SOIL SURVEY

Columbiana County Ohio

OUR SOIL * OUR STRENGTH

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
Issued February 1968

Major fieldwork for this soil survey was done in the period 1942–60. Soil names and descriptions were approved in 1965. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1960. 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 Columbiana Soil Conservation District.

HOW TO USE THIS SOIL SURVEY

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

Locating Soils

All the soils of Columbiana 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 soil descriptions and in the discussions of the capability units and woodland groups.

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, Morphology, 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 Columbiana 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 Area," which gives additional information about the county.

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Contents

NOTICE TO LIBRARIANS

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

Issued February 1968

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 COLUMBIANA COUNTY, OHIO

BY HEBER D. LESSIG, IN CHARGE, WILLIAM F. HALE AND J. LESLIE YOHN, SOIL CONSERVATION SERVICE

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

COLUMBIANA COUNTY is located in eastern Ohio, adjacent to the State of Pennsylvania (fig. 1). It has a total land area of 535 square miles, or 342,400 acres. Lisbon, the county seat, is near the center of the county. The population of the county in 1960 was 107,004, of which 45 percent was rural. East Liverpool, the largest city, had a population of 22,306.

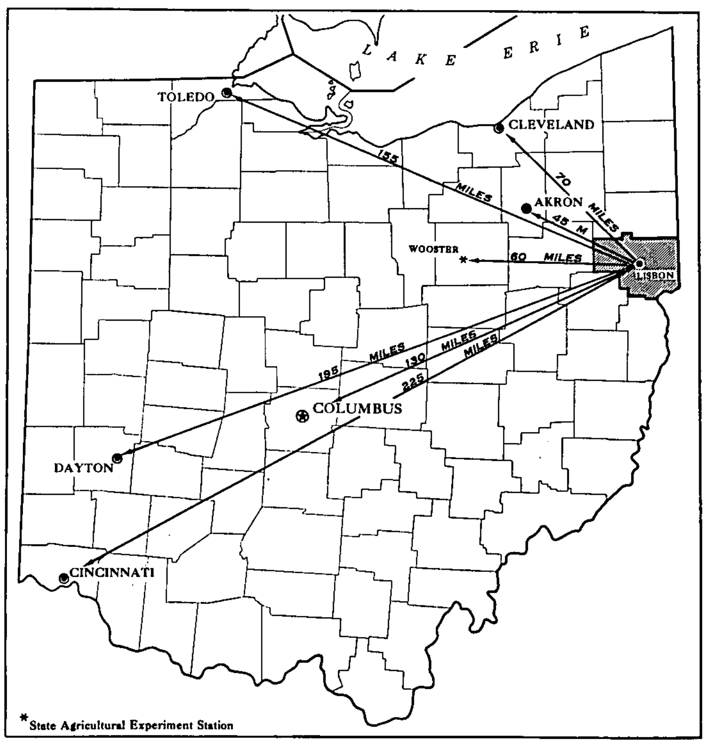

Figure 1.—Location of Columbiana County in Ohio.

How This Survey Was Made

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

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

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

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Canfield and Loudonville, 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 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. Bogart loam and Bogart silt loam are two soil types in the Bogart 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, Rittman silt loam, 2 to 5 percent slopes, is one of several phases of Rittman silt loam, a soil type that ranges from gently sloping to moderately 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, Upshur-Muskingum complex, 2 to 5 percent slopes, moderately eroded.

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 Allegheny and Monongahela silt loams, 2 to 5 percent slopes.

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 Made land or Gravel pit, 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, 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 surveys. On basis of the yield and practice tables and other data, the soil scientists set up trial groups, and then test them 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 consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Columbiana 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, stoniness, depth, drainage, and other characteristics that affect management.

Columbiana County is on the dissected Allegheny Plateau. The northern part of the county is mantled by thick glacial deposits, the central part is covered by glacial drift of variable thickness, and the southern part is unglaciated. Soil associations 1, 2, 3, and 4 are mainly on glacial till or glacial outwash in the northern and central parts. Soil association 5—an area that was glaciated but still has hilly relief—crosses the center of the county in an east-west direction. Soil associations 6, 7, 8, 9, and 10 are in the unglaciated central and southern parts of the county. Associations 6 and 8 are chiefly on terraces. Soil associations 7, 9, and 10 are mainly on hills, knolls, ridges, and valley walls. Soil association 8 occupies benches and the uplands behind them.

1. Chili-Wayland association: Well-drained soils on glacial outwash terraces, and poorly drained soils on flood plains

This soil association consists of gently sloping terraces and flood plains in the northern part of the county, an area that has been glaciated (fig. 2). Dominant in the association are the Chili and Wayland soils. The gravelly, well-drained Chili soils formed in gravelly outwash on terraces and account for about 50 percent of the total acreage. The poorly drained Wayland soils occupy the flood plains of streams and make up about 30 percent of the acreage.

Minor soils cover about 20 percent of the association. The gravelly Bogart soils and the dominantly silty Fitchville soils are on terraces; the Chagrin and the Lobdell soils are on flood plains.

Most of this association is cropland, for the Chili and Bogart soils are among the best agricultural soils in the county, and nearly all the poorly drained areas have been artificially drained. Raising and feeding livestock are the main farming enterprises, though potatoes and other special crops are grown in some areas of Chili soils.

2. Canfield-Wooster association: Moderately well drained and well drained soils on medium-textured glacial till

This soil association is characterized by gently sloping or sloping uplands and strongly sloping or moderately steep breaks along the major streams. (See fig. 2.) The association is in large, irregularly shaped areas in the northern part of the county.

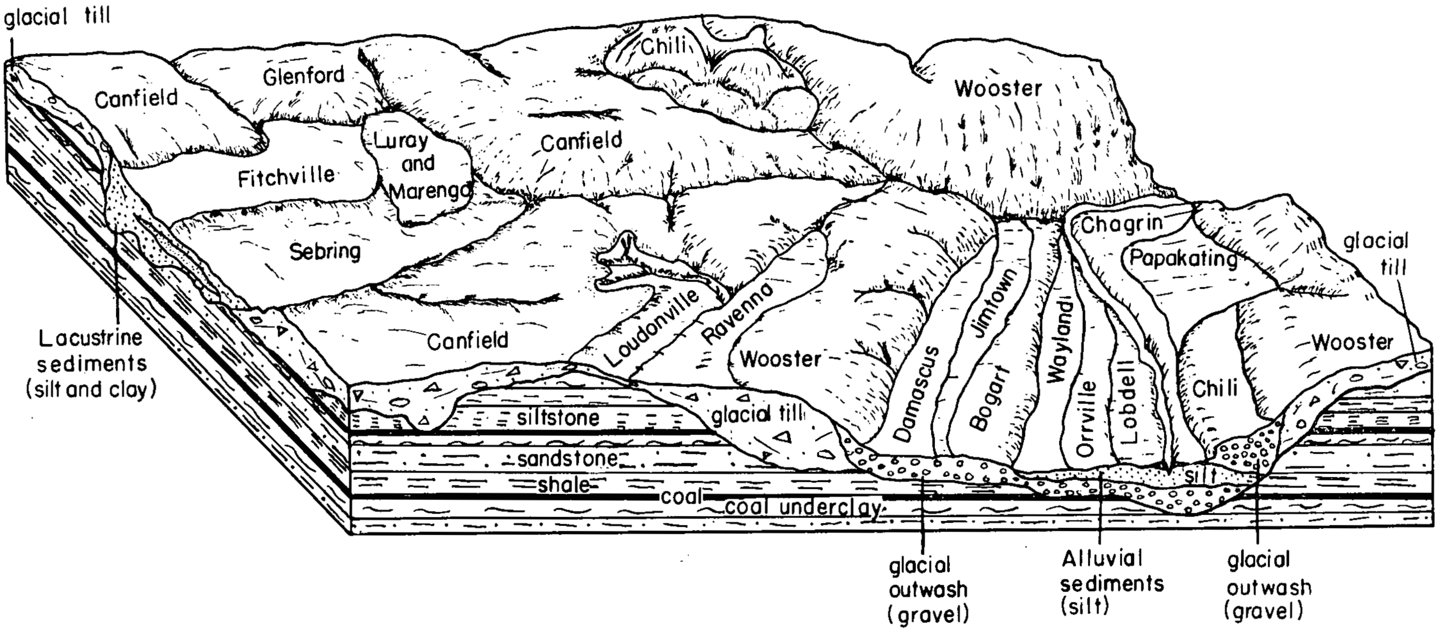

***Figure 2.*—A schematic drawing showing the relationship of soils on the Wisconsin glacial outwash plain (in the valley to the right) and on the Wisconsin till plain.**

The moderately well drained Canfield soils are dominant. These soils occupy gentle and, in most places, convex slopes; they account for about 60 percent of the association. The well-drained Wooster soils typically are on higher and steeper slopes than the Canfield, and they occupy about 30 percent of the association.

The rest of the association consists of minor soils. Among these are the poorly drained Frenchtown soils, the somewhat poorly drained Ravenna soils, and various soils in small areas on flood plains.

Some of the best and most extensive farmland in the county is in this association (fig. 3). The main farming enterprises are growing of crops and dairying. If the major soils are intensively managed, they are more productive than most other soils on uplands in northeastern Ohio. They are suited to many kinds of crops, including field crops, vegetables, and fruits. Small, poorly drained areas generally are used for pasture. Trees grow well on the soils of this association, though only a small acreage is wooded.

3. Wadsworth-Rittman association: Somewhat poorly drained and moderately well drained soils on clay loam glacial till

This soil association is mostly in gently sloping and sloping areas on glaciated uplands in the northwestern part of the county. About 50 percent of the total acreage consists of somewhat poorly drained Wadsworth soils in nearly level or depressional areas. About 35 percent is moderately well drained Rittman soils on convex slopes and in areas above the Wadsworth soils.

Minor soils in the association are the Marengo, Luray, Fitchville, and other soils. These occupy about 15 percent of the total area.

The Wadsworth and Rittman soils have a dense, compact subsoil that slows the internal movement of water. For this reason, they are more difficult to manage than well-drained soils. If they are well managed, however, Wadsworth and Rittman soils are productive.

This association is farmed intensively. Dairying is the main enterprise, but hogs and grain also are important. Tile drainage is needed in areas that are cropped with mechanized equipment.

4. Chili-Negley association: Well-drained, hilly gravelly soils on glacial drift

This soil association consists of strongly sloping and moderately steep areas on kames and moraines on the glacial till plains. About 70 percent of the association is Chili soils, and 20 percent is Negley soils, all of which are well drained and occur on gravelly hills. Between the hills are small areas of Sebring, Luray, Lorain, and other soils in swampy depressions. (See fig. 2.)

***Figure 3.*—Landscape in the Canfield-Wooster soil association.**

Most of this association is suitable for general farming and for growing special crops. Dairying is the main farming enterprise. Because the major soils are susceptible to erosion and tend to be droughty, they must be well managed for the most favorable yields of crops. The soils that are not so well drained, as well as steeper areas of Chili and Negley soils, are suitable for pasture.

5. Loudonville-Hanover-Titusville association: Well-drained, hilly soils that are shallow to moderately deep over bedrock

This soil association occupies hilly uplands in a band 3 to 5 miles wide across the central part of the county. Although glaciers covered this area, they did not smooth the hilly relief. On the ridgetops and slopes the layer of glacial till is thin, but it is thicker in nearly level areas and on benches.

About 80 percent of the association consists of hilly areas and ridgetops (fig. 4). Loudonville soils are on the ridgetops and make up about 36 percent of the total acreage. The well drained Hanover soils and the moderately well drained Titusville soils occur on ridgetops and benches and account for about 34 percent of the acreage. In addition, there are small areas of the somewhat poorly drained Gresham soils, and of Dekalb and Muskingum soils. Also included are sizable areas that have been strip mined for coal.

The soils are used for general farming in areas that have not been abandoned because of strip mining and poor yields. The steep slopes are subject to accelerated erosion if they are cultivated. Some vegetable and berry farms are on the ridgetops, where the soils warm up early in spring and where there is less danger of frost because of poor air drainage. Abandoned areas are suitable for reseeding to trees.

6. Allegheny-Monongahela-Parke association: Well drained and moderately well drained soils on terraces

This soil association is in the central and southern parts of the county; it lies on broad old terraces and the adjacent flood plains along the upper part of stream valleys.

The major soils of the association are on terraces. They are the well drained Allegheny and Parke soils, which make up about 40 percent of the total acreage, and the moderately well drained Monongahela soils, which make up about 20 percent. Small acreages of the Orrville, Wayland, Chagrin, Rainsboro, and other soils also occur. These minor soils occupy about 40 percent of the association.

Most of this association is used for general farming and for dairying (fig. 5). The major soils on terraces are productive but require good management. Soils on flood plains are used mostly for pasture because they are subject to flooding and are likely to be wet.

7. Weikert-Muskingum association: Well-drained, shallow and moderately deep soils on unglaciated knolls and ridges

This soil association occupies ridgetops and spurs in the south-central part of the county. The ridgetops are remnants of a plateau and generally are less than one-half mile wide. Steep knobs rise 150 to 250 feet above them. Deep ravines have been cut into the remaining areas of plateau, and around them are moderately steep to very steep slopes. In some places there are narrow benches between the ridges and the ravines.

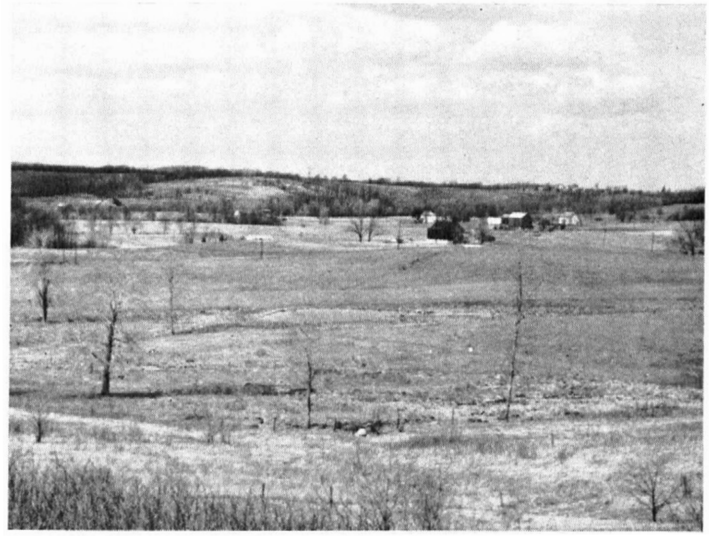

Figure 4.—**Landscape in the Loudonville-Hanover-Titusville soil association. On the hills and ridgetops in background are Loudonville and Titusville soils. In the foreground are Gresham and Hanover soils.**

The shallow Weikert and moderately deep Muskingum soils are dominant on the ridgetops, steep slopes, and knobs. These soils together make up about 90 percent of the association. Small areas of the well-drained Wellston soils are on the ridgetops, and a small acreage of the red, clayey Upshur soils is on the steep slopes and knobs.

Much of the idle farmland of the county is in this association. The steep slopes are susceptible to severe erosion and are better suited to trees than to other crops. Large areas are covered with brush and are slowly reverting to woodland. If well managed, some gently sloping areas on the ridgetops and benches are suited to crops, and much of the acreage is suited to pasture. Forest consisting mainly of oak and hickory covers most of the wooded areas.

8. Allegheny-Monongahela-Weikert association: Well drained and moderately well drained, deep silty soils on terraces and well drained, shallow to moderately deep soils on steep uplands

This soil association, which lies in the southern part of the county, is characterized by broad, gently sloping to sloping benches and the steep hills that rise behind them (fig. 6). Escarpments separate the association from the adjacent terraces and stream bottoms.

Dominant in the association are the well drained Allegheny soils and the moderately well drained Monongahela soils. Both kinds of soils formed in old silty alluvial material on benches; they account for about 70 percent of the total acreage. The shallow Weikert and moderately deep Muskingum soils also occupy large parts of the association. They occur on steep slopes and ridges rising above the benches and, along with minor soils, make up about 30 percent of the total area.

Allegheny and Monongahela soils on benches are used for general farming. These soils produce well if they are carefully managed. Gently sloping and sloping Weikert and Muskingum soils are suitable for farming but tend to be droughty. Steeper areas of these soils are well suited to permanent hay and pasture. Much of the very steep acreage is idle and brushy, and it should be reforested. Some areas of the association in the southeastern part of the county are used for urban developments.

9. Guernsey-Weikert-Muskingum association: Moderately well drained, deep soils underlain by limy materials, and shallow and moderately deep soils underlain by shale and sandstone

This soil association occurs in the southwestern part of the county, where it forms part of the drainage basin along the West Fork of Little Beaver Creek. The upper slopes and divides are underlain chiefly by siltstone and sandstone, whereas the lower slopes are underlain by bedrock that contains some limestone. In places limestone crops out. The hills are lower and the slopes are not so steep in this association as they are in other areas in the southern part of the county.

