on terraces that developed on stratified, calcareous gravel and sand outwash. These soils occur closely with the Wea, Fox, Ockley, and Westland soils.

Unlike the Fox soils, which developed under hardwood forest, the Warsaw soils developed under grass and have a darker colored A horizon containing more organic matter than the Fox soils. The Warsaw soils have a less silty upper solum, are shallower to calcareous gravel and sand, and are less acid than the Wea soils.

Typical profile of Warsaw loam, 0 to 2 percent slopes, in a cultivated area (Green Township, NW¼ sec. 1):

Ap—0 to 7 inches, very dark brown (7.5YR 2/2) loam; moderate, medium, granular structure; friable; numerous roots; slightly acid; abrupt, smooth boundary.

A12—7 to 12 inches, dark-brown (7.5YR 3/2) loam; strong, coarse, granular structure; friable; roots abundant; slightly acid; clear, wavy boundary.

B1—12 to 20 inches, yellowish-brown (10YR 5/4) coarse clay loam; dark-brown (7.5YR 4/2) coatings; moderate, medium and fine, subangular blocky structure; firm; roots common; medium acid; gradual, smooth boundary.

IIB21t—20 to 28 inches, dark reddish-brown (5YR 3/3) gravelly clay loam; moderate, medium, subangular blocky structure; firm when moist, plastic and sticky when wet; numerous rounded pebbles up to 1 inch in diameter; medium acid; gradual, smooth boundary.

IIB22t—28 to 33 inches, dark reddish-brown (5YR 3/3) gravelly clay loam; weak, coarse, subangular blocky structure; friable when moist, plastic and sticky when wet; about 50 percent is coarse skeleton consisting of rounded pebbles up to 2 inches in diameter; slightly acid; clear, wavy boundary.

IIB3—33 to 35 inches, grayish-brown (10YR 5/2) gravelly clay loam; massive; friable when moist, plastic and sticky when wet; 50 percent is coarse skeleton consisting of limestone fragments; neutral to mildly alkaline; calcareous in spots; abrupt, wavy and irregular boundary.

IIC2—35 inches +, stratified, loose, calcareous gravel-and-sand outwash of Late Wisconsin age.

The combined thickness of the dark-colored Ap and A12 horizons (mollic epipedon) ranges from 10 to 15 inches. The texture of the B horizon may be heavy loam, clay loam, sandy clay loam, or gravelly clay loam. Hues in the B horizon are 10YR to 5YR. The B3 horizon is 2 to 6 inches thick and, in many places, is moderately calcareous. The depth to loose, calcareous gravel and sand ranges from 20 to 40 inches. These soils are neutral to medium acid in the A horizon, slightly acid to strongly acid in the upper part of the B horizon, and slightly acid to mildly alkaline in the lower B horizon.

Wea series

In the Wea series are deep, well-drained soils on outwash terraces. These soils developed from silty and loamy material underlain, at a depth of 40 inches or more, by stratified, calcareous gravel and sand of Late Wisconsin glacial age.

The Wea soils occur closely with the Fox, Ockley, Thackery, Sleeth, and Westland soils. Wea soils developed under prairie grass and have a darker A horizon with more organic matter than the Ockley soils, which developed under hardwood forest. The Wea soils have a more silty upper solum and are deeper to calcareous sand and gravel than the Warsaw soils.

Typical profile of Wea silt loam, 0 to 2 percent slopes, in a cultivated area (Paxton Township, on U.S. Highway No. 50 about 2½ miles east of Bainbridge, 300 yards south of benchmark 712):

Ap—0 to 9 inches, very dark gray (10YR 3/1) silt loam; moderate, medium and coarse, granular structure; friable; numerous roots; slightly acid; abrupt, smooth boundary.

A12—9 to 17 inches, very dark gray (10YR 3/1) silt loam, very dark brown (10YR 2/2) when crushed; strong, fine and medium, granular structure; friable; roots abundant; medium acid; clear, smooth boundary.

B1—17 to 20 inches, very dark brown (10YR 2/2) fine silt loam; very dark gray (10YR 3/1) coatings; moderate, fine, subangular blocky structure; friable; roots common; medium acid; gradual, wavy boundary.

B21t—20 to 25 inches, dark-brown (10YR 4/3) fine silt loam; very dark brown (10YR 2/2) coatings; moderate, medium, subangular blocky structure; friable; a few roots; medium acid; gradual, smooth boundary.

B22t—25 to 30 inches, dark-brown (10YR 4/3) coarse silty clay loam; very dark grayish-brown (10YR 3/2) coatings; moderate, medium, subangular blocky structure; firm; medium acid; gradual, smooth boundary.

IIB23t—30 to 37 inches, yellowish-brown (10YR 5/6) clay loam; dark-brown (10YR 3/3) coatings; moderate, medium, subangular blocky structure; firm when moist, plastic and sticky when wet; medium acid to slightly acid; clear, wavy boundary.

IIB24t—37 to 42 inches, brown (7.5YR 4/2) clay loam; a few very dark gray (10YR 3/1) coatings on vertical

surfaces; weak, medium, subangular blocky structure; firm when moist, plastic and sticky when wet; slightly acid; clear, wavy boundary.

IIB3—42 to 45 inches, dark grayish-brown (10YR 4/2) sandy clay loam; contains a considerable amount of gravel; massive; friable when moist, plastic and sticky when wet; mildly to moderately alkaline; abrupt, wavy and irregular boundary.

IIC—45 to 51 inches, grayish-brown (10YR 5/2), stratified gravel and sand; calcareous; moderately alkaline.

In some places the A horizon is silty clay loam. The combined thickness of the dark-colored A and B1 horizons (mollic epipedon) ranges from 10 to 20 inches. The argillic horizon may be fine loam or silt loam, clay loam, sandy clay loam, and gravelly clay loam. Hues in the B horizon range from 10YR to 5YR. Below a depth of 20 to 36 inches, the content of gravel in the solum increases. The B3 horizon is 2 to 10 inches thick and generally is moderately calcareous. The depth to calcareous gravel and sand ranges from 40 to 60 inches. These soils are neutral to medium acid in the A horizon, slightly acid to strongly acid in the upper part of the B horizon, and slightly acid or neutral in the lower B horizon.

Wellston series

The Wellston series consists of well-drained soils that developed in a mantle of loess, as much as 30 inches thick, underlain by material that weathered from fine-grained sandstone or siltstone. These soils occupy ridgetops on the Allegheny Plateau, where they occur closely with the Muskingum soils.

The Wellston soils resemble the Coolville soils in the horizons developed from loess, but they are underlain by residuum weathered principally from sandstone. Coolville soils, in contrast, are underlain by weathered clay shale. The Wellston soils have a thicker solum and a finer textured B horizon than the Muskingum soils.

Typical profile of Wellston silt loam, 6 to 12 percent slopes, in an area formerly cultivated but now idle (Colerain Township, one-fourth mile northwest of the junction of North Ridge Road and Swamp Ridge Road):

Ap—0 to 5 inches, brown (10YR 5/3), smooth silt loam; weak, coarse, granular structure; friable; medium acid; abrupt, smooth boundary.

A2—5 to 7 inches, yellowish-brown (10YR 5/4), smooth silt loam; thin, grayish-brown (10YR 5/2) and dark-gray (10YR 4/1) vesicular coatings on ped faces; weak, coarse, granular structure; friable; strongly acid; clear, smooth boundary.

B1—7 to 13 inches, strong-brown (7.5YR 5/6), smooth silty clay loam; thin, light-brown (7.5YR 6/4) and pale-brown (10YR 6/3) silty coatings on ped faces; moderate, fine and very fine, subangular blocky structure; firm; very strongly acid; gradual, smooth boundary.

B21t—13 to 18 inches, strong-brown (7.5YR 5/6) smooth silty clay loam; thin, reddish-brown (5YR 4/4) clay coatings on some ped faces; strong, medium, subangular blocky structure; firm; strongly acid to very strongly acid; gradual, smooth boundary.

B22t—18 to 25 inches, yellowish-brown (10YR 5/6) smooth silty clay loam; a few, thin, reddish-brown (5YR 5/4) clay coatings on peds; moderate, medium, angular blocky structure; firm; a few black, concretionary stains; strongly acid to very strongly acid; abrupt, smooth boundary.

IIB31—25 to 31 inches, yellowish-brown (10YR 5/6) channery fine silt loam, weak, fine, angular blocky structure; very firm; a few light yellowish-brown (10YR 6/4) coatings on ped faces; some thin, dark, concretionary stains; about 40 percent is coarse skeleton of fine-grained sandstone fragments up to 6 inches across; very strongly acid; gradual, smooth boundary.

IIB32—31 to 45 inches, reddish-yellow (7.5YR 6/6) very channery silt loam; very weak, fine, subangular blocky structure; firm; about 75 percent is coarse skeleton of fine-grained sandstone fragments up to 6 inches across; some silty and clayey coatings on upper rock surfaces; strongly acid; abrupt, wavy boundary.

IIR—45 to 50 inches +, somewhat weathered, fine-grained sandstone bedrock (Logan formation); silt loam as described for IIB32 horizon penetrates cracks and bedding planes; grades into fresh, unweathered rock.