The moderately well drained Guernsey soils are the major soils in this association and account for about 70 percent of the total area. These soils have been influenced by limestone and are higher in natural fertility than most other soils in the county. They have a finer textured subsoil, however, and are more difficult to manage than other moderately well drained soils.

Weikert and Muskingum soils are on the hilltops and upper slopes; they are shallow or moderately deep and are somewhat droughty. Together with minor soils, they make up about 30 percent of the association.

Most of this association is used for general farming, but there are some areas of spoil from strip mining. Coal crops out on the side slopes in places slightly above the limestone. Potentially, the association is a good area for growing trees and producing wildlife. Most kinds of trees are suited to the major soils.

10. Dekalb-Weikert-Allegheny association: Shallow soils on steep valley walls, and deep silty soils on remnants of terraces

This soil association generally is steep and rough. In most places it consists of rock escarpments and cliffs and the steep walls of valleys and gorges, but there also are high, narrow remnants of terraces and small but extensive flood plains. The association is mainly in the southern part of the county along the Ohio River, Little Beaver Creek, Little Yellow Creek, and the North Fork of Yellow Creek.

Figure 5.—In the foreground is a farm on Parke and Rainsboro soils, Allegheny-Monongahela-Parke soil association.

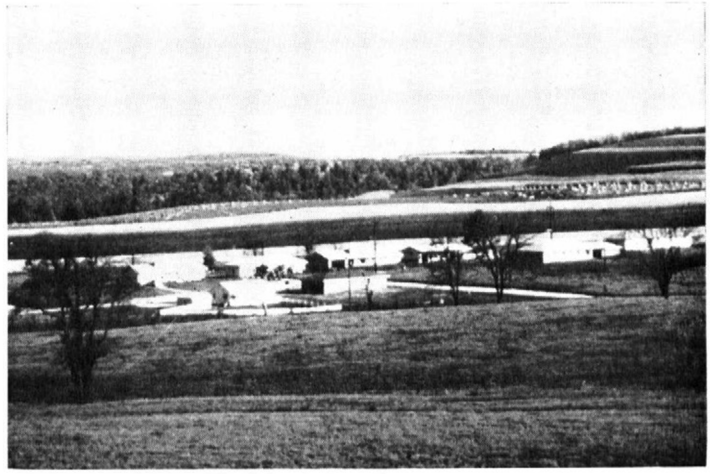

Figure 6.—Landscape in the Allegheny-Monongahela-Weikert soil association.

Dekalb and Weikert soils are dominant on the steep valley walls and make up about 50 percent of the association. On the high terraces are the deep Allegheny soils. Allegheny soils, along with Parke and other minor soils, account for about 50 percent of the total acreage.

The soils on terraces and bottom lands are well suited to crops, but most areas remain forested because the surrounding slopes are steep. In the valley of the Ohio River, part of the association is used as industrial or urban areas. In forested areas there are many kinds of trees. Oaks are dominant on steep and droughty slopes; maple, beech, tulip-poplar, hemlock, and other trees grow well in the gorges; and sycamore and elm are dominant on bottom land. The undeveloped parts of the association are inhabited by many kinds of wildlife and are excellent areas for recreation.

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 Columbiana County. In the second part, estimated acre yields are given for the principal crops under two levels of management. Next are discussions on the use of soils as woodland, for wildlife, and in engineering. Finally, there is a part that gives information about the use of soils in land use planning.

Except for dark-colored soils that are very poorly drained, all the soils on uplands of the county are naturally acid and must have regular additions of lime if they are to produce satisfactorily. It is recommended that farmers rely on the Ohio Agricultural Extension Service for soil testing and for a recommended program of fertilization based on results of the soil tests.

Many soils in the county are moderately well drained to very poorly drained, and they may not be aerated well enough for the best growth of plants. Information related to the drainage of these soils is given in the subsection "Use of Soils in Engineering" (see table 5).

Many soils of the county have a surface layer that is subject to puddling and crusting, which result in increased runoff. Crusting and sealing of the surface can be kept to a minimum by avoiding excessive tillage and by supplying adequate amounts of organic matter.

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 major 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. The numerals indicate progressively greater limitations and narrower choices for practical use, defined as follows:

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

Class II. Soils have 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 Columbiana 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.

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 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 Columbiana 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 report.

CAPABILITY UNIT I-1

This unit consists of nearly level, deep, moderately well drained and well drained soils of the Chagrin and Lobdell series. These soils are on the bottom land along streams, but flooding generally is infrequent and does not appreciably damage crops.

The soils in this unit have a friable loam or silt loam surface layer that is underlain by friable, loamy soil material. They are moderately permeable, have a thick root zone, and are easily managed. They are well suited to truck crops and to field crops, but floods late in spring may damage meadows. The soils can be row cropped continuously if crop residues are returned. Fertilizer is needed for optimum yields.

These soils are well suited to pasture, particularly in dry periods.

CAPABILITY UNIT I-2

In this unit are nearly level, friable, moderately well drained soils of the Bogart series. These soils lie on terraces and are underlain by gravel. The available moisture capacity is adequate, however, and crops are seldom damaged by drought. The soils are mottled with gray below a depth of 16 inches, but impeded drainage does not appreciably limit the growth of crops. Erosion is not a major hazard.

The soils in this unit are easily worked and are suited to a wide variety of crops. They can be row cropped continuously if crop residues are returned and if sufficient fertilizer is applied to meet the needs of the crop.

CAPABILITY UNIT IIe-1

This unit consists of gently sloping, well drained and moderately well drained soils that have a medium-textured subsoil. All the soils have a moderately thick or thick root zone and adequate available moisture capacity. Some are moderately eroded. The soils are of the Allegheny, Bogart, Canfield, Glenford, Hanover, Loudonville, Monongahela, Parke, Rainsboro, Titusville, Wellston, and Wooster series.

The surface layer of these soils is silt loam or loam, and the subsoil is loam, silt loam, or silty clay loam. Some of the soils have a weak to moderate fragipan that retards the percolation of water and the growth of roots.

Erosion can be controlled by cultivating on the contour and by keeping the soils in hay half the time. If fertilization is heavy and crop residues are returned, along with contour cultivation, a 3-year rotation consisting of 1 year of a row crop, 1 year of a small grain, and 1 year of hay can be used. In cultivated areas where slopes are long, diversion ditches or terraces are needed to reduce runoff and control erosion.

These soils are suitable for pasture if they are planted to grasses and legumes and are limed and fertilized. Erosion is not a problem on well-managed pasture.

CAPABILITY UNIT IIe-2

In this unit are gently sloping, moderately well drained and well drained soils of the Guernsey, Rittman, Summitville, Upshur, Muskingum, and Wharton series. These soils have a medium-textured surface layer and a tight, clayey subsoil. A few are moderately eroded. The Rittman soils have a strong fragipan in the lower subsoil that retards the movement of water and the growth of roots. All the soils have adequate available moisture capacity and moderately slow or slow permeability. The regular return of organic matter is essential, for structure in the surface layer tends to break down readily.

Because these soils have a slowly permeable subsoil, they do not absorb all the water that falls during periods of heavy rain. Consequently, water lost as runoff increases the erosion hazard.

If the soils in this unit are properly limed and fertilized, they are suited to all the common crops. In spring, however, they stay wet longer and cannot be worked so early as coarser textured, more friable soils. Hence, they tend to produce better yields in dry years than in wet ones.

A rotation consisting of 1 year of a row crop, 1 year of a small grain, and 2 years of hay will control erosion if it is used with contour cultivation. Diversion terraces are needed in areas where runoff from higher slopes is a hazard.

These soils produce good pasture under proper management, but they are easily compacted if pasture is grazed when wet.

CAPABILITY UNIT IIe-3

This unit consists of gently sloping, well-drained, generally shallow soils in the Dekalb, Loudonville, and Muskingum series. These soils have a loam or silt loam surface layer that contains rock fragments. The subsoil is channery silt loam or channery loam in which there are coarse fragments of siltstone and sandstone. The soils are permeable and droughty and have a moderately thick root zone.

General farm crops are commonly grown on the soils of this unit, but yields of most crops may be low in dry years. Yields of deep-rooted legumes used for hay generally are favorable. Crop residues should be returned regularly in large amounts, and generous applications of manure and adequate lime and fertilizer are needed. A suitable rotation is (1) 1 year of corn, 1 year of a small grain, and 2 years of hay; or (2) 1 year of corn, 1 year of oats, 1 year of wheat, and 3 years of hay. Contour stripcropping helps to control erosion on long slopes.

In summer, higher yields can be obtained from pasture if the mixture includes legumes. In dry periods, however, pasture plants grow slowly on these soils.

CAPABILITY UNIT IIe-4

This unit consists of gently sloping, well-drained soils that are underlain by gravel. The surface layer of these soils is loam, gravelly loam, or silt loam. The subsoil is medium textured or moderately coarse textured and friable. In addition to having slopes that are erodible, these soils have low to moderate available moisture capacity that may result in damage to crops in dry periods. Because internal drainage is good, the soils can be cultivated relatively early in spring. The soils are of the Chili and Negley series.

These soils are excellent for truck crops and are well suited to crops that mature before the dry period late in summer. Alfalfa and other field crops yield well.

Because erosion is a slight hazard on these soils, crops should be grown on the contour and in a rotation that includes 1 year of meadow in 3 years. Adequate lime and fertilizer are needed for optimum yields.

Excellent stands of early pasture can be produced, but growth may be a little slow in the drier part of the year.

CAPABILITY UNIT IIw-1

In this unit are dark, nearly level, very poorly drained soils of the Olmsted series. These soils have a silt loam or silty clay loam surface layer and a loam or gravelly loam subsoil that is moderately permeable. The water table is seasonally high. Gravel and sand underlie the subsoil.

These soils can be drained by use of tile. After they are drained, they are suitable for continuous row cropping if fertilization is heavy and if large amounts of residues are returned. In some places a diversion ditch is needed to intercept runoff from adjacent slopes.

The soils in this unit produce good pasture. A few surface ditches can be used to keep excess water from ponding. To prevent compaction and sealing, pasture should not be grazed when the soils are wet.

CAPABILITY UNIT IIw-2

This unit consists of nearly level and gently sloping, somewhat poorly drained soils in the Fitchville, Jimtown, and Ravenna series. The Fitchville and Jimtown soils have a friable loam or silt loam surface layer and a friable silt loam, gravelly loam, or silty clay loam subsoil. The Ravenna soils have a fragipan that retards the movement of water and the growth of roots. All the soils are moderately to slowly permeable and have high available moisture capacity. Depth of rooting is limited by the fragipan and by a high water table.

These soils are suited to general farm crops if tile drains are used to remove excess water. The Fitchville and Jimtown soils are easily drained by tile because their subsoil is permeable. Crops respond well to added lime and fertilizer.

The soils of this unit occupy low areas that are next to moderately well drained soils and generally are managed along with them. In areas that receive runoff from higher slopes, excess water should be removed in diversion terraces and grassed waterways. Also, by adding organic matter and by using winter cover crops, tilth and drainage can be improved, particularly early in spring.

These soils are suitable for rotations consisting of corn, small grain, and hay. They also are suitable for pasture and produce good forage, especially during dry periods. The grazing of pasture when the soils are wet causes compaction and sealing.

CAPABILITY UNIT IIw-3

In this unit are nearly level, somewhat poorly drained soils of the Orrville series. These soils, which occupy bottom land, have a friable loam or silt loam surface layer that is underlain by silt loam and loam. Permeability is moderately slow, and the available moisture capacity is high. The thickness of the root zone is limited by a high water table.

Occasional flooding generally causes little damage to crops but sometimes lays down a layer of silt on grass and hay crops. If the soils are drained, they are suited to general farm crops that are grown in rotations. The soils can be drained by tilting or ditching. An example of a suitable rotation is 1 year of corn, 1 year of a small grain, and 1 year of hay. Corn can be grown continuously if rye is used as a cover crop and if lime and fertilizer are applied in adequate amounts.

These soils are well suited to plants used for pasture, particularly in dry periods. Legumes suitable for pasture are birdsfoot trefoil and Ladino clover.

CAPABILITY UNIT IIs-1

The only soil in this unit is Chili loam, 0 to 2 percent slopes. This well-drained soil has a friable loam or gravelly loam subsoil that is moderately rapid in permeability and transmits water readily.

Although this soil has low available moisture capacity, it is suited to row crops and truck crops. These can be grown continuously if organic matter is returned regularly. Owing to a gravelly, permeable substratum, excess water is readily removed from the surface layer and subsoil. For this reason, the soil is excellent for early truck crops. It is highly suitable for irrigation and is suitable for pasture.

CAPABILITY UNIT IIIe-1

This unit consists of well drained and moderately well drained soils that have a surface layer of silt loam or loam and a subsoil of loam, silt loam, or silty clay loam. Some of these soils are moderately eroded, and some have a weak to moderate fragipan. All have a moderately thick or thick root zone and adequate available moisture capacity. The soils are of the Allegheny, Bogart, Canfield, Ernest, Glenford, Hanover, Loudonville, Monongahela, Parke, Rainsboro, Titusville, Wellston, and Wooster series and have slopes of 5 to 15 percent.

The soils in this unit are easily managed but are moderately susceptible to erosion. They are suited to corn, oats, wheat, and hay if adequate amounts of lime and fertilizer are applied. A good seedbed is more difficult to prepare on the moderately eroded soils than on the other soils of the unit. In addition, the moderately eroded soils have a lower content of organic matter and are slightly lower in productivity.

Well suited in fields used for general crops are contour stripcropping (fig. 7) and rotations in which grain crops and hay are grown for an equal number of years. A suitable rotation is (1) 1 year of corn, 1 year of a small grain, and 2 years of hay; (2) 1 year of corn, 1 year of oats, 1 year of wheat, and 3 years of hay; or (3) 1 year of corn with a cover crop of ryegrass, 1 year of oats, 1 year of wheat, and 2 years of hay. Barley can be substituted for wheat in the rotation. Diversion terraces are needed on long slopes.

These soils are suitable for pasture if they are limed and fertilized. Alfalfa and other legumes grow well. Well-managed pasture does not need practices for controlling erosion.

CAPABILITY UNIT IIIe-2

In this unit are sloping, slightly or moderately eroded soils of the Cavode, Gresham, Guernsey, Rittman, Summitville, Upshur, Muskingum, and Wharton series. These soils generally are moderately well drained and well drained, but the Cavode and Gresham soils are somewhat poorly drained. Most of the soils have a tight or clayey subsoil. Permeability is slow to moderately rapid, the available moisture capacity ranges from low to high, and productivity is low to moderately high.

The soils in this unit have a friable silt loam surface layer and a silty clay loam to silty clay subsoil. Some have a lower subsoil that is plastic when wet. Underlying the soils is black shale, red clay shale, limestone, or clay loam glacial till. The Rittman soil has a strong fragipan in the lower subsoil that restricts the penetration of roots and moisture.

Unless organic matter is returned regularly to these soils, structure tends to break down in the surface layer. During periods of heavy rainfall, the subsoil retards the intake of water and thereby causes additional runoff that increases the erosion hazard.

These soils are suited to general farm crops if they are adequately limed and fertilized. In dry years, they produce relatively higher yields than most other soils because their subsoil retains moisture longer. Erosion can be controlled by use of contour stripcropping, diversion terraces, and rotations that include hay.

The soils in this unit are well suited to pasture. If the plants are carefully grazed, there is little or no erosion hazard.

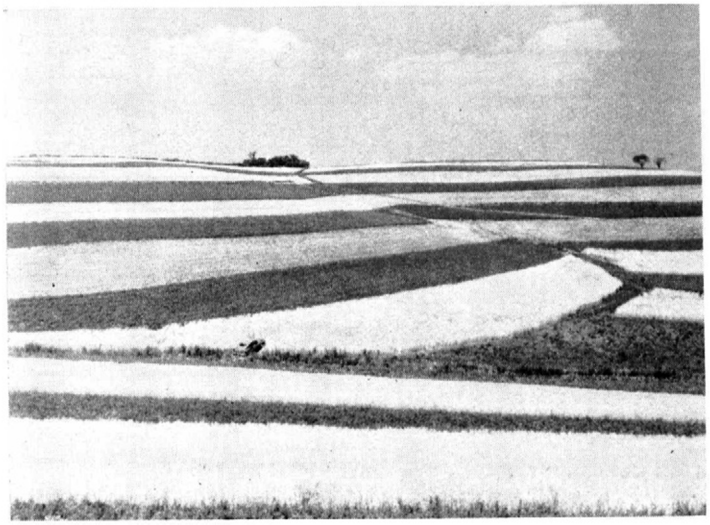

Figure 7.—**Contour stripcropping on a Wooster silt loam, capability unit IIIe-1.**

CAPABILITY UNIT IIIe-3

This unit consists of gently sloping to strongly sloping, medium-textured, well-drained soils that are shallow or moderately deep over sandstone and siltstone. These soils are of the Dekalb, Loudonville, Muskingum, and Weikert series, and some are moderately eroded. In uneroded areas they have a surface layer of loam or silt loam. The subsoil in most of the soils is 15 to 90 percent channery fragments of sandstone or siltstone, a percentage that characteristically increases with depth. Although the surface layer and subsoil are freely permeable, they have limited available moisture capacity. Water enters the surface layer readily, but crops are often damaged by drought, mainly because the root zone is relatively thin.