The thickness of the upper solum that developed in loess ranges from 18 to 36 inches. Undisturbed areas covered with trees have a dark-colored A1 horizon 2 to 3 inches thick. The B horizon generally ranges from fine silt loam to medium silty clay loam in texture, but there may be thin layers of fine silty clay loam. The depth to solid sandstone ranges from 30 to 60 inches. In some places there is a 6- to 12-inch layer of weathered clay shale directly over the sandstone. These soils are medium acid to very strongly acid in the A horizon and are strongly acid to extremely acid in the lower part of the solum.

Westland series

The Westland series consists of very poorly drained soils on glacial terraces. In these soils the upper part of the solum developed from silty and loamy materials, and the lower part developed from stratified sand and gravel. Underlying the B horizon, at a depth of 40 inches or more, are calcareous gravel and sand.

The Westland soils are in the same drainage sequence as the well drained Ockley soils, the moderately well drained Thackery soils, and the somewhat poorly drained Sleeth soils, and they occur with those soils.

Typical profile of Westland silty clay loam in a cultivated area (Green Township, center of SW¼NE¼ sec. 30):

A1p—0 to 9 inches, very dark gray (5Y 3/1) silty clay loam; moderate, medium, subangular blocky structure that breaks to moderate, coarse, granular structure; firm; slightly acid; abrupt, smooth boundary.

A12—9 to 13 inches, very dark gray (10YR 3/1) clay loam; a few ped interiors and worm casts of olive brown (2.5Y 3/2); moderate to strong, fine and medium, subangular blocky structure; firm; many rounded pebbles, ½ inch or less across, make up 5 to 10 percent of mass; slightly acid; clear, smooth boundary.

B21tg—13 to 17 inches, grayish-brown (2.5Y 5/2) clay loam; many, medium, distinct ped coatings of olive brown (2.5Y 3/1); moderate, medium, subangular blocky structure; firm; contains small pebbles as in horizon above; slightly acid to neutral; clear, smooth boundary.

B22tg—17 to 22 inches, grayish-brown (2.5Y 5/2) clay loam; many, fine, distinct mottles of yellowish brown (10YR 5/8); very dark gray (10YR 3/1) ped coatings and material in old root channels; weak, coarse, subangular blocky structure; firm; 10 to 20 percent is coarse skeleton of rounded pebbles up to 2 inches in diameter; neutral; clear, smooth boundary.

B23tg—22 to 28 inches, light brownish-gray (2.5Y 6/2) fine loam; many, fine, distinct mottles of yellowish brown (10YR 5/8); a few coatings of dark grayish brown (2.5Y 4/2) on vertical ped surfaces and in old root channels; very weak, coarse, subangular blocky

structure; friable; pebbles similar to those in horizon above but somewhat smaller; mildly alkaline; gradual, smooth boundary.

IIB31g—28 to 36 inches, grayish-brown (2.5Y 4/2) fine gravelly loam; common, fine, distinct mottles of yellowish brown (10YR 5/4); a few coatings of dark grayish brown (2.5 4/2) on ped surfaces and in old root channels; massive; friable; numerous white limestone ghosts that are mildly calcareous; mildly alkaline; gradual, wavy boundary.

IIB32g—36 to 50 inches, grayish-brown (2.5Y 5/2) gravelly loam; common, medium, distinct mottles of yellowish brown (10YR 5/8); massive; friable; moderately alkaline, calcareous; abrupt, wavy boundary.

IIC—50 to 56 inches +, calcareous gravel and sand of Late Wisconsin age; loose; stratified.

The total thickness of the dark-colored surface and subsurface horizons (mollic epipedon) ranges from 10 to 20 inches. In the gleyed B horizon, the texture may be fine loam, clay loam, sandy clay loam, or silty clay loam, and in places there are thin layers of fine clay loam or clay. Below a depth of 15 to 30 inches, the content of gravel increases in the B horizon. Calcareous gravel and sand are 40 to 60 inches below the surface. The depth to carbonates ranges from 30 to 45 inches; in some places it is not the same as the depth to gravel and sand. Except in areas that have been limed, the A horizon is medium acid to neutral.

Willette series

In the Willette series are very poorly drained organic soils that developed in less than 40 inches of woody, grassy, and sedgy materials underlain by calcareous, gray clay or silty clay. These soils lie on terraces of Late Wisconsin age. Loose, calcareous gravel and sand are generally at a depth exceeding 48 inches.

The Willette soils occur closely with the Carlisle soils, which developed in more than 42 inches of organic materials. They also occur with the Warners, Westland, and Fox soils in some places.

Typical profile of Willette muck in a cultivated area (Colerain Township, 1 mile west of Hallsville, SW¼ sec. 7):

1—0 to 7 inches, very dark brown (10YR 2/2) muck; contains many fragments of plants; fibrous; moderate, fine, granular structure; very friable; slightly acid; gradual, smooth boundary.

2—7 to 27 inches, dark-brown (7.5YR 3/2) muck; contains many fragments of partly decomposed plants; weak, coarse, granular structure; friable; slightly acid; gradual, wavy boundary.

3—27 to 36 inches +, light-gray (2.5Y 7/2) clay to silty clay; massive; firm; calcareous.

In some places there is a layer of dark-brown (7.5YR 4/2) peat below the muck. The depth to mineral material ranges from 20 to 40 inches. Willette soils are neutral to medium acid.

Laboratory Data

Soils from four of the main soil series in Ross County were sampled in the field for characterization analyses. One sample was taken of a representative soil in each series. The results of these analyses are given in table 8. Detailed descriptions of the soils sampled, including locations of the profiles described, are given in alphabetical order in the subsection "Descriptions of the Soil Series" and are identified by characterization number.

In addition to the data given in table 8, the results of mechanical analyses are available for soils in the following series: The Abscota, Alexandria, Alford, Alvin, Bonpas, Brookston, Cana, Cardington, Celina, Clermont, Colyer, Crosby, Cruze, Fawcett, Genesee, Henshaw, Kendallville, Latham, Markland, McGary, Miami, Milton, Muskingum, Ockley, Pekin, Philo, Pike, Pope, Rainsboro, Ross, Rossmoyne, Stendal, Thackery, Tyler, Wea, Wellston, and Westland series. These data are on file at the Soils Department, Ohio State University; the Ohio Department of Natural Resources, Division of Lands and Soil; or the State Office, Soil Conservation Service, Columbus, Ohio.

General Nature of the County

This section provides general information about Ross County. It discusses geology, physiography, drainage, climate, agriculture, and other subjects of general interest.

Geology

Ross County is underlain by sedimentary rocks of the Devonian, Mississippian, and Pennsylvanian systems. These rocks are bedded horizontally and dip slightly to the southeast. Because some of them have been dissected and are relatively thin, they crop out in complex arrangements. Except for the south-central and southeastern parts, all of the county was covered by glaciers, and in glaciated areas the underlying bedrock has had little influence on most of the soils.

Several glaciations passed over parts of the county during the Pleistocene epoch. Generally, the ice sheets advanced from the north. These glaciated areas are covered by till of both the Wisconsin and the Illinoian ages, and in some places the glacial material is as much as 100 feet thick.

The earlier glaciation, called the Illinoian, occurred 100,000 to 300,000 years ago and covered all but the south-central and southeastern parts of the county. At its most southerly extension, this glacier had sufficient thrust to override about half the area of the higher Allegheny Plateau.

Everywhere, except in the tongue of the Early Wisconsin glacier in Paint Valley, the outer boundary of Illinoian glaciation extends beyond the limit of the Wisconsin ice sheet. Southward through it, of course, there are penetrations of both Wisconsin and Illinoian outwash. Thus, the Illinoian glaciated area is a comparatively narrow belt between the Late Wisconsin glacial boundary to the north and the unglaciated part of the county to the south. The widest part of the belt is in the Scioto River valley.

Between the Illinoian and the Late Wisconsin glaciations, the contact is exceptionally sharp, principally because the easily recognized escarpment of the Allegheny Plateau coincides, in so many places, with the Late Wisconsin outer boundary.