General farm crops are grown in most areas of these soils, though yields are limited by too little moisture, particularly in dry years. Deep-rooted legumes do better than shallower rooted crops. Erosion generally can be controlled by stripcropping and a rotation consisting of 1 year of corn, 1 year of a small grain, and 2 years of hay. Adequate lime and fertilizer should be applied. Topdressing meadows with fertilizer after the second year will lengthen the productive life of the stand. In addition, lime is needed to maintain a good stand, for the soils are naturally acid. Meadows may be used either for hay or for rotation pasture.

Unless pasture is improved by liming, fertilizing, and the use of legumes, yields ordinarily are low, especially in summer. Improved pasture yields fairly well. Care must be taken to avoid overgrazing.

CAPABILITY UNIT IIIe-4

In this unit are sloping, well-drained soils of the Chili and Negley series. These soils have a friable loam, gravelly loam, or silt loam surface layer and a silt loam to gravelly sandy loam subsoil. Underlying the subsoil is gravelly material. Some of the soils are moderately eroded. The Negley soils have a thicker, more clayey subsoil than the Chili soils. All the soils have moderately rapid permeability and limited available moisture capacity.

The soils in this unit are suitable for crops, long-term meadow, and pasture. Yields are low in dry years. Most areas have short, irregular slopes that are difficult to stripcrop, but erosion in these areas can be kept to the minimum by omitting row crops from the rotation. On longer slopes that can be stripcropped, a suitable rotation is 1 year of a row crop, 1 year of a small grain, and 2 years of hay. Large amounts of crop residues should be returned to these soils so that runoff is reduced and the intake of water is increased. The soils can be kept productive by good management and the use of adequate lime and fertilizer.

CAPABILITY UNIT IIIw-1

This unit consists of nearly level, dark, very poorly drained soils in the Chilo, Lorain, Luray, Marengo, and Papakating series. These soils have a surface layer of black or very dark gray silt loam, silty clay loam, or clay that is underlain by a subsoil mottled with gray. The soils are fairly difficult to drain but produce well if they are drained. Although the root zone is thin in undrained areas, it is thick after drainage is improved.

Undrained areas of these soils warm up more slowly than nearby areas of well-drained soils, but crops grow rapidly after excess water is removed. Drained areas are suited to general crops and can be row cropped continuously if they are well supplied with organic matter. Soil structure deteriorates unless organic matter is returned regularly. A rotation of row crops, small grain, and hay will help to maintain good structure. Fertilizer and lime should be applied in amounts indicated by soil tests. In some places a diversion ditch is needed to intercept runoff from adjacent higher land.

Most soils in this unit can be drained by tiling, but Papakating soils are on first bottoms where tiling may not be feasible, because a suitable outlet is lacking. Surface drainage improves yields but is not so effective as tile. Flooding sometimes damages crops on the Papakating soils.

The soils of this unit can produce good pasture in summer, though they may be too wet for grazing in spring. Shallow drains in pastures will lengthen the growing season.

CAPABILITY UNIT IIIw-2

This unit consists of level and gently sloping, poorly drained and somewhat poorly drained soils on terraces and uplands. These soils are in the Cavode, Damascus, Frenchtown, Gresham, Sebring, Tyler, and Wadsworth series. They have a thin or moderately thick root zone. The surface layer is friable silt loam or silty clay loam, the subsoil is silty clay loam to loam, and the underlying material ranges from gravelly sandy loam to clay loam till. The Frenchtown, Gresham, Tyler, and Wadsworth soils have a fragipan. All the soils in the unit are moderately to slowly permeable, and nearly all are difficult to drain. The Damascus soil is easily drained by tile.

The soils of this unit are suited to general crops if they are tile drained and are heavily limed and fertilized. Wetness can be reduced also by surface drainage. A suitable rotation is one that keeps the soils covered with hay 50 percent or more of the time. Row cropping too frequently causes soil structure to deteriorate rapidly.

Birdsfoot trefoil and Ladino or alsike clover are suitable plants to include in meadow seedings because they tolerate wetness.

Pasture on these soils can be greatly improved by improving surface drainage, using lime and fertilizer, and seeding birdsfoot trefoil with pasture grasses.

CAPABILITY UNIT IIIw-3

In this unit are nearly level, poorly drained soils of the Wayland series. These soils lie on first bottoms, where the water table is high most of the year and the root zone is thin. The surface layer generally is silt loam or silty clay loam, though it is loam or sandy loam in a few areas. The subsoil is much like the surface layer but contains less organic matter and, in some places, has layers of loam, clay, or sand.

In areas where flooding is only infrequent, these soils are suitable for cropping. Row crops can be grown most of the time, but cover crops and green-manure crops should be grown frequently to improve soil structure and to provide organic matter. Surface drainage is needed, and tile drainage is beneficial if a satisfactory outlet is available.

These soils produce good pasture, even in dry weather. To control weeds and to keep grasses from smothering legumes, pasture should be mowed frequently. Seeding mixtures should include at least one legume and one grass suitable for wet soil. Tile drainage may not be feasible in permanent pasture, but furrows or shallow ditches (fig. 8), or both, generally will remove enough water so that production is improved.

CAPABILITY UNIT IIIw-4

In this unit are mucks that have a black surface layer and consist mostly of decayed organic material. These soils are in the Carlisle, Kerston, and Willette series. They formed in swamps and occur in depressions on the till plain and on low, flat bottom land. The Carlisle soil is made up of organic material more than 42 inches thick; the Kerston soil also is thick but has many layers of mineral soil material in it; and the Willette soil consists of less than 42 inches of muck underlain by silty clay.

If drained, most areas of these soils are well suited to vegetable crops. Small included areas, however, are better suited to use for wildlife because they lack a suitable outlet or are subject to frequent flooding.

Owing to the oxidation of organic matter, drained areas of these soils will shrink or subside, especially during the first few years after drainage is improved. This shrinkage should be taken into account when planning the depth at which tile lines are laid. Because short tile may get out of line, tile in lengths of 2 feet is preferable in areas where the muck is deep. In areas that are to be farmed for the first time, ditching 1 year ahead of tiling is desirable.

Broad, flat areas of these soils are subject to wind erosion and, if intensively cultivated, should be protected by windbreaks. Shrubs make the best windbreaks; they should be planted in a series of rows at right angles to the prevailing wind. The distance between rows should be about 10 times the mature height of the shrubs.

***Figure 8.*—An open ditch draining an area of Wayland silt loam, capability unit IIIw-3.**

Row crops can be grown continuously on these soils. Cover cropping in winter will help reduce excess moisture in spring and thus permit working the soils earlier. The fertilizer used should be fairly high in content of potassium, for the soils are naturally low in this element. Control of the water table and supplemental irrigation are desirable for obtaining satisfactory yields.

The soils of this unit provide good pasture in summer if the sod is thick enough to support the animals. Bluegrass or reed canarygrass makes a good sod.

CAPABILITY UNIT IVe-1

In this unit are well-drained soils that have moderate or moderately rapid permeability in the subsoil. The surface layer of these soils is medium textured and is underlain by loam, silt loam, or silty clay loam. Erosion generally is moderate, but in a few small areas it is only slight. The soils are of the Hanover, Loudonville, Wellston, and Wooster series and have slopes of 15 to 20 percent.

Although these soils can be safely used for row crops occasionally, they need the protection of meadow most of the time. Stripcropping and a rotation made up of a row crop, a small grain, and 2 to 4 years of hay generally will control erosion. If a row crop is not needed, small grain and hay can be seeded in alternate strips, the grain strips seeded to hay following harvest, and the field then kept in hay for several years. If a row crop is not grown after the grain crop is harvested, the entire field can be seeded to hay by use of trash-mulch tillage. Lime and fertilizer should be applied in adequate amounts.

The soils in this unit are suitable for pasture, but growth is occasionally slow in dry periods. For this reason, deep-rooted legumes should be considered when pasture is reseeded. Lime is needed for establishing legumes.

CAPABILITY UNIT IVe-2

This unit consists of moderately well drained and well drained soils that generally are moderately eroded. These soils are of the Ernest, Guernsey, Rittman, Summitville.

Upshur, Muskingum, and Wharton series and have slopes of 10 to 20 percent. Their surface layer ranges from silt loam to silty clay loam or clay, and their subsoil ranges from silt loam to clay. The available moisture capacity is moderate except in the Muskingum soils, where it is low. The soils of this unit do not take in water so readily as those of unit IVe-1, and erosion consequently is a more serious problem.

These soils are well suited to plants used for pasture or long-term meadow. They also are suited to small grain that is grown before meadow is reseeded. If fields are farmed in contour strips and if adequate lime, fertilizer, and manure are applied, a suitable rotation is 1 year of corn, 1 year of a small grain, and 4 or more years of meadow.

Pasture on these soils should consist of grass and legumes in dense stands and should be carefully grazed.

CAPABILITY UNIT IVe-3

In this unit are permeable, well-drained soils of the Dekalb, Loudonville, Muskingum, Weikert, and Wooster series. These soils have slopes of 5 to 20 percent and are slightly to severely eroded. Their surface layer is loam or silt loam, and their subsoil is loam or silt loam. Except in the Wooster soil, the subsoil has a high content of channery fragments of sandstone or siltstone.

Although some of the soils in this unit are severely eroded, their present surface layer is friable. Hay and pasture are better suited than row crops, but a row crop is suited every 4 to 6 years if it is grown in a rotation and in contour strips. The available moisture capacity is limited in all the soils, and crops do not grow well in dry weather. Meadows should include deep-rooted legumes.

These soils are good for pasture in spring but are poor in dry periods.

CAPABILITY UNIT IVe-4

This unit consists of well-drained soils in the Chili and Negley series that are underlain by gravel. These soils have slopes of 5 to 20 percent and generally are moderately or severely eroded. Their surface layer is silt loam or gravelly loam, and their subsoil is thin gravelly loam. The available moisture capacity is low.

The soils in this unit are better suited to hay and pasture than to cultivated crops. To control erosion, grass should be a dominant crop in the rotation. Many of the slopes are too short and irregular for stripcropping and should be seeded by use of trash-mulch tillage. On the longer slopes, meadows can be seeded in small grain in contour strips. Adequate lime and fertilizer should be applied.

These soils produce satisfactory yields of pasture early in spring, particularly if they are fertilized with nitrogen. Growth of pasture plants is slow in dry weather. Deep-rooted legumes do better than grasses.

CAPABILITY UNIT IVw-1

Only Purdy silt loam is in this unit. This nearly level soil is poorly drained, is slowly permeable, and has a seasonally high water table. In the lower part of the silty clay loam subsoil is a fragipan that slows the movement of water. The root zone is thin.

Most of this soil is used for pasture or as woodland. Some areas that have been drained are occasionally used for crops. These areas generally are small. The soil is difficult to drain, but it will not produce satisfactory yields of crops unless it is drained, limed, and fertilized. Birdsfoot trefoil and Ladino clover are plants that tolerate some wetness, and either is suitable for reseeding to hay or pasture. Livestock should be kept off pasture at times when the soil is so wet that trampling injures the sod.

CAPABILITY UNIT VIe-1

This group consists of well drained and moderately well drained soils in the Dekalb, Ernest, Guernsey, Laidig, Muskingum, Upshur, Weikert, and Wooster series. These soils have slopes of 5 to 50 percent, and some of them are moderately eroded. The surface layer ranges from loam to silty clay and, in some of the soils, is stony. The subsoil is coarse textured to fine textured.

Erosion is a severe hazard if these soils are cultivated, and droughtiness also is a problem. The steepest slopes are too steep for the safe operation of farm machinery, but they can be used for naturally occurring pasture. On the milder slopes, good stands can be obtained by liming, fertilizing, and seeding birdsfoot trefoil or an alfalfa-grass mixture. Bluegrass is well suited to all the soils and grows naturally on the Guernsey and Upshur soils. Overgrazing should be avoided, particularly on the Muskingum, Upshur, and Weikert soils.

CAPABILITY UNIT VIe-2

In this unit are strongly sloping to steep, severely eroded soils of the Chili, Loudonville, Muskingum, Negley, Rittman, Weikert, and Wooster series. These soils are well drained and moderately well drained. The surface layer varies in texture because of differences in the amount of original surface soil removed, but for the most part it is medium textured. Gullies have formed, and some have cut to the underlying material.

Plants grown for pasture respond to lime and fertilizer. To maintain the stand, restrict grazing in dry periods.

CAPABILITY UNIT VIs-1

Spoil from strip mining and nontoxic rock and soil materials from other excavations make up this unit. This mixture of materials occurs in rolling areas where coal has been mined and where clay, sand, and gravel have been removed. The spoil has been smoothed to some extent.

Much of this land has been limed or fertilized, or both, and seeded to mixtures for meadow or pasture. The response of plants to fertilizer generally is good, but in places it is only fair, and seedings have failed in large areas. Legumes such as birdsfoot trefoil, alfalfa, and sweetclover tend to get started first, then grasses follow.

This land ordinarily is too rough for operating regular farm machinery. Nevertheless, an area can be improved by smoothing it and then removing the stones. In many places stones must be removed year after year. Yields of meadow and pasture are very low at first, but they increase after roots penetrate deeper into the spoil. Attempts to grow grain on this land generally have failed, though some orchards have been successful.

CAPABILITY UNIT VIIe-1

The soils in this unit are steep or very steep and are well drained or moderately well drained. Some of them are stony. The surface layer ranges from gravelly or stony loam to silty clay loam, and the subsoil ranges from gravelly sandy loam to clay loam. The soils are of the Chili, Conotton, Negley, Dekalb, Laidig, Weikert, Muskingum, and Wooster series and have slopes of 20 to 50 percent.

The soils in this unit are too steep for cultivated crops. They are suited to pasture if grazing is carefully managed and the plant cover is maintained.

These soils are well suited to trees. Oaks do well in forested areas, but ash, sugar maple, black cherry, cucumbertree, tulip-poplar, and black walnut should be favored if they are present in the stand. These favored species are more common on north- and northeast-facing slopes where they are somewhat protected from the sun and wind. They are suitable for planting only in protected areas, but white pine, pitch pine, and chestnut oak can be planted on exposed slopes.

The soils are suitable for use as wildlife habitat.

CAPABILITY UNIT VIIe-2

The soils in this unit are strongly sloping to very steep and are severely eroded. They are of the Chili, Conotton, Dekalb, Muskingum, Negley, Upshur, Weikert, and Wooster series. Some areas are gullied, and in some areas the subsoil is exposed. The present surface layer is variable but generally is medium textured except in the Upshur soil, which has a clay surface layer. In most places the subsoil is medium textured.

These severely eroded soils should be planted to trees and kept wooded. They are better suited to plantations of pine than to most other uses, though they also are suited to vegetation planted for wildlife. Trees suitable for planting are white pine and pitch pine. Hardwoods do poorly.

CAPABILITY UNIT VIIe-3

Only Strip mine spoil, steep, is in this unit. It consists of the residue from strip mining and from other kinds of excavations. This material is in piles that are so rocky or so steep that they can be vegetated only by planting trees. If erosion is not controlled, silty material is washed from the piles and is deposited on lower lying farmland and along streams.

Planting black locust is the best and quickest way to get a vegetative cover on this land, though most of the trees are severely damaged by the locust borer before they are of fence post size. Other species that are suitable for planting and may survive are green ash, hybrid poplar, sycamore, Osage-orange, silver maple, aspen, white pine, and pitch pine. After the material has weathered and a normal succession of plants has occurred, the natural plant cover is forest.

This land will support wildlife in areas that have water and are planted to vegetation that provides food and cover.

CAPABILITY UNIT VIIIs-1

In this unit is a single miscellaneous land type—Strip mine spoil, very acid—that is not suitable for producing vegetation. It consists mainly of toxic or very acid rock materials that liberate acids on exposure to the air. Wash from these areas can be a source of stream pollution. Because the spoil contains pyritic minerals that expand when exposed, it is of little use as fill material. If possible, the spoil should be buried under nontoxic soil material.