The Illinoian drift on the uplands is patchy in distribution, probably because of the rough surface on which

TABLE 8.—*Physical and chemical*

[Analyses made by Ohio Agricultural Research and Development Center,

Soil type and characterization number	Horizon	Depth from surface	Particle size distribution								
			Very coarse sand (2 to 1 mm.)	Coarse sand (1 to 0.5 mm.)	Medium sand (0.5 to 0.25 mm.)	Fine sand (0.25 to 0.10 mm.)	Very fine sand (0.10 to 0.05 mm.)	Total sand (2 to 0.05 mm.)	Silt (0.05 to 0.002 mm.)	Clay (less than 0.002 mm.)	Fine clay (less than 0.0002 mm.)
		Inches	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Cana silt loam, RO–58.	Ap	0–7	0. 4	0. 7	0. 8	1. 3	1. 4	4. 6	71. 2	24. 2	5. 7
	A2	7–14	. 2	. 5	. 5	. 6	. 5	2. 3	63. 4	34. 3	16. 4
	B1	14–18	. 3	. 8	. 4	1. 2	. 7	3. 4	61. 4	35. 2	17. 6
	IIB21t	18–21	1. 2	1. 7	1. 9	3. 6	3. 5	11. 9	55. 9	32. 2	16. 1
	IIB22t	21–25	2. 8	3. 8	2. 4	11. 2	8. 3	28. 5	42. 3	29. 2	14. 2
	IIB22t	25–29	2. 7	3. 3	4. 1	6. 9	6. 1	23. 1	43. 7	33. 2	16. 2
	IIIB23t	29–40	. 3	. 8	. 4	1. 0	. 6	3. 1	33. 9	63. 0	27. 7
	IIIB3	40–47	1. 2	2. 0	. 9	1. 2	1. 0	6. 3	37. 7	56. 0	15. 3
	IIIC	47–53	. 8	1. 8	. 5	2. 0	1. 7	6. 8	46. 1	47. 1	8. 0
Miami silt loam, RO–10.	AP	0–6						29. 5	58. 4	12. 1	
	A2	6–9						26. 8	53. 3	19. 9	
	IIB1	9–12						23. 3	49. 3	27. 4	
	IIB21t	12–16						20. 2	39. 4	40. 4	
	IIB22t	16–20						21. 2	35. 7	43. 1	
	IIB23t	20–24						33. 8	22. 8	43. 4	
	IIC2	24–30						35. 4	37. 9	26. 7	
	IIC3	(1)						28. 3	48. 0	23. 7	
Monongahela silt loam, RO–59.	Ap	0–7	1. 3	1. 9	. 6	. 9	2. 2	6. 9	73. 1	20. 0	4. 6
	A2	7–16	. 3	1. 1	. 5	. 8	1. 6	4. 3	67. 1	28. 6	10. 6
	B1t	16–21	. 4	1. 3	. 8	. 7	. 9	4. 1	64. 2	31. 7	13. 5
	B21t	21–24	. 4	1. 3	. 5	1. 1	1. 5	4. 8	64. 8	30. 8	12. 6
	Bx1	24–30	. 6	1. 7	. 8	. 8	1. 9	5. 8	64. 0	30. 2	13. 4
	Bx2	30–37	1. 3	1. 8	. 9	. 8	2. 6	7. 4	61. 4	31. 2	13. 1
	IIBx3	37–49	4. 1	4. 4	1. 4	2. 7	4. 7	17. 3	54. 8	27. 9	6. 8
	IIBx4	49–63	2. 3	2. 2	. 6	1. 4	3. 9	10. 4	52. 0	37. 6	9. 6
	C	63–70	10. 9	9. 2	3. 0	2. 5	4. 6	30. 2	29. 9	39. 9	16. 5
	C	70–77	8. 2	5. 0	1. 3	2. 9	5. 6	23. 0	38. 7	38. 3	14. 8
Pike silt loam, RO–6.	Ap	0–10		. 6	1. 7	1. 3	18. 8	22. 4	66. 2	11. 4	2. 0
	A2	10–14		. 3	. 6	. 6	17. 5	19. 0	63. 4	17. 6	5. 8
	B1	14–20		. 1	. 3	. 4	16. 4	17. 2	58. 3	24. 5	11. 2
	B21	20–30		. 1	. 2	. 4	16. 9	17. 6	53. 9	28. 5	15. 4
	B22t	30–39		. 1	. 2	. 4	21. 1	21. 8	52. 9	25. 3	14. 6
	B31	39–56		1. 1	1. 7	. 4	11. 5	14. 7	63. 2	22. 1	11. 4
	IIA2b	56–79		12. 9	16. 8	2. 9	5. 6	38. 2	47. 3	14. 5	6. 3
	IIB21b	79–89		13. 8	14. 9	3. 5	9. 2	41. 4	28. 8	29. 8	12. 6
	IIB22b	89–104		20. 1	12. 9	3. 2	6. 8	43. 0	21. 2	35. 8	17. 5
	IIB23b	104–110		23. 0	14. 3	3. 4	6. 7	47. 4	23. 2	29. 4	14. 4
	IIB24b	110–120		24. 7	13. 9	5. 1	9. 8	53. 5	23. 1	23. 4	10. 2
	IIB24b	120–126		34. 3	10. 3	3. 0	8. 0	55. 6	20. 0	24. 4	11. 0
	IIB24b	126–132		37. 4	14. 6	2. 9	7. 1	62. 0	15. 4	22. 6	11. 7
	IIB3b	132–160		40. 8	15. 6	2. 8	6. 9	66. 1	17. 7	16. 2	6. 7
	IIB3b	160–200		37. 2	25. 2	3. 4	6. 0	67. 3	10. 2	22. 5	6. 2

[1] 48 inches below surface.

it was deposited and because of the relatively weak expression of the glacier near its lower margin. The drift is thickest in the valleys, but it is sufficiently thick on most of the ridgetops, especially the flat-topped plateaus, to underlie most of the soils that developed from it. It is missing or is extremely thin on most of the steep side slopes of bedrock hills, and the glacier apparently bypassed a few of the highest points. In contrast, the broadly rolling area between Indian Creek and Paint Creek is covered more deeply with drift than any other part of the county.

Unweathered Illinoian drift on uplands is calcareous except in local areas where it is thin over acid shale or sandstone. The drift is generally loam in texture and, compared with Illinoian till to the east and northeast of the county, is more clayey, is less sandy, and contains more free carbonates.

Glacial terraces of Illinoian age occur in many areas of Ross County. These terraces are underlain by calcareous sand and gravel. They are the dissected remnants of material that once filled the valleys and was much more extensive than it is now. It was deposited by

data for selected soils

Ohio State University. Dashes indicate no determination made]

Textural class	pH	Organic matter	Nitrogen	$CaCO_3$ equivalent	Exchangeable cations (milliequivalent per 100 grams of soil)						Base saturation
					Hydrogen	Calcium	Magnesium	Potassium	Sum of exchangeable cations	Total bases	
		Percent	*Percent*	*Percent*							*Percent*
Silt loam	6.0	1.7			5.8	5.1	2.8	0.26	14.0	8.2	59
Silty clay loam	4.6	.4			11.6	3.7	4.4	.31	20.0	8.4	42
Silty clay loam	4.6	.3			13.3	2.8	5.5	.34	21.9	8.6	39
Silty clay loam	4.5	.1			13.0	2.0	5.1	.32	20.4	7.4	36
Clay loam	4.6				11.8	1.4	4.0	.26	17.5	5.7	33
Clay loam	4.4				14.5	1.0	4.1	.29	19.9	5.4	27
Clay	4.1				26.4	1.3	8.0	.60	36.3	9.9	27
Clay	4.0				18.0	.7	5.5	.43	24.6	6.6	27
Silty clay	4.1				17.0	.5	4.5	.41	22.4	5.4	24
Silt loam	6.6	3.3			3.8	6.0	1.5	.20	11.5	7.7	67
Silt loam	5.7	1.0			5.6	3.0	1.9	.14	10.6	5.0	47
Silty clay loam	5.4	.8			7.2	3.8	2.6	.20	13.8	6.6	48
Clay	5.3	.7			9.5	7.0	5.2	.34	22.0	12.5	57
Clay	5.6	.8			8.4	9.3	6.3	.36	24.4	16.0	66
Clay	6.6				4.7	12.2	7.7	.33	24.9	20.2	81
Loam	7.5			26.3							
Loam	7.8			28.6							
Silt loam	4.8	2.1			9.7	2.4	1.2	.17	13.5	3.8	28
Silty clay loam	4.5	.4			10.4	2.2	2.4	.22	15.2	4.8	32
Silty clay loam	4.5	.3			14.0	1.8	3.4	.29	19.5	5.5	28
Silty clay loam	4.4	.3			13.7	1.6	3.4	.29	19.0	5.3	28
Silty clay loam	4.4	.1			13.7	1.1	3.7	.28	18.8	5.1	27
Silty clay loam	4.4				14.1	1.0	3.6	.28	19.0	4.9	26
Silty clay loam	4.3				13.9	.5	2.3	.19	16.9	3.0	18
Silty clay loam	4.2				17.1	.6	3.0	.21	20.9	3.8	18
Clay loam	4.1				17.5	.9	2.1	.27	20.8	3.3	16
Clay loam	4.1				16.1	1.1	1.8	.23	19.2	3.1	16
Silt loam	6.9	1.00	0.09		2.8	5.7	1.2	.23	9.9	7.1	72
Silt loam	6.0	.14	.04		3.4	3.7	1.2	.14	8.4	5.0	60
Silt loam	5.4	.14	.04		5.0	6.1	1.7	.19	13.0	8.0	62
Silty clay loam	5.4	0	.04		6.2	7.5	2.9	.26	16.9	10.7	63
Silt loam	5.4	0	.04		5.8	6.5	3.2	.26	15.8	10.0	63
Silt loam	5.5	0	.03		5.2	22.6	3.8	.45	32.1	26.9	84
Silt loam	5.7		.02		3.2	24.6	3.6	.47	31.9	28.7	90
Clay loam	5.9		.03								
Clay loam	6.0		.04								
Sandy clay loam	5.9		.04								
Sandy clay loam	6.0		.03		4.8	6.3	4.0	26	15.4	10.6	69
Sandy clay loam	6.0		.03								
Sandy clay loam	6.0		.03								
Sandy loam	6.1		.03								
Sandy clay loam	6.3		.02								

streams flowing from the Illinoian ice sheet. The most important area of glacial terraces is in the old preglacial Teays Valley southeast of Chillicothe.

Glacial materials of Wisconsin age cover the northern one-third to one-half of the county. All of the Late Wisconsin drift is calcareous, even that on the Allegheny Plateau, except in small areas where the drift is thin over bedrock. In Paint Creek valley there is an area, thought to be of Early Wisconsin age, in which the glacial till contains a significant amount of acid shale and sandstone.

In most places the Wisconsin glaciation terminates as the outstanding Cuba end moraine. Except where the glacier overrode the Allegheny Plateau, the moraine abuts the steep Illinoian glaciated hills along the plateau escarpment. Two other moraines of Late Wisconsin age occur in the county, the Reesville and the Bloomingburg moraines.

Gravelly and sandy outwash of Wisconsin age is most extensive in the valleys of the Scioto River and Paint Creek. Here, the outwash is in relatively thick, stratified deposits consisting of highly calcareous gravel and sand.

Lacustrine deposits of Wisconsin age occur both within the Wisconsin glacial area and south of it. These deposits are mostly calcareous silt but, in minor lenses, are sand and silty clay loam. They lie in areas of old glacial lakes that formed during Late Wisconsin time.

Covering many areas of the county is loess that originated during Wisconsin glaciation or in the postglacial period. This material is thickest in the higher areas west of the Scioto River, particularly on broad ridgetops. Little or no loess mantles the crests of knolls and the steeper side slopes.

Physiography

Ross County lies in two physiographic provinces, the Central Lowland (or Mississippian Plain) and the Allegheny Plateau. The two provinces are separated by the Allegheny escarpment, which crosses the county in an irregular line from the southwestern corner to the northeastern one. Along the escarpment there is an ascent of several hundred feet from the Central Lowlands to the Allegheny Plateau.

The Central Lowlands physiographic province, in general, makes up the northern third of the county. It is the principal farming area and contains little woodland. Productivity for farm crops is high. Except along the raised and billowy Late Wisconsin terminal moraine, the area consists of an undulating to rolling plain and only slightly lower valleys. Its landscape contrasts sharply with that of the higher, more rugged, more forested Allegheny Plateau to the south. All the area of the Central Lowlands was covered by Late Wisconsin glacial ice.

The Allegheny Plateau occupies the southern two-thirds of the county. It was once continuous but now is dissected by many streams, and it is a succession of rugged hills underlain by bedrock. Through erosion some of the divides have been reduced to sharply narrow ridgetops that break abruptly to steep hillsides. Other divides are wide and flat topped. Much of the plateau was glaciated, but the glaciers did not alter the pre-glacial relief to a great degree. The two northernmost protrusions of the plateau were covered by Late Wisconsin ice. Of the remaining part, roughly the northern half was covered by Illinoian ice, but the southern half generally was unglaciated, though it was penetrated by valley trains of Wisconsin and Illinoian outwash.

Glaciation and the deposition of drift tended to reduce the contrast between the Central Lowlands and the Allegheny Plateau. Because glacial drift was deposited unevenly, the till plain of the lowlands took on a billowy appearance, whereas the glaciated part of the plateau was smoothed by ice that scraped the hills and partly filled the valleys. Nevertheless, the escarpment that marks the edge of the Allegheny Plateau remains a prominent feature of the landscape. A few kames occur in the county, mostly in the Wisconsin glacial area.

Drainage

All of Ross County drains into the Scioto River, which flows southward through the county and empties into the Ohio River about 50 miles south of Chillicothe. In the nearly level to undulating areas in the northern part of the county, surface runoff is generally slow and the water-storing capacity of the soils is high. In the hills of the Appalachian Plateau to the south, surface runoff is rapid and, in many of the soils, the water-storing capacity is low.

Climate [3]

The climate of Ross County is continental, and rainfall is well distributed throughout the year. In table 9 are given temperature and precipitation data summarized from observations made at Chillicothe, which lies in the valley of the Scioto River. At this location, temperature tends to be higher than the corresponding temperature in the hilly western and extreme eastern parts of the county. The average annual temperature in the Scioto River valley is about 1 degree higher than that in the hilly areas. In contrast, precipitation tends to be slightly lower along the river valley than it is in the hilly parts of the county. Nevertheless, the data in table 9 are considered applicable to the entire county.

Soils generally are warmest in valley bottoms and are coolest on uplands where they are exposed to stronger winds. For example, soils used for corn were recently studied over a period of three growing seasons to determine the influence of location on soil temperature. During the growing season for corn, May through August, the average temperature of the soil at a 4-inch depth was 76.6°F on bottom land, 74.5° on terraces, and 73.1° on uplands.

Soils also are warmest on slopes facing south and west and in areas near obstructions that interfere with the free movement of wind. They are coolest on slopes facing north and east.

In winter the depth of frost penetration depends on the severity of the cold and the presence or absence of a protective snow cover. In an average winter, soils used for farming seldom freeze to a depth exceeding 6 to 8 inches in this county. During a mild period, even in January or February, all frost in the soil may disappear.

Soil moisture varies widely during the year. The recharge season is normally winter, and nearly all the soils are saturated with water by April 1. Rainfall in spring generally is sufficient to maintain ample moisture in the soil until the end of June. Chances are about 2 in 5 that 1 inch of rain will fall each week late in May and in June. This amount of rainfall comes close to meeting the needs of growing crops. In July and August, however, the chances of receiving 1 inch of rain per week are only 3 in 10, and during this period rainfall ordinarily is not enough for most crops. As a result, late in August all but 10 to 20 percent of the available moisture in the root zone has been exhausted. The summer must be unusually wet if the supply of available moisture is to be kept above 50 percent of field capacity.

Table 10 shows the probability of freezing temperatures at Chillicothe on or after given dates in spring and on or before given dates in fall. The last column to the right is included in the table because light frost can occur when the temperature of the air is several degrees above freezing. In contrast, some kinds of plants are

[3] By L. T. PIERCE, State climatologist, U.S. Weather Bureau.

TABLE 9.—*Temperature and precipitation at Chillicothe, Ross County, Ohio*

[Dashed lines indicate data not available]

Month	Temperature					Precipitation						
	Average daily maximum [1]	Average daily minimum [1]	Average [1]	Two years in 10 will have at least 4 days with [2]—		Average monthly total [1]	Greatest monthly [3]		Smallest monthly [3]		Average number of days with snow on ground [4]	Average depth of snow on days with snow on ground [4]
				Maximum temperature equal to or higher than—	Minimum temperature equal to or lower than—		Total amount	Year	Total amount	Year		
	°F.	°F.	°F.	°F.	°F.	Inches	Inches		Inches			Inches
January	43. 0	24. 5	33. 7	58	6	3. 49	13. 08	1937	0. 58	1931	9	1
February	44. 2	23. 6	33. 9	64	11	2. 77	5. 59	1956	. 32	1941	7	1
March	53. 7	31. 4	42. 6	71	16	3. 71	7. 18	1945	. 83	1941	4	1
April	65. 3	40. 7	53. 0	84	29	3. 72	7. 78	1948	1. 05	1960	1	(5)
May	76. 5	50. 8	63. 7	88	36	3. 75	10. 44	1933	. 52	1932	0	0
June	85. 4	60. 8	73. 1	93	48	3. 94	10. 49	1941	. 29	1930	0	0
July	88. 5	63. 9	76. 2	95	54	4. 23	6. 83	1931	. 20	1911	0	0
August	86. 9	61. 8	74. 3	95	51	3. 40	10. 14	1926	. 14	1910	0	0
September	81. 1	54. 4	67. 7	95	41	2. 92	7. 56	1950	. 69	1928	0	0
October	70. 3	42. 6	56. 5	84	30	1. 92	7. 22	1919	. 05	1924	0	0
November	54. 5	33. 2	43. 9	72	21	2. 58	5. 77	1927	. 38	1917	2	1
December	43. 8	25. 4	34. 6	61	8	2. 67	6. 37	1923	. 60	1925	8	1
Year	66. 1	42. 8	54. 4	----------	----------	39. 10	53. 98	1935	23. 51	1930	31	1

[1] Based on 30-year record, through 1960.
[2] Based on 15-year record, through 1961.
[3] Based on 54-year record, through 1962.
[4] Based on 20-year record, through 1962.
[5] Trace.

TABLE 10.—*Probabilities of last freezing temperatures in spring and first in fall*

[Computed from records kept at Chillicothe, Ohio, for a 29-year period, through 1955]

Probability	Dates for given probability and temperature					
	16° F. or lower	20° F. or lower	24° F. or lower	28° F. or lower	32° F. or lower	36° F. or lower
Spring:						
1 year in 10 later than	March 24	March 30	April 15	April 28	May 6	May 22
2 years in 10 later than	March 18	March 24	April 8	April 22	May 2	May 18
5 years in 10 later than	March 7	March 12	March 25	April 10	April 25	May 10
Fall:						
1 year in 10 earlier than	November 19	November 7	October 27	October 12	October 2	September 20
2 years in 10 earlier than	November 24	November 12	November 1	October 18	October 7	September 25
5 years in 10 earlier than	December 4	November 20	November 9	October 27	October 15	October 3

not injured by frost unless the temperature falls 4 or more degrees below freezing.