Estimated Yields

Table 1 shows, for most soils in the county, estimates of 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. Yields for the following soils and miscellaneous land types are not shown in the table, because cultivated crops and hay are generally not suited to them:

- Chili, Conotton, and Negley soils, 20 to 50 percent slopes.
- Chili, Conotton, and Negley soils, 20 to 50 percent slopes, severely eroded.
- Dekalb loam, 20 to 35 percent slopes.
- Dekalb loam, 20 to 35 percent slopes, moderately eroded.
- Dekalb soils, 20 to 35 percent slopes, severely eroded.
- Gravel pit.
- Made land.
- Strip mine spoil, steep.
- Strip mine spoil, very acid.
- Upshur-Muskingum complex, 20 to 35 percent slopes, severely eroded.
- Upshur-Muskingum complex, 20 to 50 percent slopes, moderately eroded.
- Weikert and Muskingum soils, 20 to 35 percent slopes, severely eroded.
- Weikert and Muskingum soils, 35 to 50 percent slopes, severely eroded.
- Wooster soils, 20 to 35 percent slopes, severely eroded.
- Wooster soils, 35 to 50 percent slopes, moderately eroded.

Except for Gravel pit, Made land, Strip mine spoil, steep, and Strip mine spoil, very acid, the foregoing soils and land types produce 30 to 80 cow-acre-days of pasture in cleared areas.

The yields listed in columns A are those that can be expected over a period of years under an average level of management. An average level of management consists of practices that generally were followed by the majority of farmers in the county at the time of the survey. Some of the yields shown, however, are considerably lower than those obtained by many farmers. Average management may include some practices that are used under improved management, but they are not always adequate. For example, fertilizer is applied but possibly in too small amounts, or weeds and harmful insects may be inadequately controlled.

Yields listed in columns B are yields that can be expected under improved management. This level of management is made up of practices that have been successfully and consistently used. On cropland, it consists of using high-yielding varieties of seed; cultivating on the contour; using terraces, diversion ditches, or stripcropping; constructing grassed waterways; establishing surface or subsurface drainage, where needed; growing cover crops; controlling insect pests, diseases, and weeds; maintaining good tilth, and applying fertilizer and lime at recommended rates. The estimates in columns B also are affected by the timeliness of tillage and other farming operations.

It should be understood that these yield figures may 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. In addition, yields may vary from one area to another because of differences in past management or in numbers and kinds of diseases and insects. For soils on bottom land, the estimates are based on the assumption that crops are not damaged by flooding.

The estimates in table 1 are based on information obtained from farmers, the county agricultural extension agent, workers with the Consumer and Marketing Service, the Soil Conservation Service, and other agricultural leaders. These yields show the relative productivity of the soils and their response to management. Although the general level of crop yields and of yield estimates tends to rise over a period of years, the relationship of the soils to each other normally remains the same.

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

[Yields in columns A are those obtained under the management commonly practiced; those in columns B are yields to be expected under improved management. Dashed lines indicate crop is not commonly grown. In columns B, corn yields of less than 50 bushels per acre are not shown]

Soil	Corn		Wheat		Oats		Hay		Bluegrass pasture	
	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Allegheny silt loam, 5 to 10 percent slopes	59	94	22	38	35	52	2.6	3.7	120	185
Allegheny silt loam, 5 to 10 percent slopes, moderately eroded	53	88	20	35	31	46	2.3	3.4	105	165
Allegheny silt loam, 10 to 15 percent slopes	49	76	19	33	27	41	2.2	3.3	95	160
Allegheny silt loam, 10 to 15 percent slopes, moderately eroded	47	68	19	32	25	38	2.1	3.2	95	155
Allegheny silt loam, sandstone substratum, 5 to 10 percent slopes	58	93	22	39	38	66	2.8	3.8	130	190
Allegheny and Monongahela silt loams, 2 to 5 percent slopes [2]	64	98	24	40	42	68	2.8	3.9	130	195
Allegheny and Monongahela silt loams, 2 to 5 percent slopes, moderately eroded [2]	58	94	21	38	38	65	2.5	3.9	115	195
Bogart loam, 0 to 2 percent slopes	70	108	28	44	47	72	3.2	4.3	155	215
Bogart loam, 2 to 5 percent slopes	69	107	27	42	45	70	3.0	4.1	145	205
Bogart silt loam, 0 to 2 percent slopes	70	107	27	42	46	71	3.0	4.1	145	205
Bogart silt loam, 2 to 5 percent slopes	68	105	26	41	44	69	2.9	4.0	135	200
Bogart soils, 5 to 10 percent slopes	63	101	24	39	41	66	2.7	3.3	125	190
Bogart soils, 5 to 10 percent slopes, moderately eroded	57	95	21	36	36	61	2.6	3.5	120	170
Canfield silt loam, 2 to 5 percent slopes	67	105	23	40	39	68	2.5	4.0	115	200
Canfield silt loam, 2 to 5 percent slopes, moderately eroded	61	101	20	38	35	65	2.2	4.0	95	200
Canfield silt loam, 5 to 10 percent slopes	62	101	21	38	36	65	2.3	3.8	115	190
Canfield silt loam, 5 to 10 percent slopes, moderately eroded	56	95	18	35	31	60	2.0	3.5	85	170
Carlisle muck	80	120	32	40	55	80	3.7	4.7	185	240
Cavode silt loam, 2 to 5 percent slopes	39	67	15	27	27	47	2.1	2.6	95	120
Cavode silt loam, 5 to 10 percent slopes	35	63	14	25	24	44	1.9	2.4	80	110
Cavode silt loam, 5 to 10 percent slopes, moderately eroded	28	56	10	21	18	38	1.5	2.0	60	85
Chagrin loam	70	103	28	43	46	71	3.4	4.3	165	215
Chagrin silt loam	70	103	28	43	46	71	3.4	4.3	165	215
Chili gravelly loam, 2 to 5 percent slopes	52	90	22	35	43	68	2.0	3.3	85	160
Chili gravelly loam, 5 to 10 percent slopes, moderately eroded	44	78	18	33	25	41	1.5	2.8	60	130
Chili gravelly loam, 10 to 15 percent slopes, moderately eroded	38	58	17	30	17	30	1.3	2.6	55	120
Chili loam, 0 to 2 percent slopes	64	101	24	41	49	74	2.5	3.8	115	190
Chili loam, 2 to 5 percent slopes	58	95	21	38	45	70	2.3	3.6	100	175
Chili loam, 2 to 5 percent slopes, moderately eroded	52	90	19	36	38	60	2.1	3.4	95	165
Chili loam, 5 to 10 percent slopes	51	89	18	36	37	58	2.0	3.3	85	160
Chili loam, 5 to 10 percent slopes, moderately eroded	45	84	16	34	29	48	1.8	3.1	75	150
Chili loam, 10 to 15 percent slopes	46	76	15	32	17	35	1.7	3.0	70	145
Chili loam, 10 to 15 percent slopes, moderately eroded	38	71	16	31	16	31	1.6	2.9	65	135
Chili loam, 15 to 20 percent slopes, moderately eroded	30	53	12	24	12	24	1.4	2.4	55	110
Chili soils, 5 to 10 percent slopes, severely eroded	34	64	12	25	13	27	1.1	2.0	40	85
Chili soils, 10 to 15 percent slopes, severely eroded	25	------	13	19	15	19	1.0	1.8	40	75
Chili soils, 15 to 20 percent slopes, severely eroded	21	------	13	20	14	18	.8	1.5	--------	60
Chilo silty clay loam	65	105	21	30	45	51	3.1	4.0	145	200
Damascus silt loam	44	81	16	33	28	54	1.7	2.9	70	135
Dekalb loam, 2 to 5 percent slopes	53	96	22	39	38	66	2.6	3.4	120	165
Dekalb loam, 5 to 10 percent slopes	46	91	21	37	34	63	2.4	3.2	110	155
Dekalb loam, 5 to 10 percent slopes, moderately eroded	40	85	20	34	29	54	2.1	2.9	95	135
Dekalb loam, 10 to 15 percent slopes, moderately eroded	34	56	19	32	19	34	1.9	2.7	80	125
Dekalb loam, 15 to 20 percent slopes, moderately eroded	28	------	14	26	15	28	1.7	2.2	70	95
Dekalb stony loam, 5 to 20 percent slopes	------	------	------	------	------	------	------	------	70	--------

See footnotes at end of table.

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

Soil	Corn		Wheat		Oats		Hay		Bluegrass pasture	
	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Dekalb stony loam, 20 to 50 percent slopes	------	------	------	------	------	------	------	------	70	90
Ernest silt loam, 5 to 10 percent slopes	45	75	18	32	31	55	2.3	3.0	105	143
Ernest silt loam, 10 to 15 percent slopes, moderately eroded	33	------	15	26	17	28	1.8	2.5	75	115
Ernest silt loam, 15 to 20 percent slopes, moderately eroded	25	------	13	20	13	20	1.6	2.0	65	85
Ernest silt loam, 20 to 35 percent slopes, moderately eroded	15	------	10	15	10	15	1.2	1.6	50	65
Fitchville silt loam, 0 to 2 percent slopes	49	83	18	32	31	55	2.1	3.0	95	145
Fitchville silt loam, 2 to 5 percent slopes	49	83	18	32	31	55	2.1	3.0	95	145
Frenchtown silt loam	38	75	14	29	24	49	1.5	2.5	60	115
Glenford silt loam, 2 to 5 percent slopes	65	103	21	38	35	65	2.5	3.8	115	190
Glenford silt loam, 5 to 10 percent slopes	60	99	19	36	32	62	2.3	3.6	105	175
Glenford silt loam, 5 to 10 percent slopes, moderately eroded	54	93	16	33	27	57	2.0	3.3	85	160
Gresham silt loam, 2 to 5 percent slopes	42	70	18	29	30	50	2.3	2.7	105	125
Gresham silt loam, 5 to 10 percent slopes	38	67	16	27	24	41	2.1	2.5	95	115
Guernsey silt loam, 2 to 5 percent slopes	68	107	23	40	39	68	2.7	4.3	125	215
Guernsey silt loam, 5 to 10 percent slopes	63	103	22	38	36	65	2.5	4.1	115	205
Guernsey silt loam, 5 to 10 percent slopes, moderately eroded	56	96	21	35	31	55	2.2	3.8	95	190
Guernsey silt loam, 10 to 15 percent slopes, moderately eroded	50	76	20	32	27	45	2.0	3.6	85	175
Guernsey silty clay loam, thin solum variant, 10 to 15 percent slopes, moderately eroded	40	87	20	40	24	45	3.5	4.0	170	200
Guernsey silty clay loam, thin solum variant, 15 to 20 percent slopes, moderately eroded	36	68	18	34	20	40	3.3	3.8	160	190
Hanover silt loam, 2 to 5 percent slopes	63	96	24	40	42	68	2.8	3.8	130	190
Hanover silt loam, 2 to 5 percent slopes, moderately eroded	57	92	21	38	38	65	2.5	3.8	115	190
Hanover silt loam, 5 to 10 percent slopes	58	92	22	38	39	65	2.6	3.6	120	177
Hanover silt loam, 5 to 10 percent slopes, moderately eroded	52	86	19	35	31	46	2.3	3.3	105	215
Hanover silt loam, 10 to 15 percent slopes, moderately eroded	46	75	17	32	20	34	1.8	3.1	75	150
Hanover silt loam, 15 to 20 percent slopes, moderately eroded	39	------	15	26	15	26	1.5	2.6	60	120
Jimtown loam, 0 to 2 percent slopes	58	92	25	40	43	68	2.8	3.9	130	195
Jimtown loam, 2 to 5 percent slopes	57	91	24	39	42	67	2.7	3.8	125	190
Jimtown silt loam, 0 to 2 percent slopes	56	90	24	39	41	66	2.6	3.7	150	185
Jimtown silt loam, 2 to 5 percent slopes	55	89	25	38	40	65	2.5	3.6	115	175
Kerston muck	80	120	32	40	55	80	3.7	4.7	185	240
Laidig stony loam, 5 to 10 percent slopes	------	------	------	------	------	------	------	------	70	114
Laidig stony loam, 10 to 15 percent slopes	------	------	------	------	------	------	------	------	70	114
Laidig stony loam, 15 to 20 percent slopes	------	------	------	------	------	------	------	------	70	108
Laidig stony loam, 20 to 35 percent slopes	------	------	------	------	------	------	------	------	65	108
Lobdell loam	72	105	29	44	47	73	3.5	4.5	170	230
Lobdell silt loam	70	103	28	43	46	71	3.4	4.3	165	215
Lorain clay	72	105	28	30	48	51	3.5	4.5	170	230
Loudonville silt loam, 2 to 5 percent slopes	58	90	24	40	41	68	3.0	3.5	143	170
Loudonville silt loam, 2 to 5 percent slopes, moderately eroded	51	86	20	37	37	60	2.7	3.5	125	170
Loudonville silt loam, 5 to 10 percent slopes	52	85	22	38	38	55	2.8	3.3	130	160
Loudonville silt loam, 5 to 10 percent slopes, moderately eroded	46	79	19	32	36	40	2.3	3.0	105	145
Loudonville silt loam, 10 to 15 percent slopes, moderately eroded	40	59	17	33	19	36	1.8	2.8	75	130
Loudonville silt loam, 15 to 20 percent slopes, moderately eroded	32	------	14	27	14	27	1.6	2.2	65	95
Loudonville and Muskingum soils, 2 to 5 percent slopes.[3]										
Loudonville and Muskingum soils, 2 to 5 percent slopes, moderately eroded.[3]										
Loudonville and Muskingum soils, 5 to 10 percent slopes, moderately eroded.[3]										
Loudonville and Muskingum soils, 5 to 15 percent slopes, severely eroded [4]	28	50	13	25	13	24	1.5	2.0	60	85
Loudonville and Muskingum soils, 10 to 15 percent slopes, moderately eroded.[3]										
Loudonville and Muskingum soils, 15 to 20 percent slopes.[3]										
Loudonville and Muskingum soils, 15 to 20 percent slopes, severely eroded [4]	18	------	12	18	12	18	1.1	1.5	50	60
Luray and Marengo silty clay loams	73	110	21	38	36	65	3.5	4.0	170	200
Luray and Marengo silt loams	73	106	29	31	49	52	3.5	4.6	170	235

See footnotes at end of table.

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

Soil	Corn		Wheat		Oats		Hay		Bluegrass pasture	
	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Monongahela silt loam, 2 to 5 percent slopes	65	102	24	40	42	68	2.7	3.8	125	190
Monongahela silt loam, 5 to 10 percent slopes	60	98	23	38	39	65	2.5	3.6	115	175
Monongahela silt loam, 5 to 10 percent slopes, moderately eroded	54	92	20	35	34	60	2.2	3.3	95	160
Monongahela silt loam, 10 to 15 percent slopes	50	88	18	33	22	45	2.1	3.2	95	155
Monongahela silt loam, 10 to 15 percent slopes, moderately eroded	48	86	17	32	30	40	2.0	3.1	85	149
Negley gravelly loam, 2 to 5 percent slopes	54	92	19	36	43	68	2.2	3.4	95	165
Negley gravelly loam, 5 to 10 percent slopes, moderately eroded	41	81	15	30	35	60	1.8	2.8	75	130
Negley gravelly loam, 10 to 15 percent slopes, moderately eroded	33	60	17	30	19	31	1.5	2.6	60	120
Negley loam, 2 to 5 percent slopes	62	98	23	38	45	70	2.3	3.6	105	175
Negley loam, 5 to 10 percent slopes	53	91	20	35	40	65	2.0	3.3	85	160
Negley loam, 5 to 10 percent slopes, moderately eroded	50	88	18	34	38	63	1.8	3.1	75	150
Negley loam, 10 to 15 percent slopes, moderately eroded	43	65	16	31	18	33	1.7	2.8	70	130
Negley silt loam, 2 to 5 percent slopes	65	100	25	40	45	70	2.8	4.0	130	200
Negley silt loam, 5 to 10 percent slopes, moderately eroded	53	90	20	36	28	55	2.3	3.5	105	170
Negley silt loam, 10 to 15 percent slopes, moderately eroded	47	70	18	33	22	35	1.8	3.3	75	160
Negley soils, 15 to 20 percent slopes, moderately eroded	18	------	13	18	15	20	.7	1.3	40	50
Negley soils, 10 to 20 percent slopes, severely eroded	27	------	13	19	15	19	.8	1.6	40	65
Olmsted silt loam	75	115	30	40	48	67	3.5	4.5	170	230
Olmsted silty clay loam	70	110	25	35	47	68	3.3	4.3	170	230
Orrville loam	59	93	26	42	44	69	3.2	4.1	155	205
Orrville silt loam	57	91	25	40	42	67	3.0	3.9	145	195
Papakating silt loam	73	108	25	38	40	60	3.5	4.0	170	200
Papakating silty clay loam	71	105	23	36	38	58	3.2	3.7	155	185
Parke silt loam, 2 to 5 percent slopes	64	98	25	39	44	69	3.3	4.2	160	210
Parke silt loam, 5 to 10 percent slopes	59	94	23	37	41	66	3.1	4.0	150	200
Parke silt loam, 5 to 10 percent slopes, moderately eroded	53	88	20	34	36	61	2.8	3.7	131	185
Purdy silt loam	32	60	10	21	18	35	1.2	2.1	55	95
Rainsboro silt loam, 2 to 5 percent slopes	67	105	26	41	44	69	3.0	4.0	145	200
Rainsboro silt loam, 5 to 10 percent slopes	62	101	24	39	41	66	2.8	3.8	130	190
Rainsboro silt loam, 5 to 10 percent slopes, moderately eroded	56	95	21	36	36	61	2.5	3.5	115	170
Ravenna silt loam, 0 to 2 percent slopes	51	85	21	33	36	56	2.3	3.0	105	145
Ravenna silt loam, 2 to 5 percent slopes	51	85	21	33	36	56	2.3	3.0	105	145
Rittman silt loam, 2 to 5 percent slopes	63	98	23	40	36	68	2.4	3.2	110	155
Rittman silt loam, 5 to 10 percent slopes, moderately eroded	49	82	17	35	26	49	1.9	2.9	80	145
Rittman silt loam, 10 to 15 percent slopes, moderately eroded	43	62	16	32	20	34	1.8	2.7	75	125
Rittman silt loam, 15 to 20 percent slopes, moderately eroded	35	------	13	25	18	26	1.0	1.2	40	50
Rittman soils, 10 to 15 percent slopes, severely eroded	35	------	13	23	14	24	.8	1.7	35	70
Rittman soils, 15 to 20 percent slopes, severely eroded	27	------	11	18	15	20	.5	1.8	30	75
Sebring silt loam	38	75	18	29	24	49	1.5	2.5	60	115
Sebring silty clay loam	35	72	15	27	21	45	1.3	2.2	55	95
Strip mine spoil, glacial materials, rolling	------	------	------	------	------	------	.5	1.0	40	50
Strip mine spoil, sandstone and shale materials, rolling	------	------	------	------	------	------	.2	.5	--------	--------
Summitville silt loam, 2 to 5 percent slopes	46	74	19	33	32	55	2.5	3.8	115	190
Summitville silt loam, 5 to 10 percent slopes	41	70	17	31	29	52	2.4	3.6	108	175
Summitville silt loam, 5 to 10 percent slopes, moderately eroded	37	63	15	27	23	41	2.3	3.3	105	160
Summitville silt loam, 10 to 15 percent slopes, moderately eroded	33	------	13	24	16	28	2.2	3.0	95	145
Titusville silt loam, 2 to 5 percent slopes	65	100	24	40	42	68	2.7	3.7	125	185
Titusville silt loam, 5 to 10 percent slopes	60	96	22	38	40	66	2.5	3.5	115	170
Titusville silt loam, 5 to 10 percent slopes, moderately eroded	54	90	19	35	31	52	2.2	3.2	95	155
Titusville silt loam, 10 to 15 percent slopes	56	70	18	33	35	60	2.3	3.2	105	155
Titusville silt loam, 10 to 15 percent slopes, moderately eroded	45	60	15	25	25	45	2.0	3.0	85	145
Tyler silt loam, 0 to 2 percent slopes	46	77	20	31	32	53	2.3	2.8	105	130
Tyler silt loam, 2 to 5 percent slopes	45	76	19	30	31	52	2.3	2.8	105	130
Upshur-Muskingum complex, 2 to 5 percent slopes, moderately eroded [5]	44	89	25	39	38	55	2.9	3.6	135	175
Upshur-Muskingum complex, 5 to 10 percent slopes, moderately eroded [5]	40	85	19	34	32	40	2.7	3.4	--------	165

See footnotes at end of table.

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

Soil	Corn		Wheat		Oats		Hay		Bluegrass pasture	
	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Upshur-Muskingum complex, 10 to 15 percent slopes, moderately eroded [5]	34	65	17	31	17	33	2. 0	3. 2	85	155
Upshur-Muskingum complex, 15 to 20 percent slopes, moderately eroded [5]	28	------	14	25	14	27	1. 7	2. 7	70	125
Wadsworth silt loam, 0 to 2 percent slopes	47	82	20	32	32	55	2. 0	2. 8	85	130
Wadsworth silt loam, 2 to 5 percent slopes	47	82	20	32	32	55	2. 0	2. 8	85	130
Wayland silt loam	40	77	15	31	26	52	1. 5	1. 7	60	70
Wayland silty clay loam	25	56	12	25	20	46	1. 0	1. 7	40	70
Weikert and Muskingum soils, 2 to 5 percent slopes:										
Muskingum soil	55	85	24	39	38	66	2. 7	3. 4	126	166
Weikert soil	------	------	------	30	------	45	------	2. 0	--------	90
Weikert and Muskingum soils, 2 to 5 percent slopes, moderately eroded:										
Muskingum soil	47	80	20	36	33	62	2. 4	3. 2	110	155
Weikert soil	------	------	------	25	------	40	------	2. 0	--------	80
Weikert and Muskingum soils, 5 to 10 percent slopes:										
Muskingum soil	46	80	21	37	34	63	2. 4	3. 2	110	155
Weikert soils	------	------	------	25	------	35	------	2. 0	--------	80
Weikert and Muskingum soils, 5 to 10 percent slopes, moderately eroded:										
Muskingum soil	40	75	19	34	29	58	2. 1	2. 9	95	140
Weikert soil	------	------	------	20	------	35	------	------	--------	75
Weikert and Muskingum soils, 5 to 10 percent slopes, severely eroded:										
Muskingum soil	25	------	13	24	14	25	1. 4	1. 8	55	75
Weikert soil	------	------	------	------	------	------	------	1. 5	--------	60
Weikert and Muskingum soils, 10 to 15 percent slopes:										
Muskingum soil	38	59	20	33	23	37	2. 2	3. 0	95	145
Weikert soil	------	------	------	------	------	------	------	2. 0	--------	75
Weikert and Muskingum soils, 10 to 15 percent slopes, moderately eroded:										
Muskingum soil	31	55	18	30	18	32	1. 8	2. 6	75	120
Weikert soil	------	------	------	------	------	------	------	1. 5	--------	65
Weikert and Muskingum soils, 10 to 15 percent slopes, severely eroded (both soils)	20	------	13	19	15	19	1. 1	1. 4	40	55
Weikert and Muskingum soils, 15 to 20 percent slopes, moderately eroded (both soils)	26	------	12	24	12	24	1. 6	2. 1	65	95
Weikert and Muskingum soils, 15 to 20 percent slopes, severely eroded (both soils)	18	------	11	16	11	16	. 7	1. 2	--------	50
Weikert and Muskingum soils, 20 to 35 percent slopes (both soils)	------	------	------	------	------	------	------	------	--------	50
Weikert and Muskingum soils, 35 to 50 percent slopes (both soils)	------	------	------	------	------	------	------	------	--------	50
Wellston silt loam, 2 to 5 percent slopes	58	90	24	40	41	68	3. 0	3. 5	145	170
Wellston silt loam, 5 to 10 percent slopes	52	85	22	38	38	65	2. 8	3. 3	130	160
Wellston silt loam, 5 to 10 percent slopes, moderately eroded	46	79	19	35	33	60	2. 5	3. 0	115	145
Wellston silt loam, 10 to 15 percent slopes, moderately eroded	40	65	17	32	19	35	1. 7	2. 8	70	130
Wellston silt loam, 15 to 20 percent slopes, moderately eroded	31	------	14	25	16	30	1. 5	2. 4	60	110
Wharton silt loam, 2 to 5 percent slopes	45	73	18	30	31	51	2. 5	3. 0	115	140
Wharton silt loam, 5 to 10 percent slopes	40	69	16	28	28	48	2. 3	2. 8	105	130
Wharton silt loam, 5 to 10 percent slopes, moderately eroded	33	60	14	24	22	42	2. 0	2. 5	85	115
Wharton silt loam, 10 to 15 percent slopes, moderately eroded	28	------	13	20	16	24	1. 8	2. 3	75	105
Willette muck	71	105	23	36	38	58	3. 2	3. 7	155	185
Wooster loam, 5 to 10 percent slopes, moderately eroded	54	90	21	35	30	40	2. 1	3. 5	95	170
Wooster silt loam, 2 to 5 percent slopes	65	100	25	40	43	68	2. 8	4. 0	130	200
Wooster silt loam, 2 to 5 percent slopes, moderately eroded	60	97	23	38	40	55	2. 6	4. 0	120	200
Wooster silt loam, 5 to 10 percent slopes	60	96	23	38	36	48	2. 4	3. 8	110	190
Wooster silt loam, 5 to 10 percent slopes, moderately eroded	54	90	22	35	30	40	2. 1	3. 5	95	170
Wooster soils, 10 to 15 percent slopes	54	81	21	35	27	60	2. 2	3. 6	95	175
Wooster soils, 10 to 15 percent slopes, moderarely eroded	48	75	20	32	25	38	1. 9	3. 3	80	160
Wooster soils, 10 to 15 percent slopes, severely eroded	38	60	15	24	15	24	1. 4	2. 4	55	110
Wooster soils, 15 to 20 percent slopes, moderately eroded	42	65	18	26	19	28	1. 7	2. 7	70	125
Wooster soils, 15 to 20 percent slopes, severely eroded	32	------	14	20	14	22	. 9	1. 6	50	60
Wooster soils, 20 to 35 percent slopes, moderately eroded	------	------	------	------	------	------	------	------	--------	110

[1] Number of days in the grazing season that 1 acre will provide grazing for one cow, steer, or horse; five hogs; or seven sheep or goats without injury to the pasture.

[2] Allegheny soils only; for estimated yields on the Monongahela soils, see Monongahela silt loams.

[3] For Loudonville soils, see Loudonville silt loams; for Muskingum soils, see Weikert and Muskingum soils.

[4] Loudonville soil only; for Muskingum soil, see Weikert and Muskingum soils, 15 to 20 percent slopes, severely eroded.

[5] Upshur soils only; for Muskingum soils, see Weikert and Muskingum soils.

Use of Soils as Woodland

Woodland in Columbiana County consists mainly of beech and maple in the northwestern part, a mixed forest of beech-maple and oak-hickory in the central part, and oak and hickory in the southern part.

In addition to sugar maple and beech, woodland in the northwestern part of the county contains a considerable amount of yellow-poplar, cucumbertree, white ash, slippery elm, American elm, and several kinds of hickory. In the mixed forest of the central part, beech, sugar maple, white ash, elm, and hickory are dominant on the less well drained soils, and white, black, and red oaks are dominant on the well-drained and the shallower soils. Along the gorge of Little Beaver Creek, there are sweet and yellow birches, eastern hemlock, and eastern white pine scattered through the stands of sugar maple, cucumbertree, yellow-poplar, and beech.

The oak-hickory forest in the southern part of the county occurs on south-facing slopes, on most ridgetops, and in shallow areas on north-facing slopes. On north slopes where the soils are moderately deep to deep, the stands contain white ash, sugar maple, elm, yellow-poplar, and black cherry. On some of the eroded upper slopes that are exposed, there are stands of chestnut oak and pitch pine. Chestnut originally grew on the sandstone ridges and the gravelly soils throughout the county, but chestnut trees have been killed by the chestnut blight.

The trees on bottom land are chiefly sycamore and elm, though well-drained soils on bottom land support such desirable trees as red oak, yellow-poplar, and white ash.

The original forest in the county has been cut, and most of the acreage has been cleared for farmland and pasture. At present, however, about 20 percent of the county is covered by stands that are similar to the original forest but contain more yellow-poplar, red maple, hickory, elm, beech, hophornbeam, aspen, white ash, black locust, and black cherry.

The Conservation Needs Inventory reported that in 1958 the woodland in the county amounted to 78,000 acres. This acreage is increasing yearly as more farmland is abandoned and idle land reverts to forest. The plant cover in such areas is a succession of poverty grass, blackberry, and thornapple, and then a mixed forest consisting mainly of black cherry, red maple, hickory, elm, and, in places, black locust. Eroded soils revert to woodland more slowly and to less desirable trees than uneroded soils. Planted pine does well on idle land.

Some woodland is lost to strip mining each year, a trend that is likely to continue for many years.

Forest trees grow best on northerly and easterly exposures in coves that are protected from the wind and sun, on deep soils where drainage is better than poor, and on soils that have a thick surface layer. Black walnut does best on soils derived partly from limestone and on bottom land where the soil is neutral. Yellow-poplar and cucumbertree are most productive on deep, fertile soils in coves and other unexposed areas. Black cherry is most common in cutover areas of well-drained soils. Black locust grows well on limestone soils and on eroded bluffs along the Ohio River; it is the best tree for planting on Strip mine spoil, though it is damaged by the locust borer after about the eighth year of growth.

Sugar maple and beech are most productive on moderately well drained to somewhat poorly drained soils that developed from glacial drift or that occur on north-facing slopes in the unglaciated part of the county. Oaks are dominant on well-drained soils having southerly and westerly exposures. White oak, which lives longer than other trees, is dominant in many old stands. Hickory favors moderately well drained soils that have a moderately fine textured subsoil.

White ash commonly is the dominant species in second-growth stands on somewhat poorly drained soils. Hickory, black cherry, and ash generally will grow on most soils if there is enough space in the stand. White pine, hemlock, black and yellow birches, and cucumbertree are dominant in some areas along stream gorges in the southern part of the county. Chestnut oak and pitch pine grow on the crests of south-facing slopes and on knobs where the soils are shallow, but other trees do not grow well in these areas. Sycamore and American elm are dominant on somewhat poorly drained bottom land. American elm, red maple, pin oak, and swamp white oak are the chief trees on poorly drained soils in all areas.

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 15 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 estimated site indexes for oaks and, where useful, for yellow-poplar and white pine. Site index is the total height, in feet, that 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.

Of the features that determine the productivity of a soil for trees, one of the most important is aspect, particularly in areas having slopes of more than 15 percent. Aspect is the direction in which a slope faces. Slopes facing north or east of a line drawn from true northwest to true southeast are commonly indicated as north; those facing south or west of this line are indicated as south. The best aspect for tree growth is north. Because southerly slopes are hot and dry, they generally produce poorer wood crops than northerly slopes.

Also given in the descriptions of woodland groups are lists of trees to favor in natural stands, lists of trees to use in plantings, and ratings of hazards and limitations to management. These listings and ratings require explanation.

For each woodland group, the species to favor in natural stands are named in order of priority. That is, the first, second, and third species generally are preferred over those that follow in the list. All the trees named have a higher relative value than others not named, but they are not the only trees that grow well on soils of the group. For example, beech, hickory, and American elm do well on many soils but are of low value.

Trees named as suitable for planting are those that grow best if planted in idle areas. Generally, hardwood trees are omitted from the lists because planted hardwoods have not done well in the county. White pine and Norway spruce normally grow better than other species on all soils except those that are poorly drained and those having exposed southerly slopes. Norway spruce should be planted only on north-facing slopes and lower south-facing slopes.

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 prevent 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. As a rule, plant competition is slight on well-drained soils and is severe on poorly drained soils, but it can be severe on any soil. Except on poorly drained soils, however, tree seedlings generally survive well if they are planted before a brushy cover is established, though control of brush generally is needed in plantations of Christmas trees.

Equipment limitation refers to soil characteristics that restrict or prohibit the use of conventional equipment. Among these characteristics are slope, stones or other obstructions, wetness, instability, 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 the 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. Slope does not severely limit the use of crawler-type tractors unless it exceeds 50 percent. Consequently, none of the soils in Columbiana County is rated as having a severe limitation because of slope, for there is no soil in the county with slopes of more than 50 percent.

Windthrow hazard depends on the development of roots and on the capacity of soils to hold trees firmly. The hazard is *slight* if windthrow is no special problem or if trees can be expected to remain standing after they are released, or freed from competition, on all sides. It is *moderate* if roots hold the trees firmly, except when the soil is excessively wet or when the wind is strongest. The hazard is *severe* if roots do not provide enough stability to prevent the trees from being blown over when they are released on all sides. On poorly drained soils and on soils having an impermeable or a clayey subsoil, windthrow is a severe hazard because the trees are shallow rooted.

Discussed in the following pages are the woodland suitability groups of Columbiana 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 survey.

WOODLAND SUITABILITY GROUP 1

The soils in this group formed in glacial materials and are deep, medium textured, permeable, and well drained. They are of the Chagrin, Parke, and Wooster series and have slopes of 0 to 50 percent. Some of the soils are moderately eroded. The Chagrin soils are on flood plains and are subject to occasional overflow for short periods.

Under good management, the soils in this group produce excellent yields of high-quality timber. Potentially, they are capable of producing the highest yields of any soils in Ohio. The site index for red oak ranges from 75 on southerly aspects to 90 on northerly aspects and in coves. For white oak the site index is about 70 on southerly aspects and 75 on northerly aspects.

The trees to favor in natural stands are white oak, yellow-poplar, sugar maple, red oak, black walnut, black cherry, and white ash. Suitable trees to plant for wood crops are white pine and Norway spruce. Trees suitable as Christmas trees are Norway spruce, Scotch pine, white pine, and Douglas-fir.