Tornadoes are not unknown in Ross County, but they touch down only once in 4 or 5 years and cause considerably less damage than tornadoes in midwestern States farther south and west. In this county the paths of tornadoes seldom exceed 500 feet in width or 1 mile in length.

Organization

Ross County, the sixth county formed from the old Northwest Territory, was created by a proclamation of Governor St. Clair on August 20, 1798. It is named for James Ross, who achieved fame during the Revolutionary War. Originally, the county was much larger than it is now, for only 10 counties made up the entire State of Ohio in 1801. Settlement began west of the Scioto River, in an area that was part of the Virginia Military Lands and was surveyed by metes and bounds. Settled somewhat later was the part of the county lying east of the Scioto River, an area that was part of the Congress Lands and was surveyed by the rectangular system of land surveying.

Transportation

The county is served by four railroads, and it has a well-distributed network of Federal, State, county, and

township roads. All roads except a few of the township roads are paved.

Agriculture

According to the U.S. Bureau of the Census, Ross County had 1,628 farms and 324,268 acres in farms in 1959. Nearly 80 percent of the farms were operated by owners and part owners, and the rest were operated by managers and tenants. The land in farms accounted for about 74 percent of the county in 1959, but the acreage has decreased in recent years because highways, recreational areas, and areas of expanding industry and housing have been built or enlarged and because many individual farms have been consolidated into larger holdings that are used mainly for the production of forest products.

The number of farms in the county decreased from 2,176 in 1954 to 1,628 in 1959. However, the average size of farms increased during the same period. In 1954, the average size of farms was about 156 acres, but in 1959 it was about 200 acres. The increase in size came about because of economic conditions and the impact of modern farming technology. Much of the land in the better agricultural areas of Ross County is well suited to large-scale farming.

Livestock raising and the production of general field crops are the most important types of farming in Ross County. In 1959, there were 710 miscellaneous and unclassified farms in the county. The rest of the farms, classified according to their major source of income, were divided as follows:

	Number
Cash grain	218
Fruit and nut farms	5
Poultry farms	25
Dairy farms	116
Livestock farms other than dairy and poultry farms	485
General farms	69

In 1959, according to the Ohio Crop Reporting Service (*4*), the principal kinds of livestock on farms in Ross County were as follows:

	Number
Cattle and calves	36, 600
Milk cows and heifers	7, 100
Hogs and pigs	53, 200
Sheep for breeding	9, 400
Chickens	101, 000

The average acre yields of the principal field crops in 1959 were corn, 64.0 bushels; wheat, 19.5 bushels; oats, 39.0 bushels; soybeans, 26.0 bushels; and all hay, 1.60 tons.

Acreages of the principal field crops harvested in 1959 were as follows:

	Acres
Corn	68, 900
Wheat	22, 600
Oats	7, 800
Soybeans	3, 400
All hay	29, 400

The total acreage of cropland in the county in 1959 was 195,367 acres, or about 44 percent of the total land area. In 1954, the total acreage of cropland was 187,479 acres, or about 41 percent of the county.

In 1959, about 23 percent of the county was in pasture, and the remaining 32 percent was in forest. These percentages have remained fairly constant over a long period of years.

Since early time the major farming enterprises in the county have been the growing of corn, wheat, and mixed hay and the raising of livestock, principally hogs and beef cattle. Livestock farms are the most common. In 1959, about 62 percent of the farm operators owned all the land they farmed.

Corn has always been the chief field crop in this county. In 1959, the other important crops, in order of decreasing acreage, were wheat, clover and timothy hay, alfalfa hay, oats, and soybeans. Some barley and rye are grown, but the acreages of these crops have been decreasing.

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Glossary

Aggregate, soil. Many fine particles held in a single mass or cluster such as a clod, crumb, block, or prism.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern.

Available moisture capacity. The difference between the amount of water in a soil at field capacity and the amount in the same soil at the permanent wilting point. Commonly expressed as inches of water per inch depth of soil.

Base saturation. The degree to which material that has base-exchange properties is saturated with exchangeable cations other than hydrogen, expressed as a percentage of the cation-exchange capacity.

Catena, soil. A sequence, or "chain," of soils on a landscape, developed from one kind of parent material but having different characteristics because of differences in relief and drainage.

Channery soil. A soil that contains thin, flat fragments of sandstone or limestone, as much as 6 inches in length along the longer axis. A single piece is called a fragment.

Chroma. See Color, Munsell notation.

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.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Color, 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 chroma of 4.

Complex, soil. A mapping unit consisting of different kinds of soils that occur in such small individual areas or in such an intricate pattern that they cannot be shown separately on a publishable soil map.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent; will not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Control section. The part of a soil profile that strongly influences the placement of a soil in the current system of soil classification. As used in this county, it reaches from a depth of 10 inches to 40 inches, or to the bottom of the diagnostic horizon if that horizon extends below 40 inches but not below 60 inches.

Drainage, soil. The relative rapidity and extent of removal of water, under natural conditions, from on and within the soil.

Eluviation. The movement of material from one place to another within the soil, in either true solution or colloidal suspension. Soil horizons that have lost material through eluviation are said to be eluvial; those that have received material are illuvial.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flood plain. Nearly level land, consisting of stream sediment, that borders a stream and is subject to flooding unless protected artificially.

Fragipan (Bx horizon). A loamy, brittle, subsurface horizon that is very low in organic matter and clay but is rich in silt or very fine sand. The layer is seemingly cemented when dry, has a hard or very hard consistence, and has a high bulk density in comparison with the horizon or horizons above it. When moist, the fragipan tends to rupture suddenly if pressure is applied, rather than to deform slowly. The layer is generally mottled, is slowly or very slowly permeable to water, and has few or many bleached fracture planes that form polygons. Fragipans are a few inches to several feet thick; they generally occur in or below the B horizon, 15 to 40 inches below the surface.

Glacial drift. Rock material transported by glacial ice and then deposited; also includes the assorted and unassorted materials deposited by streams flowing from glaciers.

Glacial outwash. Cross-bedded gravel, sand, and silt deposited by meltwater as it flowed from glacial ice.

Glacial till. Unassorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

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Gleization, or gleying. The reduction, translocation, and segregation of soil compounds, notably of iron, generally in the subsoil or substratum, as a result of poor aeration and drainage; indicated in the soil by mottles of dominantly gray. The soil-forming processes leading to the development of a gley soil.

Gravelly soil. From 15 to 50 percent of material, by volume, consists of rounded or angular rock fragments that are not prominently flattened and are up to 3 inches in diameter.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes.

Hue. See Color, Munsell notation.

Illuviation. The accumulation of material in a soil horizon through 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.

Inclusion. A kind of soil that has been included in mapping a soil of a different kind because the area was too small to be mapped separately on a map of the scale used.

Kame (geology). An irregular, short ridge, or hill, of stratified glacial drift.

Lacustrine. Material deposited in lake water and exposed by lowering of the water level or elevation of the land.

Leaching, soil. The removal of materials in solution by percolating water.

Loess. A fine-grained eolian deposit consisting dominantly of silt-sized particles.

Loam. Soil having equal amounts of sand, silt, and clay.

Mapping unit. Any soil, miscellaneous land type, soil complex, or undifferentiated soil group shown on the detailed soil map and identified by a letter symbol.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier.

Morphology, soil. The makeup of the soil, including the texture, structure, consistence, color, and other physical, chemical, mineralogical, and biological properties of the various horizons that make up the soil profile.

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.

Muck. An organic soil consisting of fairly well decomposed organic material that is relatively high in mineral content, finely divided, and dark in color.

Outwash plain. A plain consisting of material washed out from glacial ice.

Parent material. The horizon of weathered rock or partly weathered soil material from which soil has formed; horizon C in the soil profile.

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod.

Permeability. The quality of a soil horizon that enables water or air to move through it. Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

pH. See Reaction.

Phase, soil. A subdivision of a soil type, series, or other unit in the soil classification system made because of differences in the soil that affect its management but do not affect its classification in the natural landscape. A soil type, for example, may be divided into phases because of differences in slope, stoniness, thickness, or some other characteristic that affects management.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an

alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Mildly alkaline	7.4 to 7.8
Very strongly acid	4.5 to 5.0	Moderately alkaline	7.9 to 8.4
Strongly acid	5.1 to 5.5	Strongly alkaline	8.5 to 9.0
Medium acid	5.6 to 6.0	Very strongly alkaline	9.1 and higher
Slightly acid	6.1 to 6.5		
Neutral	6.6 to 7.3		

Relief. The elevations or inequalities of a land surface, considered collectively.

Sand. Individual rock or mineral fragments in soils having diameters ranging from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Series, soil. A group of soils developed from a particular type of parent material and having genetic horizons that, except for texture of the surface layer, are similar in differentiating characteristics and in arrangement in the profile.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting upon parent material, as conditioned by relief over periods of time.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in a 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.

Stony. Used to describe soils that contain stones in numbers that interfere with or prevent tillage.

Stratified. Composed of, or arranged in, strata, or layers, such as stratified alluvium. The term is confined to geological material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

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 profile below plow depth.

Substratum. Any layer lying beneath the solum, or true soil; the C or R horizon.

Surface layer. A term used in nontechnical soil descriptions for one or more layers above the subsoil. Includes A horizon and part of B horizon; has no depth limit.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. (See also Clay, Sand and Silt.) The basic textural classes, in order of increasing proportions of fine particles are as follows: 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."