Competition from weeds, grass, and brush generally is moderate after openings are made in the canopy, but competition is severe on the Chagrin soils. Weeding ordinarily is necessary to remove undesirable plants. The equipment limitation and the erosion hazard are slight on most of the soils, but they are moderate on Wooster soils having slopes of 20 to 50 percent. Windthrow is no problem on the soils of this group.

WOODLAND SUITABILITY GROUP 2

This group consists of deep, medium-textured to moderately fine textured, moderately well drained soils of the Bogart, Canfield, Ernest, Glenford, Guernsey, Lobdell, Monongahela, Rainsboro, and Titusville series. Slopes generally range from 0 to 15 percent. Most of these soils formed in glacial materials or alluvium, but the Ernest and Guernsey soils formed in residual material from acid shale and sandstone in the unglaciated area of the county. Some of the soils are moderately eroded. The Lobdell soils are subject to occasional flooding for short periods.

The soils in this group are highly productive of many kinds of trees. Except on the Ernest and Monongahela soils, the estimated site index for oaks is 85 to 95. It is 75 to 80 on the Ernest and Monongahela soils.

The trees to favor in natural stands are yellow-poplar, white oak, sugar maple, red oak, white ash, black cherry, and cucumbertree. Trees preferred for planting for wood crops are white pine and Norway spruce. Suitable as Christmas trees are Norway spruce, Scotch pine, white pine, and Douglas-fir.

Plant competition generally is moderate on these soils; some weeding is necessary to remove undesirable trees. Competition from unwanted plants is severe on the Lobdell soils. The limitation on the use of heavy equipment generally is slight, but it is moderate on the Ernest soils, where seepy wet spots are common. Windthrow is a moderate hazard on the Ernest and Monongahela soils because of a limited root zone. It is not a problem on the other soils. Erosion is a moderate hazard in areas of Ernest soils having slopes of more than 20 percent. To help control soil losses in these areas, woodland operations should be across the slope wherever possible.

WOODLAND SUITABILITY GROUP 3

In this group are moderately deep to deep, well-drained soils that overlie gravel. These soils are of the Chili, Conotton, and Negley series. They formed in glacial material and have a lower available moisture capacity than the soils in groups 1 and 2. Some of the soils in this group are gravelly, and some are moderately eroded. Slopes are mostly 0 to 20 percent but range to 50 percent.

Potentially, the productivity of the soils in this group is very good. The estimated site index is 80 to 90 for oaks and is 70 to 80 for white pine.

Among the trees to favor in natural stands are white oak, yellow poplar, red oak, and black cherry. Suitable trees to plant for wood crops are white pine and Norway spruce. Suitable as Christmas trees are Scotch pine, Norway spruce, and white pine.

Plant competition generally is slight. Some weeding of competing plants, particularly hickory, is needed to maintain stands of desirable trees. The equipment limitation is moderate on slopes of 20 to 50 percent and is slight elsewhere. Erosion and windthrow are only slight hazards on all the soils.

WOODLAND SUITABILITY GROUP 4

This group consists of medium-textured to moderately fine textured, well-drained soils that formed in acid materials. These soils are of the Allegheny, Hanover, and Monongahela series and have slopes of 2 to 20 percent. Almost all of them are deep, but the Allegheny soil with a sandstone substratum is only moderately deep. Some are moderately eroded.

Potentially, the soils in this group have very good productivity for wood crops. The estimated site index for upland oaks is 75 to 90.

Trees to favor in natural stands are white oak, yellow-poplar, black oak, red oak, and black cherry. Suitable trees to plant for wood crops are white pine and Norway spruce. Suitable as Christmas trees are Norway spruce, Scotch pine, white pine, and Douglas-fir.

Plant competition is rated as moderate, and some weeding of undesirable species is required in existing stands. All other hazards and limitations are rated as slight.

WOODLAND SUITABILITY GROUP 5

This group consists of a land type and of severely eroded soils that formed in glacial materials. In most areas the original surface layer has been lost and the subsoil is exposed. The soils are of the Chili, Conotton, Negley, Rittman, and Wooster series. Slopes range from 5 to 50 percent. The Rittman soils have a fragipan that hinders the movement of air and the growth of roots.

The potential productivity of the soils in this group is not known, because measurable trees are lacking. In some places the soils are idle and are covered with trees and brush, and several areas are still farmed. Woodlots occur in some areas, but the trees generally are inferior, and a desirable stand can be obtained only by planting. White pine and Norway spruce are suitable trees to plant for wood crops. Scotch pine, Norway spruce, and white pine are suitable as Christmas trees. Productivity is slightly higher on slopes facing north and east than it is on slopes facing south and west.

The equipment limitation is moderate on slopes exceeding 20 percent, but it is slight on milder slopes. Erosion is a severe hazard on all the slopes unless a good cover of plants is established. Even after the soils are covered, the erosion hazard is slight to moderate. To reduce the risk of soil losses, trees should be planted on the contour.

The mortality of planted tree seedlings is moderate on these soils. That is, between 25 and 50 percent of planted seedlings likely will die because of effects of the soil. Plant competition is slight.

WOODLAND SUITABILITY GROUP 6

The soils in this group are of the Laidig series and are well drained and stony. They formed in colluvium on lower slopes below areas that are shallow to sandstone. Most areas of these soils are in coves and on low-lying benches along the gorge of Little Beaver Creek. Slopes range from 5 to 35 percent.

Dominant in the natural stands on these soils are sugar maple, cucumbertree, yellow birch, yellow-poplar, and other hardwoods that grow under medium conditions of moisture. Potentially, the productivity of these soils for wood crops is very good to excellent. The estimated site index is 90 to 100 for yellow-poplar and is 75 to 80 for upland oaks.

Trees preferred in natural stands are yellow-poplar, white oak, yellow birch, sugar maple, red oak, white ash, sweet birch, and cucumbertree. White pine and Norway spruce are suitable for planting for wood crops. Norway spruce, Scotch pine, and white pine are suitable as Christmas trees.

The use of equipment on these soils is severely limited by stones and boulders. Plant competition and the hazards of erosion and windthrow are rated as slight.

WOODLAND SUITABILITY GROUP 7

This group consists of shallow to moderately deep, well-drained soils of the Dekalb, Guernsey, Loudonville, Muskingum, Weikert, and Wellston series. These soils occur mainly in the unglaciated area in the southern part of the county. They are underlain by acid sandstone, siltstone, or shale at a depth ranging from 15 to 40 inches. Slopes range from 2 to 20 percent. Some of the soils are moderately eroded, and some are severely eroded.

The soils of this group are in an area where local differences in elevation range from 200 to 400 feet. Consequently, slope and aspect have a decided influence on productivity. The potential productivity ranges from average to very good. Except on the Weikert soils, the site index for upland oaks is 70 to 80 on north-facing slopes and on the lower part of south-facing slopes. It is slightly lower on the same slopes of the Weikert soils. On the middle and upper parts of south-facing slopes and on ridgetops, the site index for upland oaks generally is 65 to 75, but it is slightly lower on the Weikert soils.

Weikert soils are less productive than the other soils in this group because they have a high content of channery fragments and stones.

In natural stands the trees to favor on northerly slopes and the lower part of southerly slopes are white oak, yellow-poplar, red oak, black cherry, and sugar maple. White, red, scarlet, and chestnut oaks are favored on the middle and upper parts of southerly slopes and on ridgetops.

Trees suitable for planting for wood crops are white pine, red pine, and Norway spruce on north-facing slopes and the lower third of south-facing slopes. Suitable trees are white pine and pitch pine on the middle and upper thirds of south-facing slopes and on ridgetops.

Scotch pine can be grown as Christmas trees on all slopes. White pine and Norway spruce, as before mentioned, are suitable on north slopes and the lower part of south slopes, and can be grown as Christmas trees.

In areas planted to trees, erosion is a severe hazard until adequate cover is established.

The mortality of planted seedlings is moderate on the upper and middle parts of south slopes and on ridgetops. Here, from 25 to 50 percent of planted seedlings may die because of effects of the soil.

The hazard of windthrow is moderate to slight on the moderately deep soils but is moderate to severe on the shallow soils of this group. The use of equipment is only slightly limited.

WOODLAND SUITABILITY GROUP 8

In this group are shallow to moderately deep, well-drained soils of the Dekalb, Muskingum, and Weikert series. These soils are in the unglaciated part of the county and are underlain by acid sandstone, siltstone, or shale. Slopes range from 20 to 50 percent. Some areas are moderately eroded, and some are severely eroded.

The potential productivity of these soils for wood crops is good. Except on the Weikert soils, the site index for oaks is 65 to 75 on north-facing slopes and on the lower part of south-facing slopes. It is slightly lower on the same slopes of Weikert soils. On the upper and middle parts of south-facing slopes and on ridgetops, the site index for upland oaks generally is 60 to 70, but it is lower on the Weikert soils.

The trees preferred in natural stands, the trees suitable to plant for wood crops, and the ones suitable as Christmas trees are the same as those listed for group 7.

The use of equipment on these soils is moderately limited by steep slopes. Erosion is a moderate or severe hazard. The hazard of windthrow is moderate to severe on the shallow soils but generally is only slight on the moderately deep soils.

The mortality of planted seedlings is moderate on the upper and middle parts of south slopes and on ridgetops. Between 25 and 50 percent of planted seedlings may die because of effects of the soil and of aspect.

WOODLAND SUITABILITY GROUP 9

This group consists of stony, well-drained soils and a miscellaneous land type that are shallow to moderately deep over sandstone and shale. The soils are of the Dekalb series and have slopes of 5 to 50 percent. Some areas are severely eroded.

Areas of these soils on south- and west-facing slopes and on exposed ridgetops are very dry. Here, the existing stands are made up almost entirely of upland oaks.

Potentially, the productivity of these soils for wood crops is fair to good. The estimated site index for oaks is 65 to 70 on northerly slopes and the lower part of southerly slopes. It is 55 to 60 on the upper and middle parts of southerly slopes and on ridgetops.

In natural stands the trees to favor on north-facing slopes and the lower part of south-facing slopes are white oak, yellow-poplar, red oak, black cherry, and sugar maple. White, red, scarlet, and chestnut oaks are favored on the upper and middle parts of south-facing slopes and on ridgetops.

Among the trees planted for wood crops, white pine is suitable on all exposures. In addition, red pine can be grown on northerly slopes and the lower part of southerly slopes. Pitch pine is suitable on ridgetops and the upper and middle parts of southerly slopes. As Christmas trees, Scotch pine is suitable on all slopes, and white pine and Norway spruce are suitable on north slopes and the lower part of south slopes. Because Strip mine spoil is so variable, however, each area should be investigated before planting. Some areas are very acid, and planted trees are not likely to survive.

Stones and boulders, as well as slope, cause a moderate to severe limitation in the use of equipment on these soils. The erosion hazard is moderate to severe. Windthrow is a slight to moderate hazard in moderately deep areas but is a severe hazard in shallow areas. Plant competition generally is slight.

WOODLAND SUITABILITY GROUP 10

This group is made up of deep, clayey Upshur soils on uplands in the unglaciated area of the county. These soils have slopes of 2 to 50 percent and are moderately or severely eroded. They occur closely with the Muskingum soils and are mapped only in complexes with those soils. The Muskingum soils are placed in woodland suitability group 7.

The potential productivity of Upshur soils is good. Stands of native trees consist mainly of upland oaks. The estimated site index for upland oaks is 65 to 80 on north-facing slopes and the lower part of south-facing slopes. It is 60 to 70 on the upper and middle parts of south-facing slopes and on ridgetops.

The trees to favor in natural stands on north slopes and the lower part of south slopes are white oak, red oak, sugar maple, and white ash. Red and chestnut oaks are favored on the middle and upper parts of south slopes and on ridgetops.

White, red, and pitch pines are suitable for planting for wood crops on north slopes and the lower part of south slopes. Pitch pine can be grown for wood crops on the middle and upper parts of south slopes and on ridgetops. Suitable as Christmas trees are white pine and Scotch pine on north slopes and the lower part of south slopes. Other areas should not be used for the production of Christmas trees.

Competition from undesirable plants is moderate on these soils. Hickory and other unwanted species must be removed if the most desirable stand is to be maintained. The equipment limitation is moderate on slopes exceeding 20 percent and is slight on milder slopes. Erosion is a moderate or severe hazard, but windthrow is only a slight hazard.

The mortality of planted seedlings generally is severe, especially on hot slopes and ridgetops. More than 50 percent of planted seedlings die because of soil effects.

WOODLAND SUITABILITY GROUP 11

The soils in this group are slowly permeable and moderately well drained or well drained. They have a fragipan or a subsoil of impervious clay. The soils are of the Rittman, Summitville, and Wharton series and occupy slopes of 2 to 20 percent. Some are moderately eroded. The Rittman soils occur in the glaciated area of the county, and the Summitville and Wharton soils are in the unglaciated area.

Potentially, the productivity of these soils for wood crops is very good. The estimated site index for oaks is

75 to 90 on northerly or protected slopes and is 65 to 80 on southerly slopes.

In natural stands the trees to favor are yellow-poplar, sugar maple, black walnut, white oak, white ash, red oak, and black cherry. Suitable trees to plant for wood crops are white pine and Norway spruce. Suitable for Christmas trees are Norway spruce, Scotch pine, white pine, and Douglas-fir.

Competition from grasses and weeds is moderate in open fields planted to trees. Annual mowing may be needed in plantations of Christmas trees. The equipment limitation is moderate because of seasonal wetness. Unless the soils are frozen, trafficability generally is poor in winter and spring. Windthrow is a moderate hazard, for root systems tend to be shallow because of the impervious underlying material. The erosion hazard is slight.

WOODLAND SUITABILITY GROUP 12

In this group are deep to moderately deep, somewhat poorly drained soils of the Cavode, Fitchville, Gresham, Jimtown, Orrville, Ravenna, Tyler, and Wadsworth series. These soils either have a high water table much of the year or have a fragipan or a clayey subsoil that restricts drainage and root development. Slopes range from 2 to 10 percent. The Cavode soils formed in residual material derived from shale; the other soils of the group formed in glacial material or alluvium. The Orrville soils occur on flood plains and are occasionally flooded.

In spite of the seasonally high water table or the impervious subsoil, these soils are highly productive of trees. Most areas are in mixed stands of beech, maple, and elm. The estimated site index is 85 to 95 for upland oaks but is only 75 to 85 for pin oak.

Trees to favor in natural stands are white ash, sugar maple, red maple, and red oak. Species suitable for planting for wood crops include white pine and cottonwood. Yellow-poplar grows fairly well but, in most areas, does not occur naturally and must be planted. Suitable as Christmas trees are Scotch pine, Norway spruce, and white pine.

Competition from weeds and grass ordinarily is moderate but is severe in plantations. Mowing often is necessary in areas planted to trees. The use of equipment is moderately limited in winter and spring, when the soils usually are wet and soft. Because rooting is shallow, windthrow is a moderate hazard. The erosion hazard is slight.

WOODLAND SUITABILITY GROUP 13

This group consists of deep, medium-textured to fine-textured, poorly drained and very poorly drained soils that formed in glacial material or alluvium. These soils have a high water table most of the year. They are level or nearly level and are of the Chilo, Damascus, Frenchtown, Lorain, Luray, Marengo, Olmsted, Papakating, Purdy, Sebring, and Wayland series.

These soils are highly productive of trees but, in many areas, are covered mainly with elm and other low-value species. The chief management problem is the removal of these inferior trees in favor of pin oak and swamp white oak. The estimated site index for oaks is 80 to 90. Other species favored in natural stands are red maple and sycamore. Trees preferred for planting for wood crops are northern white-cedar, cottonwood, and sycamore. The soils generally are not suitable for the production of Christmas trees.

Plant competition is severe in plantations on these soils. For this reason, and because of wetness, white pine generally is not suitable for planting. The soils are so wet and soft that the use of equipment is limited to dry periods late in summer and in fall or to periods when the soil is frozen. Because root systems are shallow in most places, windthrow is a severe hazard after openings are made in a stand. Pin oak and swamp white oak, however, are less susceptible to windthrow than other, less desirable species. The erosion hazard is slight or none.

WOODLAND SUITABILITY GROUP 14

This group consists of very poorly drained organic soils that have a water table at or near the surface most of the year. The soils are of the Carlisle, Kerston, and Willette series.

Most areas of these soils are not now used as woodland. Typically, they are in grass or brush or have been drained and are cultivated. Northern white-cedar is about the only species well suited to the soils, but it grows slowly and brings negligible returns.

Plant competition and the windthrow hazard are severe. The soils are very soft, and the use of mechanized equipment generally is not possible. Erosion is not a hazard.

WOODLAND SUITABILITY GROUP 15

This group consists of land types that generally are not now used as woodland. These areas are so variable in kind and amount of soil material and other characteristics that an on-site investigation is needed to determine the desirability of each site for trees.