Topsoil. A presumed fertile soil or soil material, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Type, soil. A subdivision of the soil series that is made on the basis of differences in the texture of the surface layer.

Upland (geology). Land consisting of material unworked by water in recent geologic time and lying, in general, at a higher elevation than the alluvial plain or stream terrace. Land above the lowlands along rivers.

Value. See Color, Munsell notation.

Variant, soil. A soil having properties sufficiently different from other known soils to justify a new series name but occupying a geographic area so limited that creation of a new series is not believed to be justified.

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, soil. 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.

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GUIDE TO MAPPING UNITS

[For a full description of a mapping unit, read both the description of the mapping unit and the description of the soil series to which the mapping unit belongs.

[See table 1, page 15, for estimated acre yields for each soil and table 6, page 75, for approximate acreage and proportionate extent of the soils. For discussion of irrigation groups, see section beginning on page 14. For information significant to engineering, see section beginning on page 23]

Map symbol	Mapping unit	Described on page	Capability unit		Woodland suitability group		Irrigation group
			Symbol	Page	Number	Page	Number
Ab	Abscota sandy loam, calcareous variant	74	IIw-5	9	3	20	1
AdC2	Alexandria silt loam, 6 to 12 percent slopes, moderately eroded	74	IIIe-1	9	4	20	---
AdD2	Alexandria silt loam, 12 to 18 percent slopes, moderately eroded	74	IVe-1	11	4	20	---
AdE2	Alexandria silt loam, 18 to 25 percent slopes, moderately eroded	74	VIe-1	12	4	20	---
AdF2	Alexandria silt loam, 25 to 40 percent slopes, moderately eroded	74	VIIe-1	13	4	20	---
AeD3	Alexandria soils, 12 to 18 percent slopes, severely eroded	74	VIe-1	12	4	20	---
AeE3	Alexandria soils, 18 to 25 percent slopes, severely eroded	77	VIe-1	12	4	20	---
AfC2	Alford silt loam 6 to 12 percent slopes, moderately eroded	77	IIIe-3	10	4	20	---
AfD2	Alford silt loam, 12 to 18 percent slopes, moderately eroded	77	IVe-1	11	4	20	---
AfE2	Alford silt loam, 18 to 25 percent slopes, moderately eroded	78	VIe-1	12	4	20	---
Ag	Algiers silt loam	78	IIw-1	7	1	19	---
AlA	Alvin fine sandy loam, 0 to 2 percent slopes	78	IIs-1	9	4	20	1
AlB	Alvin fine sandy loam, 2 to 6 percent slopes	78	IIe-1	7	4	20	1
AlC2	Alvin fine sandy loam, 6 to 12 percent slopes, moderately eroded	78	IIIe-2	10	4	20	---
AvA	Avonburg silt loam, 0 to 2 percent slopes	79	IIIw-2	11	2	19	4
AvB	Avonburg silt loam, 2 to 6 percent slopes	79	IIIw-2	11	2	19	4
BaA	Bartle silt loam, 0 to 2 percent slopes	79	IIIw-2	11	2	19	4
BaB	Bartle silt loam, 2 to 6 percent slopes	79	IIIw-2	11	2	19	4
Bo	Bonpas silty clay loam	80	IIw-3	8	1	19	4
Br	Brookston silt loam	80	IIw-3	8	1	19	4
Bs	Brookston silty clay loam	80	IIw-3	8	1	19	4
CaB	Cana silt loam, 2 to 6 percent slopes	80	IIe-2	7	6	20	3
CaB2	Cana silt loam, 2 to 6 percent slopes, moderately eroded	80	IIe-2	7	6	20	3
CaC	Cana silt loam, 6 to 12 percent slopes	81	IIIe-4	10	6	20	---
CaC2	Cana silt loam, 6 to 12 percent slopes, moderately eroded	81	IIIe-4	10	6	20	---
CaD	Cana silt loam, 12 to 18 percent slopes	81	IVe-3	12	6	20	---
CaD2	Cana silt loam, 12 to 18 percent slopes, moderately eroded	81	IVe-3	12	6	20	---
CaE	Cana silt loam, 18 to 25 percent slopes	81	VIe-2	13	6	20	---

GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Described on page	Capability unit		Woodland suitability group		Irrigation group
			Symbol	Page	Number	Page	Number
CaF	Cana silt loam, 25 to 45 percent slopes	81	VIIe-2	13	6	20	---
CeC3	Cana soils, 6 to 12 percent slopes, severely eroded	81	IVe-4	12	6	20	---
CeD3	Cana soils, 12 to 18 percent slopes, severely eroded	81	VIe-2	13	6	20	---
CeF3	Cana soils, 18 to 35 percent slopes, severely eroded	81	VIIe-2	13	6	20	---
CfE	Cana very flaggy silt loam, 18 to 25 percent slopes	81	VIs-1	13	6	20	---
CfF	Cana very flaggy silt loam, 25 to 35 percent slopes	81	VIIs-1	13	6	20	---
CgF	Cana-Colyer very flaggy silt loams, 25 to 35 percent slopes	81	VIIs-1	13	6	20	---
ChB	Cardington silt loam, 2 to 6 percent slopes	82	IIe-1	7	4	20	3
ChC2	Cardington silt loam, 6 to 12 percent slopes, moderately eroded	82	IIIe-1	9	4	20	---
ChD2	Cardington silt loam, 12 to 18 percent slopes, moderately eroded	82	IVe-1	11	4	20	---
CkC3	Cardington soils, 6 to 12 percent slopes, severely eroded	82	IVe-2	12	4	20	---
CkD3	Cardington soils, 12 to 18 percent slopes, severely eroded	82	VIe-1	12	4	20	---
Cm	Carlisle muck	82	IIIw-1	11	8	21	5
CnE2	Casco and Lorenzo soils, 18 to 25 percent slopes, moderately eroded	83	VIe-1	12	5	20	---
CnE3	Casco and Lorenzo soils, 18 to 25 percent slopes, severely eroded	83	VIIe-1	13	5	20	---
CoA	Celina silt loam, 0 to 2 percent slopes	83	I-1	6	4	20	3
CoB	Celina silt loam, 2 to 6 percent slopes	83	IIe-1	7	4	20	3
CoB2	Celina silt loam, 2 to 6 percent slopes, moderately eroded	83	IIe-1	7	4	20	3
Cp	Clermont silt loam	83	IIIw-2	11	1	19	4
CrE	Colyer shaly silt loam, 12 to 25 percent slopes	84	VIs-1	13	6	20	---
CrG	Colyer shaly silt loam, 25 to 75 percent slopes	84	VIIs-1	13	6	20	---
CsE	Colyer-Cana complex, 18 to 25 percent slopes	84	VIs-1	13	6	20	---
CsG	Colyer-Cana complex, 25 to 75 percent slopes	84	VIIs-1	13	6	20	---
CtB	Coolville silt loam, 2 to 6 percent slopes	84	IIe-2	7	6	20	3
CtB2	Coolville silt loam, 2 to 6 percent slopes, moderately eroded	84	IIe-2	7	6	20	3
CtC2	Coolville silt loam, 6 to 12 percent slopes, moderately eroded	84	IIIe-4	10	6	20	---
CvA	Crosby silt loam, 0 to 2 percent slopes	85	IIw-2	8	2	19	4
CvB	Crosby silt loam, 2 to 6 percent slopes	85	IIw-2	8	2	19	4
CwB	Cruze silt loam, 2 to 6 percent slopes	85	IIe-2	7	6	20	3
CwC2	Cruze silt loam, 6 to 12 percent slopes, moderately eroded	85	IIIe-4	10	6	20	---

GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Described on page	Capability unit		Woodland suitability group		Irrigation group
			Symbol	Page	Number	Page	Number
CwD2	Cruze silt loam, 12 to 18 percent slopes, moderately eroded	85	IVe-4	12	6	20	---
CwE	Cruze silt loam, 18 to 25 percent slopes	85	VIe-2	13	6	20	---
CzC3	Cruze soils, 6 to 12 percent slopes, severely eroded	85	IVe-4	12	6	20	---
CzD3	Cruze soils, 12 to 18 percent slopes, severely eroded	85	VIe-2	13	6	20	---
DnG	Dekalb and Neotoma extremely rocky fine sandy loams, 25 to 70 percent slopes	86	VIIs-1	13	7	21	---
DoG	Dekalb and Neotoma fine sandy loams, 35 to 70 percent slopes	86	VIIe-2	13	7	21	---
Ee	Eel silt loam	86	IIw-5	9	3	20	3
Fa	Fawcett silt loam	86	IIIw-2	11	2	19	4
FgA	Fox gravelly loam, 0 to 2 percent slopes	87	IIs-1	9	5	20	1
FgB	Fox gravelly loam, 2 to 6 percent slopes	87	IIe-1	7	5	20	1
FgC2	Fox gravelly loam, 6 to 12 percent slopes, moderately eroded	87	IIIe-2	10	5	20	---
FlA	Fox loam, 0 to 2 percent slopes	87	IIs-1	9	5	20	1
FlB	Fox loam, 2 to 6 percent slopes	87	IIe-1	7	5	20	1
FlC2	Fox loam, 6 to 12 percent slopes, moderately eroded	87	IIIe-2	10	5	20	---
FmA	Fox sandy loam, 0 to 2 percent slopes	87	IIs-1	9	5	20	1
FmB	Fox sandy loam, 2 to 6 percent slopes	87	IIe-1	7	5	20	1
FnA	Fox silt loam, 0 to 2 percent slopes	87	IIs-1	9	5	20	1
FnB	Fox silt loam, 2 to 6 percent slopes	87	IIe-1	7	5	20	1
FnB2	Fox silt loam, 2 to 6 percent slopes, moderately eroded	87	IIe-1	7	5	20	1
FnC2	Fox silt loam, 6 to 12 percent slopes, moderately eroded	88	IIIe-2	10	5	20	---
FoC3	Fox soils, 6 to 12 percent slopes, severely eroded	88	IVe-2	12	5	20	---
FwD2	Fox and Warsaw soils, 12 to 18 percent slopes, moderately eroded	88	IVe-1	11	5	20	---
FwD3	Fox and Warsaw soils, 12 to 18 percent slopes, severely eroded	88	VIe-1	12	5	20	---
Ge	Genesee fine sandy loam	88	IIw-5	9	3	20	1
Gn	Genesee silt loam	88	IIw-5	9	3	20	1
Go	Genesee silty clay loam	88	IIw-5	9	3	20	1
	Gravel pits	89	-----	--	--	--	---
He	Henshaw silt loam	89	IIw-2	8	2	19	4
HkC2	Hickory silt loam, 6 to 12 percent slopes, moderately eroded	89	IIIe-1	9	4	20	---
HkD2	Hickory silt loam, 12 to 18 percent slopes, moderately eroded	89	IVe-1	11	4	20	---
HkE	Hickory silt loam, 18 to 25 percent slopes	89	VIe-1	12	4	20	---
HoD3	Hickory soils, 12 to 18 percent slopes, severely eroded	90	VIe-1	12	4	20	---
HoE3	Hickory soils, 18 to 25 percent slopes, severely eroded	90	VIe-1	12	4	20	---

GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Described on page	Capability unit		Woodland suitability group		Irrigation group
			Symbol	Page	Number	Page	Number
HoF	Hickory soils, 25 to 45 percent slopes	90	VIIe-1	13	4	20	---
KeA	Kendallville silt loam, 0 to 2 percent slopes	90	I-1	6	4	20	2
KeB	Kendallville silt loam, 2 to 6 percent slopes	90	IIe-1	7	4	20	2
KeC2	Kendallville silt loam, 6 to 12 per- slopes, moderately eroded	90	IIIe-1	9	4	20	---
KeD2	Kendallville silt loam, 12 to 18 percent slopes, moderately eroded-	90	IVe-1	11	4	20	---
KeE2	Kendallville silt loam, 18 to 25 percent slopes, moderately eroded-	90	VIe-1	12	4	20	---
KnC3	Kendallville soils, 6 to 12 percent slopes, severely eroded	90	IVe-2	12	4	20	---
KnD3	Kendallville soils, 12 to 18 percent slopes, severely eroded	91	VIe-1	12	4	20	---
KnE3	Kendallville soils, 18 to 25 percent slopes, severely eroded	91	VIe-1	12	4	20	---
KnF2	Kendallville soils, 25 to 40 percent slopes, moderately eroded	91	VIIe-1	13	4	20	---
LaC2	Latham silt loam, 6 to 12 percent slopes, moderately eroded	91	IVe-3	12	6	20	---
LaD2	Latham silt loam, 12 to 18 percent slopes, moderately eroded	91	VIe-2	13	6	20	---
LaE	Latham silt loam, 18 to 25 percent slopes	91	VIe-2	13	6	20	---
LaE2	Latham silt loam, 18 to 25 percent slopes, moderately eroded	91	VIe-2	13	6	20	---
LhD3	Latham soils, 12 to 18 percent slopes, severely eroded	92	VIIe-2	13	6	20	---
LhE3	Latham soils, 18 to 25 percent slopes, severely eroded	92	VIIe-2	13	6	20	---
LhF	Latham soils, 25 to 40 percent slopes	92	VIIe-2	13	6	20	---
LoC	Loudonville silt loam, 6 to 12 per- cent slopes	92	IIIe-3	10	7	21	---
LoD2	Loudonville silt loam, 12 to 18 per- cent slopes, moderately eroded	92	IVe-1	11	7	21	---
LoE2	Loudonville silt loam, 18 to 25 per- cent slopes, moderately eroded	93	IVe-1	11	7	21	---
LoF2	Loudonville silt loam, 25 to 45 per- cent slopes, moderately eroded	93	VIIe-2	13	7	21	---
	Made land	93	------	--	-	--	---
MaA	Markland silt loam, 0 to 2 percent slopes	93	IIw-4	8	4	20	3
MaB	Markland silt loam, 2 to 6 percent slopes	93	IIIe-4	10	4	20	3
MaC2	Markland silt loam, 6 to 12 percent slopes, moderately eroded	93	IVe-3	12	4	20	---
MaD2	Markland silt loam, 12 to 18 percent slopes, moderately eroded	94	VIe-2	13	4	20	---
MaE2	Markland silt loam, 18 to 25 percent slopes, moderately eroded	94	VIe-2	13	4	20	---
MaF2	Markland silt loam, 25 to 35 percent slopes, moderately eroded	94	VIIe-1	13	4	20	---
MeC3	Markland soils, 6 to 12 percent slopes, severely eroded	94	VIe-2	13	4	20	---
MeD3	Markland soils, 12 to 18 percent slopes, severely eroded	94	VIIe-1	13	4	20	---

GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Described on page	Capability unit		Woodland suitability group		Irrigation group
			Symbol	Page	Number	Page	Number
MgA	McGary silt loam, 0 to 2 percent slopes	94	IIIw-2	11	2	19	4
MgB	McGary silt loam, 2 to 6 percent slopes	94	IIIw-2	11	2	19	4
MnD3	Mentor soils, 12 to 18 percent slopes, severely eroded	95	VIe-1	12	4	20	---
MkA	Mentor very fine sandy loam, 0 to 2 percent slopes	95	I-1	6	4	20	2
MkB	Mentor very fine sandy loam, 2 to 6 percent slopes	95	IIe-1	7	4	20	2
MkC2	Mentor very fine sandy loam, 6 to 12 percent slopes, moderately eroded	95	IIIe-3	10	4	20	---
MkD2	Mentor very fine sandy loam, 12 to 18 percent slopes, moderately eroded	95	IVe-1	11	4	20	---
MkE2	Mentor very fine sandy loam, 18 to 25 percent slopes, moderately eroded	95	VIe-1	12	4	20	---
MlB	Miami silt loam, 2 to 6 percent slopes	96	IIe-1	7	4	20	2
MlB2	Miami silt loam, 2 to 6 percent slopes, moderately eroded	96	IIe-1	7	4	20	2
MlC	Miami silt loam, 6 to 12 percent slopes	96	IIIe-1	9	4	20	---
MlC2	Miami silt loam, 6 to 12 percent slopes, moderately eroded	96	IIIe-1	9	4	20	---
MlD	Miami silt loam, 12 to 18 percent slopes	96	IVe-1	11	4	20	---
MlD2	Miami silt loam, 12 to 18 percent slopes, moderately eroded	96	IVe-1	11	4	20	---
MlE	Miami silt loam, 18 to 25 percent slopes	96	VIe-1	12	4	20	---
MmB3	Miami soils, 2 to 6 percent slopes, severely eroded	97	IIIe-1	9	4	20	---
MmC3	Miami soils, 6 to 12 percent slopes, severely eroded	97	IVe-2	12	4	20	---
MmD3	Miami soils, 12 to 18 percent slopes, severely eroded	97	VIe-1	12	4	20	---
MmE3	Miami soils, 18 to 25 percent slopes, severely eroded	97	VIe-1	12	4	20	---
MmF	Miami soils, 25 to 40 percent slopes	97	VIIe-1	13	4	20	---
Mn	Millsdale silty clay loam	98	IIw-3	8	1	19	4
MoB	Milton silt loam, 2 to 6 percent slopes	98	IIIe-2	10	4	20	2
MoC2	Milton silt loam, 6 to 12 percent slopes, moderately eroded	98	IVe-1	11	4	20	---
MoE2	Milton silt loam, 18 to 25 percent slopes, moderately eroded	98	VIe-1	12	4	20	---
MpA	Monongahela silt loam, 0 to 2 percent slopes	98	IIw-4	8	4	20	3
MpB	Monongahela silt loam, 2 to 6 percent slopes	99	IIe-2	7	4	20	3
MpC2	Monongahela silt loam, 6 to 12 percent slopes, moderately eroded	99	IIIe-4	10	4	20	---
MrD	Muskingum very stony silt loam, 6 to 18 percent slopes	99	VIIs-1	13	7	21	---

GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Described on page	Capability unit		Woodland suitability group		Irrigation group
			Symbol	Page	Number	Page	Number
MsE	Muskingum and Latham stony silt loams, 12 to 25 percent slopes----	99	VIs-1	13	7	21	---
MtG	Muskingum and Latham very stony silt loams, 25 to 70 percent slopes----	99	VIIs-1	13	7	21	---
MuE	Muskingum, Berks, and Neotoma very stony silt loams, 18 to 25 percent slopes----------	99	VIIs-1	13	7	21	---
MuG	Muskingum, Berks, and Neotoma very stony silt loams, 25 to 70 percent slopes----------	100	VIIs-1	13	7	21	---
NeC2	Negley soils, 6 to 12 percent slopes, moderately eroded---------	100	IIIe-2	10	5	20	---
NfD2	Negley and Fox soils, 12 to 18 percent slopes, moderately eroded----	100	IVe-1	11	5	20	---
NfD3	Negley and Fox soils, 12 to 18 percent slopes, severely eroded------	100	VIe-1	12	5	20	---
NfE2	Negley and Fox soils, 18 to 25 percent slopes, moderately eroded----	100	VIe-1	12	5	20	---
NfE3	Negley and Fox soils, 18 to 25 percent slopes, severely eroded------	101	VIIe-1	13	5	20	---
NlF	Negley, Fox and Lorenzo soils, 25 to 40 percent slopes----------	101	VIIe-1	13	5	20	---
OcA	Ockley silt loam, 0 to 2 percent slopes----------	102	I-1	6	4	20	1
OcB	Ockley silt loam, 2 to 6 percent slopes----------	102	IIe-1	7	4	20	1
PaB	Parke silt loam, 2 to 6 percent slopes----------	102	IIe-1	7	4	20	1
PaC2	Parke silt loam, 6 to 12 percent slopes, moderately eroded---------	102	IIIe-3	10	4	20	---
PaD2	Parke silt loam, 12 to 18 percent slopes, moderately eroded---------	103	IVe-1	11	4	20	---
PaE	Parke silt loam, 18 to 25 percent slopes----------	103	VIe-1	12	4	20	---
PeC3	Parke soils, 6 to 12 percent slopes, severely eroded----------	103	IVe-2	12	4	20	---
PeD3	Parke soils, 12 to 18 percent slopes, severely eroded----------	103	VIe-1	12	4	20	---
PeE3	Parke soils, 18 to 25 percent slopes, severely eroded----------	103	VIe-1	12	4	20	---
PgC2	Parke-Negley complex, 6 to 12 percent slopes, moderately eroded----	103	IIIe-3	10	4	20	---
PhB	Pekin fine sandy loam, 2 to 6 percent slopes----------	103	IIe-2	7	4	20	3
PkA	Pekin silt loam, 0 to 2 percent slopes----------	103	IIw-4	8	4	20	3
PkB	Pekin silt loam, 2 to 6 percent slopes----------	104	IIe-2	7	4	20	3
PkC2	Pekin silt loam, 6 to 12 percent slopes, moderately eroded---------	104	IIIe-4	10	4	20	---
PkD2	Pekin silt loam, 12 to 18 percent slopes moderately eroded---------	104	IVe-3	12	4	20	---
PlB	Pekin silt loam, over clay, 2 to 6 percent slopes----------	104	IIe-2	7	4	20	3
PlC2	Pekin silt loam, over clay, 6 to 12 percent slopes, moderately eroded-	104	IIIe-4	10	4	20	---
PlD2	Pekin silt loam, over clay, 12 to 18 percent slopes, moderately eroded-	104	IVe-3	12	4	20	---

GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Described on page	Capability unit		Woodland suitability group		Irrigation group
			Symbol	Page	Number	Page	Number
PlE2	Pekin silt loam, over clay, 18 to 25 percent slopes moderately eroded-	104	VIe-1	12	4	20	---
PmC3	Pekin soils, 6 to 12 percent slopes, severely eroded----------	104	IVe-4	12	4	20	---
Pn	Philo silt loam----------	105	IIw-5	9	3	20	3
Po	Philo soils, channery variant-------	105	IIw-5	9	3	20	3
PpA	Pike silt loam, 0 to 2 percent slopes----------	105	I-1	6	4	20	1
PpB	Pike silt loam, 2 to 6 percent slopes----------	105	IIe-1	7	4	20	1
Pr	Pope silt loam----------	105	IIw-5	9	3	20	1
Ps	Pope soils, channery variant--------	105	IIw-5	9	3	20	1
RaA	Rainsboro silt loam 0 to 2 percent slopes----------	106	IIw-4	8	4	20	3
RaB	Rainsboro silt loam, 2 to 6 percent slopes----------	106	IIe-2	7	4	20	3
RaC2	Rainsboro silt loam 6 to 12 percent slopes, moderately eroded---------	106	IIIe-4	10	4	20	---
RaD2	Rainsboro silt loam, 12 to 18 percent slopes, moderately eroded----	106	IVe-3	12	4	20	---
RbC3	Rainsboro soils, 6 to 12 percent slopes, severely eroded----------	106	IVe-4	12	4	20	---
RbD3	Rainsboro soils, 12 to 18 percent slopes, severely eroded----------	106	VIe-1	12	4	20	---
RdD	Rarden silt loam, 12 to 18 percent slopes----------	107	VIe-2	13	6	20	---
RdD2	Rarden silt loam, 12 to 18 percent slopes, moderately eroded---------	107	VIe-2	13	6	20	---
RdE2	Rarden silt loam, 18 to 25 percent slopes, moderately eroded---------	107	VIe-2	13	6	20	---
ReD3	Rarden soils, 12 to 18 percent slopes, severely eroded----------	107	VIIe-2	13	6	20	---
RfC	Rarden and Coolville silt loams, 6 to 12 percent slopes----------	107	IIIe-4	10	6	20	---
RfC2	Rarden and Coolville silt loams, 6 to 12 percent slopes, moderately eroded----------	107	IIIe-4	10	6	20	---
RgC3	Rarden and Coolville soils, 6 to 12 percent slopes, severely eroded---	107	IVe-4	12	6	20	---
RhF2	Ritchey silt loam, 25 to 35 percent slopes, moderately eroded---------	108	VIIe-1	13	4	20	---
Rk	Riverwash----------	108	------	--	9	21	---
RlG	Rodman-Lorenzo complex, 25 to 50 percent slopes----------	108	VIIe-1	13	5	20	---
Rm	Ross fine sandy loam----------	108	IIw-5	9	3	20	1
Rn	Ross silt loam----------	108	IIw-5	9	3	20	1
Ro	Ross silty clay loam----------	109	IIw-5	9	3	20	1
RoA	Rossmoyne silt loam, 0 to 2 percent slopes----------	109	IIw-4	8	4	20	3
RpB	Rossmoyne silt loam, 2 to 6 percent slopes----------	109	IIe-2	7	4	20	3
RpB2	Rossmoyne silt loam, 2 to 6 percent slopes, moderately eroded---------	109	IIe-2	7	4	20	3
RpC2	Rossmoyne silt loam, 6 to 12 percent slopes, moderately eroded---------	109	IIIe-4	10	4	20	---
RpD2	Rossmoyne silt loam, 12 to 18 percent slopes, moderately eroded----	109	IVe-3	12	4	20	---

GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Described on page	Capability unit		Woodland suitability group		Irrigation group
			Symbol	Page	Number	Page	Number
RpE2	Rossmoyne silt loam, 18 to 25 percent slopes, moderately eroded	110	VIe-2	13	4	20	---
RsC3	Rossmoyne soils, 6 to 12 percent slopes, severely eroded	110	IVe-4	12	4	20	---
RsD3	Rossmoyne soils, 12 to 18 percent slopes, severely eroded	110	VIe-2	13	4	20	---
Sh	Shoals silt loam	110	IIw-1	7	2	19	4
Sl	Sleeth silt loam	111	IIw-2	8	2	19	4
Sn	Stendal silt loam	111	IIw-1	7	2	19	---
Sr	Stone quarries	111	-----	---	9	21	---
TaA	Taggart silt loam, 0 to 2 percent slopes	111	IIw-2	8	2	19	4
TaB	Taggart silt loam, 2 to 6 percent slopes	112	IIw-2	8	2	19	4
Te	Taggart silt loam, wet	112	IIIw-2	11	1	19	4
ThA	Thackery silt loam, 0 to 2 percent slopes	112	I-1	6	4	20	3
ThB	Thackery silt loam, 2 to 6 percent slopes	112	IIe-1	7	4	20	3
Ty	Tyler silt loam	112	IIIw-2	11	2	19	4
UnA	Uniontown silt loam, 0 to 2 percent slopes	113	I-1	6	4	20	3
UnB	Uniontown silt loam, 2 to 6 percent slopes	113	IIe-1	7	4	20	3
UnC2	Uniontown silt loam, 6 to 12 percent slopes, moderately eroded	113	IIIe-1	9	4	20	---
Wa	Wallkill silt loam	113	IIw-1	7	1	19	5
We	Warners mucky silt loam	114	IIIw-1	11	8	21	5
Wl	Warsaw loam	114	IIs-1	9	5	20	1
WsA	Wea silt loam, 0 to 2 percent slopes	114	I-1	6	4	20	1
WsB	Wea silt loam, 2 to 6 percent slopes	114	IIe-1	7	4	20	1
WtC	Wellston silt loam, 6 to 12 percent slopes	115	IIIe-3	10	7	21	---
Wu	Westland silty clay loam	115	IIw-3	8	1	19	4
Wv	Willette muck	115	IIIw-1	11	8	21	5

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