Yield and growth data

Table 2 lists potential yields for even-aged, fully stocked stands of second-growth upland oaks. Table 3 lists the potential annual growth for upland oaks in even-aged, fully stocked stands. Both tables were compiled from USDA Technical Bulletin 560 (*12*).[1]

TABLE 2.—*Yields per acre*[1] *from second-growth upland oaks in even-aged, fully stocked stands*

Age of stand	Site index				
	40	50	60	70	80
Years	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*
30	100	350	850	1, 750	3, 350
40	600	1, 400	3, 200	5, 500	8, 600
50	1, 400	3, 250	6, 300	9, 750	13, 750
60	2, 700	5, 600	9, 700	13, 900	18, 600
70	4, 250	8, 150	12, 800	17, 700	23, 100
80	5, 900	10, 450	12, 600	21, 200	27, 250
90	7, 600	12, 600	18, 300	24, 500	30, 950
100	9, 200	14, 700	20, 900	27, 650	34, 400

[1] According to International Rule, ⅛ inch, for stems to a top diameter of 5 inches, inside bark.

[1] Italic numbers in parentheses refer to Literature Cited, p. 130.

TABLE 3.—*Annual growth per acre* [1] *of upland oaks in even-aged, fully stocked stands*

Age of stand	Site index				
	40	50	60	70	80
Years	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*
30	3	12	28	58	112
40	15	35	80	138	215
50	28	65	126	195	275
60	45	93	162	232	310
70	61	116	183	253	330
80	74	131	196	265	341
90	84	140	203	272	344
100	92	147	209	276	344

[1] International Rule, ⅛ inch.

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 Columbiana County was settled, wildlife and fish were abundant in this area. Moreover, because the use of 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 white-tail deer. Less common game species and furbearers are muskrat, beaver, 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 Columbiana County. Smallmouth bass, rock bass, and sunfish are the main game fish. Largemouth 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. Food and cover both may be scarce in pastured fields because the plants are kept grazed by livestock. Wooded areas generally provide adequate cover but, in many places, are deficient in winter food. Hedgerows, landscaped tracts, idle and abandoned fields, and similar areas commonly provide the best habitat for wildlife.

Discussed in the following paragraphs is the relationship between the 10 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 and 4.—These associations are chiefly on terraces and flood plains and on kames and moraines on the glacial till plain. The principal soils are the Chili, Negley, and Wayland. Most of the acreage is farmed; corn, wheat, and meadow are the main crops. Some special crops are grown on the Chili and Wayland soils. Pasture and woodland occur in areas along streams that are frequently flooded.

Because food, cover, and water are well distributed, the wildlife population is large and diverse. Quail is the main game bird, but pheasants also are present. Rabbit is the principal game mammal. Raccoon, opposum, and gray and fox squirrels are common in wooded areas and along streams.

Soil associations 2 and 3.—These associations are in the northern and northwestern parts of the county. The main soils are the Canfield, Rittman, Wadsworth and Wooster. About 70 percent of the total area is cultivated; soybeans, corn, wheat, and hay are the principal crops. About 15 percent of the acreage is pastured, 13 percent is wooded, and the rest is idle. Pasture, wooded tracts, and idle fields generally are small and scattered. 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, and there are fox squirrels in grazed woods. Also in these areas are red fox and white-tailed deer.

Soil association 6.—This association lies along the major streams in the southern part of the county. It consists of long, narrow terraces and benches occupied by the Allegheny, Monongahela, and Parke soils. Most of the acreage is used for crops, and generally the only areas used for pasture or as woodland are those frequently flooded. Corn is the main crop, but meadow and wheat also are grown. Trees, shrubs, and weeds grow in narrow areas along most streams and ditches.

The kinds and numbers of wildlife on this association generally are similar to those on associations 1 and 4, but pheasants are less abundant on association 6.

Soil associations 5, 7, 8, 9, and 10.—These associations are in the southern part of the county and are mainly rolling to steep. The principal soils are the Allegheny, Dekalb, Guernsey, Hanover, Loudonville, Monongahela, Muskingum, and Weikert. Some of the major streams in the county flow through this part.

Most areas of these associations are wooded. Cultivated fields and pasture are well distributed but are not extensive. This pattern of open areas and woody vegetation is favorable for deer, rabbit, quail, grouse, gray fox, and gray squirrel. Songbirds and other birds of wooded areas are common here, as are raccoon and small mammals of the forest. Fox squirrel generally occur only in wooded tracts that are grazed by livestock.

Use of Soils in Engineering [2]

Soils are of special interest to engineers because they affect the construction and maintenance of roads, airports, pipelines, building foundations, facilities for water storage, erosion control structures, drainage systems, and sewage disposal systems. The properties most important to the engineer are permeability to water, shear strength, compaction characteristics, soil drainage, shrink-swell characteristics, grain size, plasticity, and pH. Depths to water table and to bedrock also are important. The relief may be significant.

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 the 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. Estimate 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.

With the use of the soil map for identification, the engineering interpretations in this subsection can be used for many purposes. It should be emphasized that they do not eliminate the need for sampling and testing at the site of specific engineering works, particularly where heavy loads are to be supported and where the excavations are deeper than the depths of layers here reported. Even in these situations, the soil map is useful for planning more detailed field investigations and for suggesting the kinds of problems that may be expected.

The range in characteristics of some soil types is sufficiently large to preclude precise predictions about the physical properties and expected engineering performances of soil areas shown by the various map symbols. Furthermore, many soil types have not been subjected to detailed soil-mechanics tests. For many of them the only physical test data available are mechanical analyses, made according to U.S. Department of Agriculture standards, of soil profiles that occur somewhere within the range of characteristics of a given soil type. Nevertheless, by using the information given here, the engineer can plan a detailed investigation at the proposed construction site.

[2] A. F. Kleinhenz, State conservation engineer, Soil Conservation Service, assisted in preparing this subsection.

Some terms used by the soil scientist may be unfamiliar to the engineer, and some have special meanings in soil science. These terms, as well as other special terms that are used in this report, are defined in the Glossary.

Engineering classification systems

Two systems of classifying soils are in general use among engineers, the Unified Classification System (*18*), and the system used by the American Association of State Highway Officials (*1*). Both are used in this report.

In the Unified Classification, the soils are grouped on the basis of their texture and plasticity and their performance as material for engineering structures. In this system, two letters are used to designate each of 15 possible classes. The letters G, S, C, M, and O stand for gravel, sand, clay, silt, and organic soils, respectively, and W, P, L, and H refer to well graded, poorly graded, low liquid limit, and high liquid limit, respectively. In this system, SM and GM are sands and gravels that include fines of silt; ML and CL are silts and clays that have a liquid limit below 50; and MH and CH are silts and clays that have a liquid limit above 50.

In the ASSHO system, soil materials are classified in seven principal groups. These groups range from A–1, gravelly soils of high bearing capacity, to A–7, clay soils having low bearing capacity when wet. Within each group, the relative value of the soil for engineering purposes is indicated by a group index number. Group index numbers range from 0 for the best material to 20 for the poorest. They are shown in parentheses following the soil group symbol, for example A–4(8). (See table 6.)

Physical properties

Table 4 gives a brief description of the soils mapped in Columbiana County and lists their estimated properties. The textural terms used to describe the soil material in the main horizons are those used by the U.S. Department of Agriculture. The estimated classifications according to the Unified and the AASHO systems are based on laboratory test data, field observations, and information in other parts of this report.

An explanation of some of the terms in table 4 may be helpful. Permeability refers to the movement of water through undisturbed soil horizons that are saturated but occur above a true water table and can drain freely. Estimates are based on soil texture and structure, on permeability and infiltration tests on some of the soil, and on drainage observations. In soil horizons that have a high content of organic matter, permeability rates under saturated conditions are considerably higher than the values given in table 4. Percolation of water through the surface layer of soils varies considerably and depends on land use, management, and initial moisture conditions.

Available moisture capacity is the maximum amount of water a soil can hold available for plants. It is the water held in the range between field capacity and the wilting point. Table 4 gives an estimated average for each soil horizon.

Reaction is given in pH values, which indicate the acidity or alkalinity of the soil. It is based on tests of selected soils in the field and the laboratory. The values listed are the normal range that can be expected in the field.

TABLE 4.—*Estimated*

[Absence of data indicates

Soil and map symbol	Description of soil and site	Depth from surface (typical profile)
		Inches
Allegheny (AhC, AhC2, AhD, AhD2, AlC, AmB, AmB2). (For properties of the Monongahela soil in mapping units AmB and AmB2, refer to the Monongahela soil series in this table.)	Deep, well-drained soils on terraces; 2 feet of silt loam underlain by 2 feet of sandy clay loam, over 2 to 10 feet of sandy loam; may contain layers of sand and weathered gravel; depth to bedrock generally is 4 to 15 feet but is only 3 to 4 feet in places.	0–8 8–24 24–41 41–60
Bogart (BgA, BgB, BoA, BoB, BsC, BsC2)	Moderately well drained soils on terraces; 1 foot of silt loam or loam underlain by 1 to 2 feet of sandy loam, over thick layers of sand and gravel that contain thin layers of finer textured material.	0–16 16–47 47–70
Canfield (CaB, CaB2, CaC, CaC2)	Moderately well drained soils on uplands; 1 foot of silt loam and loam underlain by a 2-foot fragipan; parent material is loam glacial till; depth to bedrock is more than 5 feet.	0–14 14–47 47–60
Carlisle (Cc)	Very poorly drained muck in swamps; slopes are 0 to 2 percent; more than 4 feet of muck underlain by dark-gray clayey material; water table is at the surface; bedrock may be at depth of 30 feet or more; generally ponded.	0–48 48–120
Cavode (CdB, CdC, CdC2)	Somewhat poorly drained soils on uplands; 1 foot of silt loam underlain by silty clay loam to silty clay; parent material is from clay shale bedrock; depth to bedrock 4 to 6 feet.	0–9 9–48
Chagrin (Ce, Cg)	Well-drained soils formed in alluvium on bottom lands on 0 to 2 percent slopes; 1 foot of silt loam or loam underlain by silt loam parent material; layers of sand and gravel may be present; bedrock is generally at depth of more than 30 feet; water table is at 4-foot depth; subject to occasional flooding.	0–12 12–35
Chili (ChB, ChC2, ChD2, ClA, ClB, ClB2, ClC, ClC2, ClD, ClD2, ClE2, CmC3, CmD3, CmE3, CnF, CnF3). (For properties of the Conotton and Negley soils in mapping units CnF and CnF3, refer to the Conotton and Negley soil series in this table.)	Well-drained soils on terraces and kames; about 1 foot of gravelly loam underlain by gravelly sandy loam, sand, and gravel; bedrock is generally at depth of more than 30 feet.	0–8 8–45 45–60
Chilo (Co)	Very poorly drained, dark-colored soil on stream terraces; slopes range from 0 to 5 percent; 3 feet of silty clay loam underlain by 3 to 10 feet of loam or silt loam containing a few layers of fine gravel and sand; parent material is alluvium; sandstone or shale bedrock generally is at depth of more than 5 feet; water table is at surface; frequently ponded.	0–8 8–17 17–38 38–50
Conotton (CnF, CnF3). (For properties of the Chili and Negley soils in mapping units CnF and CnF3, refer to the Chili and Negley soil series in this table.)	Well-drained, gravelly, sandy soils on terraces; depth to bedrock is generally more than 30 feet.	0–30 30–60
Damascus (Da)	Poorly drained soil on terraces; 1 foot of silt loam underlain by 1 to 3 feet of sandy loam, over beds of sand and gravel; thin layers of silt loam or fine loam generally occur at 4- to 10-foot depth; water table is at surface; depth to sandstone or siltstone bedrock is 30 feet or more; frequently ponded.	0–7 7–35 35–60
Dekalb (DeB, DeC, DeC2, DeD2, DeE2, DeF, DeF2, DkF3, DsD, DsF).	Moderately shallow soils on uplands; 2 to 3 feet of loam and sandy loam over weathered sandstone bedrock, which occurs at depth of about 2 feet; where surface layer is stony loam, the surface is littered by stones and boulders.	0–8 8–19 19–29
Ernest (ErC, ErD2, ErE2, ErF2)	Deep, moderately well drained soils at base of steep slopes; 1 foot of silt loam underlain by 1½ feet of silty clay loam, over 1 to 3 feet of silty clay; the parent material is silty clay loam colluvium; many rock fragments commonly litter the surface; depth to bedrock ranges from 10 to 30 feet.	0–9 10–34 34–48 48–62

properties of soils

estimate was not made]

Engineering classification		Percentage passing sieve—			Range in permeability	Estimated available moisture capacity	Range in reaction	Shrink-swell potential
Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				
					Inches per hour	*Inches per inch of soil*	*pH*	
ML	A-4		100	65–75	0. 63–2. 0	0. 18	4. 5–5. 0	Low.
ML or CL	A-6 or A-4		100	80–95	0. 63–2. 0	. 17	4. 6–5. 0	Moderate.
CL or SC	A-4	85–100	80–90	40–55	0. 63–2. 0	. 16	4. 6–5. 0	Low.
SC or SM	A-4 or A-2	85–100	80–100	30–45	0. 63–2. 0	. 15	5. 0–6. 0	Low.
ML or SM	A-4	85–100	80–95	30–70	2. 0–6. 3	. 16	4. 3–5. 4	Low.
SM or ML	A-2 or A-4	70–90	60–85	25–55	2. 0–6. 3	. 10	4. 8–5. 4	Low.
SM or GM	A-2	30–75	30–60	20–35	2. 0–6. 3	. 07	5. 0–7. 4	Low.
ML	A-4	85–100	80–100	65–100	0. 63–2. 0	. 18	5. 0–5. 5	Low.
ML or CL	A-4	85–100	80–100	50–80	0. 2–0. 63	. 10	4. 8–5. 2	Low.
ML	A-4	85–100	80–100	50–80	0. 63–2. 0	. 15	7. 0–7. 5	Low.
Pt					0. 63–2. 0	. 25	6. 0–7. 0	High.
CH	A-7		100	95–100	0. 2–0. 63	. 15	6. 5–7. 5	High.
ML	A-4	100	90–100	80–90	0. 2–0. 63	. 18	5. 0–5. 2	Moderate.
ML, CL, or CH	A-6 or A-7	80–95	70–80	40–70	<0. 2	. 15	4. 8–5. 2	High.
ML	A-4		100	65–100	2. 0–6. 3	. 18	5. 6–6. 0	Low.
ML	A-4		100	65–100	0. 63–2. 0	. 18	5. 6–6. 0	Low.
SM or ML	A-4 or A-2	70–90	75–85	30–70	6. 3+	. 15	4. 5–5. 0	Low.
SM or ML	A-2 or A-4	70–90	60–85	25–55	2. 0–6. 3	. 10	5. 1–5. 5	Low.
SM or GM	A-2 or A-4	30–75	30–60	15–40	6. 3+	. 04	6. 0–7. 5	Low.
CL	A-6		100	80–100	0. 2–0. 63	. 18	5. 5–7. 0	Moderate.
CH	A-6 or A-7		100	80–100	<0. 2	. 17	5. 2–6. 5	Moderate.
ML or CL	A-6	80–100	80–100	80–100	0. 63–2. 0	. 15	5. 0–6. 0	Low.
ML or CL	A-4		100	50–80	0. 2–0. 63	. 17	6. 0–6. 5	Low.
SM or GM	A-2	40–70	35–70	25–35	6. 3+	. 10	4. 5–5. 0	Low.
SM, GM, SP-SM, or GP-GM.	A-2 or A-1	25–70	20–50	10–35	6. 3–12. 0+	. 04	6. 0–7. 0	Low.
ML	A-4	100	80–100	65–80	2. 0–6. 3	. 18	5. 0–5. 5	Low.
SM or ML	A-4	70–90	60–85	35–60	0. 63–2. 0	. 17	5. 0–5. 5	Low.
SM or GM	A-2, A-4	40–75	30–70	20–45	0. 63–2. 0	. 10	6. 0–7. 4	None.
SM	A-2 or A-4	70–80	60–80	20–50	2. 0–6. 3+	. 15	4. 3–4. 8	Low.
SM	A-2 or A-4	70–80	60–80	20–50	2. 0–6. 3+	. 14	4. 3–5. 0	Low.
SM	A-2	65–75	50–70	15–25	2. 0–6. 3+	. 10	5. 1–5. 5	Low.
ML	A-4	75–85	70–80	60–70	0. 63–2. 0	. 18	4. 8–5. 0	Low.
ML or CL	A-4	80–90	75–85	70–80	0. 2–2. 5	. 17	4. 8–5. 4	Moderate.
CH or CL	A-7	85–100	80–100	75–90	0. 2–0. 63	. 17	4. 8–5. 4	High.
CL	A-6	80–90	75–85	70–80	0. 2–0. 63	. 17	5. 8–6. 5	Moderate.

TABLE 4.—*Estimated*

Soil and map symbol	Description of soil and site	Depth from surface (typical profile)
		Inches
Fitchville (FcA, FcB)	Somewhat poorly drained soils on terraces; 1 foot of silt loam underlain by 4 feet of silty clay loam, over silty clay; water table is at a 2-foot depth; parent material is lacustrine deposits of silt, clay, and some sand.	0–9 9–54 54–60
Frenchtown (Fr)	Poorly drained soil having 0 to 5 percent slopes on uplands; 1 foot of silt loam underlain by 1 foot of loam, over 2 feet of a firm, dense loam fragipan; parent material is firm loam glacial till; bedrock is at depth of more than 10 feet; water table is at surface; occasionally ponded.	0–10 10–21 21–42 42
Glenford (GfB, GfC, GfC2)	Moderately well drained soils on terraces; 1 foot of silt loam underlain by 2 feet of silty clay loam, over silty, sandy, and clayey materials; seasonal water table is at 2½-foot depth; parent material is lacustrine deposits of silt, clay, and some sand.	0–9 9–43
Gresham (GrB, GrC)	Somewhat poorly drained soils on uplands; 1½ feet of silt loam over 4 feet of silty clay loam; bedrock occurs at depth of 10 to 30 feet; parent material is clay loam till; water table is at a 2-foot depth.	0–12 12–60
Guernsey:		
Silt loam (GuB, GuC, GuC2, GuD2)	Moderately well drained soils on uplands; 1 foot of silt loam over 2 to 3 feet of silty clay loam, over silty clay; parent material is mostly limestone but partly sandstone and shale; bedrock occurs at depth of 4 to 6 feet.	0–11 11–26 26–50
Silty clay loam (GvD2, GvE2)	Well-drained soils on uplands; 1 foot of silty clay loam over 1 foot of silty clay; parent material is a mixture of limestone, sandstone, and shale; bedrock occurs at depth of 2 to 4 feet.	0–8 8–26
Hanover (HaB, HaB2, HaC, HaC2, HaD2, HaE2).	Deep, well-drained soils on uplands; 2 feet of silt loam underlain by 2 to 3 feet of loam; the parent material is loam glacial till; the depth to bedrock ranges from 10 to 30 feet.	0–10 10–20 20–62 62–80
Jimtown (JtA, JtB, JwA, JwB)	Somewhat poorly drained soils on terraces; 1 foot of silt loam or loam underlain by sandy loam, over thick layers of sand and gravel and thin layers of finer textured material; depth to bedrock is more than 10 feet; water table is at a 1-foot depth seasonally.	0–15 15–25 25–58
Kerston (Km)	More than 4 feet of muck in swamps; underlain by clayey material at a 4- to 10-foot depth; depth to bedrock is more than 30 feet and may be more than 100 feet; water table is at surface; generally flooded.	0–48 48–120
Laidig (LaC, LaD, LaE, LaF)	Well-drained soils on lower part or base of steep slopes; more than 5 feet of stony, sandy material; bedrock is at a 10- to 30-foot depth.	0–4 4–38 38–60
Lobdell (Lb, Ld)	Moderately well drained soils formed in alluvium on bottom lands having slopes of 0 to 2 percent; 3 feet of silt loam underlain by sandy loam material; sandy and gravelly layers may be present; bedrock is generally at a depth of more than 30 feet; water table is at a 2-foot depth; subject to occasional flooding.	0–14 14–33 33–42
Lorain (Ln)	Dark-colored, very poorly drained soil in swamps having slopes of 0 to 2 percent; more than 6 feet of clay or silty clay; water table is at surface; bedrock is at depth of more than 30 feet; generally ponded.	0–10 10–29 29–49
Loudonville (LoB, LoB2, LoC, LoC2, LoD2, LoE2, LuB, LuB2, LuC2, LuC3, LuD2, LuE, LuE3). (For properties of the Muskingum soil in mapping units LuB, LuB2, LuC2, LuC3, LuD2, LuE, and LuE3, refer to the Muskingum soil series in this table.)	Moderately deep, well-drained soils on uplands; 1 foot of silt loam underlain by 2 feet of loam, over sandstone or siltstone bedrock; soil may contain many fragments; upper 2 to 3 feet formed from glacial till; bedrock is weathered to a 4- to 6-foot depth below soil surface.	0–8 8–38
Luray (Lv, Lw) For properties of the Marengo soil in mapping units Lv and Lw, refer to Marengo soil series in this table.)	Very poorly drained, dark-colored soils on terraces; 1 foot of silty clay loam or silt loam underlain by 4 feet of loam or silty clay loam; the parent material is loam or silt loam alluvium; water table is at surface; depth to bedrock is more than 30 feet and in places is 200 feet.	0–8 8–30 30–56

properties of soils—Continued

Engineering classification		Percentage passing sieve—			Range in permeability	Estimated available moisture capacity	Range in reaction	Shrink-swell potential
Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				
					Inches per hour	*Inches per inch of soil*	*pH*	
ML	A-4	100	80–100	65–90	0. 63–2. 0	0. 18	4. 8–5. 4	Low.
CL	A-6	100	80–100	80–95	0. 2–0. 63	. 17	5. 1–6. 0	Moderate.
ML or CL	A-4 or A-6	80–100	80–100	70–90	0. 2–0. 63	. 17	6. 0–7. 0	Low.
ML	A-4	85–100	80–100	65–100	0. 63–2. 0	. 18	5. 1–5. 5	Low.
ML or CL	A-4		100	50–80	0. 2–0. 63	. 17	5. 1–5. 5	Low.
ML or CL	A-4	85–100	80–100	50–80	<0. 2	. 15	5. 1–6. 0	Low.
ML	A-4	85–100	80–100	50–70	0. 2	. 15	7. 0–7. 5	Low.
ML or CL	A-4	100	80–100	65–100	0. 63–2. 0	. 18	4. 5–5. 5	Low.
CL	A-6	100	80–100	80–90	0. 2–0. 63	. 17	4. 4–5. 5	Moderate.
ML	A-4	100	80–100	65–100	0. 63–2. 0	. 18	4. 7–5. 0	Low.
ML–CL	A-6	85–95	80–90	60–80	<0. 2	. 17	7. 0–7. 6	Moderate.
ML	A-4	100	80–100	65–100	0. 2–0. 63	. 18	4. 7–5. 5	Moderate.
CL or ML	A-6	85–95	80–90	80–85	0. 2	. 17	4. 8–5. 5	Moderate.
CH	A-7		80–100	80–100	<0. 2	. 16	5. 0–7. 6	High.
CL or ML	A-7	85–95	80–90	80–85	0. 2–0. 63	. 17	5. 2–6. 5	High.
CH	A-7	85–90	80–90	70–80	<0. 2	. 16	4. 9–7. 6	High.
ML	A-4	80–100	80–100	65–100	0. 63–2. 0	. 18	4. 5–5. 0	Low.
ML	A-4	80–100	80–100	65–100	0. 63–2. 0	. 18	4. 5–5. 0	Moderate.
ML	A-4	80–100	75–90	60–80	0. 63–2. 0	. 15	4. 5–5. 0	Low.
ML	A-4	75–95	75–90	60–70	2. 0–6. 3	. 15	4. 6–6. 0	Low.
ML or SM	A-4	75–90	75–85	40–70	2. 0–6. 3	. 18	5. 0–6. 7	Low.
SM, ML, or SC	A-2 or A-4	70–90	55–80	25–55	0. 63–2. 0	. 15	5. 0–6. 7	Low.
SM, SC, or GM	A-1 or A-2	30–75	30–60	20–35	0. 63–2. 0	. 15	6. 0–7. 0	Low.
Pt					0. 63–2. 0	. 25	6. 0–7. 0	High.
CH	A-7		100	95–100	<0. 063	. 15	6. 5–7. 5	High.
SM, SC, ML, or GM	A-4	65–85	60–85	35–55	2. 0–6. 3	. 15	4. 8–5. 0	Low.
ML or SM	A-4 or A-2	55–85	45–85	20–60	0. 63–2. 0	. 12	4. 5–5. 0	Low.
GP–GM or GM	A-2 or A-1	40–60	45–55	10–25	0. 2–0. 63	. 12	5. 0–5. 4	Low.
ML	A-4		100	65–95	2. 0–6. 3	. 18	5. 0–6. 0	Low.
ML	A-4	95–100	85–95	50–70	2. 0–6. 3	. 18	5. 0–6. 0	Low.
ML or SM	A-4 or A-2	90–100	85–95	25–60	2. 0–6. 3	. 14	5. 6–7. 0	Low.
CH	A-7		100	80–100	0. 2–0. 63	. 18	5. 2–7. 0	High.
CH	A-7		100	80–100	0. 063–0. 2	. 15	5. 3–7. 0	High.
CH	A-7		100	80–95	<0. 063	. 15	6. 5–7. 5	High.
ML	A-4	85–95	80–90	65–80	2. 0–6. 3	. 18	4. 8–5. 2	Low.
SM or GM	A-4	65–85	60–70	40–50	0. 63–6. 3	. 15	4. 8–5. 2	Low.
ML or CL	A-4 or A-6		90–100	80–100	0. 2–0. 63	. 18	6. 2–7. 0	Low.
ML or CL	A-4, A-6, or A-7.	90–100	80–100	70–95	<0. 2–0. 63	. 15	6. 2–7. 0	Moderate.
ML or CL	A-4 or A-6	85–100	80–100	75–100	<0. 2–0. 63	. 17	7. 0–7. 5	Low.

TABLE 4.—*Estimated*

Soil and map symbol	Description of soil and site	Depth from surface (typical profile)
		Inches
Marengo (Lv, Lw). (For properties of the Luray soil in mapping units Lv and Lw, refer to the Luray soil series in this table.)	Very poorly drained, dark-colored soils in upland depressions; 1 foot of silt loam or silty clay loam underlain by 2 to 3 feet of clay loam or silty clay loam; parent material is loam glacial till; water table is at surface; bedrock is at depth of more than 30 feet.	0–11 11–40 40–53
Monongahela (MoB, MoC, MoC2, MoD, MoD2, AmB, AmB2). (For properties of the Allegheny soil in mapping units AmB and AmB2, refer to the Allegheny soil series in this table.)	Deep, moderately well drained soils on terraces; 1 to 2 feet of silt loam underlain by 2 to 4 feet of silty clay loam; some thin layers of sand and gravel; seasonal water table is at a 2-foot depth; bedrock is at a 4- to 12-foot depth.	0–15 15–56 56–71
Muskingum (LuB, LuB2, LuC2, LuC3, LuD2, LuE, LuE3, UmB2, UmC2, UmD2, UmE2, UmF2, UmF3, WmB, WmB2, WmC, WmC2, WmC3, WmD, WmD2, WmD3, WmE2, WmE3, WmF, WmF3, WmG, WmG3). (For properties of the Loudonville soil in mapping units LuB, LuB2, LuC2, LuC3, LuD2, LuE, and LuE3, refer to the Loudonville soil series in this table. For properties of the Upshur soil in UmB2, UmC2, UmD2, UmE2, UmF2, and UmF3, refer to the Upshur soil series. For properties of the Weikert soil in mapping units WmB, WmB2, WmC, WmC2, WmC3, WmD, WmD2, WmD3, WmE2, WmE3, WmF, WmF3, WmG, and WmG3, refer to the Weikert soil series.)	Silty, moderately deep soils on uplands; underlain by weathered siltstone at a depth of 2 to 3 feet; the stone content increases below 1½ to 2 feet and ranges to 50 percent just above bedrock.	0–12 12–25
Negley (NeB, NeC2, NeD2, NgB, NgC, NgC2, NgD2, NIB, NIC2, NID2, NsE2, NsE3, CnF, CnF3). (For properties of the Chili and Conotton soils in mapping units CnF, and CnF3, refer to the Chili and Conotton soil series in this table.)	Well-drained soils on terraces and kames; 1 foot of gravelly silt loam underlain by gravelly sandy clay loam and gravelly loamy sand; the parent material is layers of gravel and sand; depth to bedrock is generally more than 30 feet and may be as much as 100 feet.	0–9 9–39 39–99
Olmsted (Od, Om)	Very poorly drained, dark-colored soils on stream terraces having slopes of 0 to 5 percent; about 1 foot of loam underlain by loam and gravelly loam; parent material is gravelly and sandy glacial outwash containing layers of finer textural material, which retards drainage; bedrock is generally at depth of more than 5 feet; frequently ponded.	0–10 10–32 32–44
Orrville (Or, Ov)	Somewhat poorly drained soils formed in alluvium on bottom lands having 0 to 2 percent slopes; 2 feet of silt loam underlain by loam and silt loam parent material; sandy and gravelly layers may be present; bedrock is generally at depth of more than 30 feet; water table is at 1-foot depth; subject to frequent flooding.	0–23 23–34 34–45
Papakating (Pa, Pc)	Very poorly drained, dark-colored soils from alluvium in bottom lands; ½ foot of silty clay loam or silt loam underlain by clay loam or loam parent material; bedrock is generally at depth of more than 30 feet; water table is at surface; subject to frequent flooding.	0–5 5–16 16–26
Parke (PkB, PkC, PkC2)	Well-drained soils or terraces; formed from medium-textured material over sand and gravel; 2 feet of silt loam underlain by 2 feet of clay loam and gravelly sandy clay loam, over layers of weathered sand and gravel; bedrock is at depth of more than 10 feet.	0–23 23–44 44–92
Purdy (Pu)	Poorly drained soil on terraces; 1 to 2 feet of silt loam underlain by silty clay loam; the parent material is silt loam to silty clay loam; water table is at depth of 0 to 1 foot; sandstone or siltstone bedrock is at 6- to 15-foot depth; thin layers of sand or gravel occur in places.	0–9 9–39 39–73

properties of soils—Continued

Engineering classification		Percentage passing sieve—			Range in permeability	Estimated available moisture capacity	Range in reaction	Shrink-swell potential
Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				
					Inches per hour	*Inches per inch of soil*	*pH*	
CL or MH	A-6 or A-7	95-100	80-100	80-95	0. 2-0. 63	0. 18	5. 5-7. 0	Moderate.
CL or CH	A-6 or A-7	90-100	85-100	65-85	<0. 2-0. 63	. 17	5. 9-7. 0	Moderate.
ML, CL, or CH	A-4, A-6, or A-7.	80-100	80-100	60-80	<0. 2-0. 63	. 15	7. 0-7. 5	Low.
ML	A-4		90-100	80-95	0. 63-2. 0	. 18	4. 7-5. 0	Low.
ML or CL	A-4 or A-6		85-100	70-95	0. 2-0. 63	. 17	4. 5-5. 0	Moderate.
ML, CL, or SM	A-4 or A-6		75-100	45-90	0. 2-0. 63	. 17	5. 3-6. 0	Moderate.
ML	A-4	80-100	70-95	50-85	0. 63-2. 0	. 18	4. 4-5. 0	Low.
ML or GM	A-4	60-90	50-85	45-70	0. 63-2. 0	. 14	4. 1-5. 0	Low.
ML	A-4	80-90	60-80	60-70	2. 0-6. 3	. 15	4. 2-4. 6	Low.
GM, SM, or ML	A-2 or A-4	55-80	50-75	25-60	2. 0-6. 3	. 16	4. 4-4. 6	Low.
GM or GP-GM	A-1	30-40	20-30	5-15	6. 3+	. 04	5. 0-6. 0	Low.
ML, SM	A-4 or A-2	70-90	60-80	30-70	2. 0-6. 3	. 18	6. 0-7. 0	Low.
ML, GM, or SM	A-4 or A-2	55-85	50-75	25-60	0. 63-2. 0	. 15	6. 0-7. 0	Low.
GM	A-1 or A-2	35-60	25-50	15-30	0. 63-2. 0+	. 10	6. 6-7. 5	Low.
ML	A-4		90-100	70-90	0. 63-2. 0	. 18	5. 0-6. 0	Low.
ML	A-4		90-100	50-80	0. 2-0. 63	. 18	5. 0-6. 6	Low.
ML or SM	A-4		80-90	40-65	0. 63-2. 0	. 18	6. 0-7. 0	Low.
ML, OL, or CL	A-4		100	90-100	0. 2-0. 63	. 18	5. 4-6. 0	Moderate.
ML or CL	A-6 or A-4		100	55-85	0. 2-0. 63	. 18	6. 0-7. 0	Moderate.
ML or CL	A-4		100	50-80	0. 2-0. 63	. 18	6. 4-7. 0	Moderate.
ML	A-4		85-100	50-95	0. 63-2. 0	. 18	4. 5-4. 8	Moderate.
SC or CL	A-6 or A-4	85-90	80-100	35-80	0. 63-2. 0	. 17	4. 5-4. 8	Moderate.
GM or GP-GM	A-1 or A-2	30-50	25-40	5-15	6. 3+	. 10	4. 5-5. 4	Low.
ML or CL	A-4		90-100	70-80	0. 63-2. 0	. 18	4. 6-4. 8	Moderate.
ML or CL	A-4		90-100	80-100	<0. 2	. 17	5. 0-5. 2	Moderate.
CL or CH	A-6 or A-7		90-100	80-90	<0. 2	. 17	5. 0-5. 2	Moderate.

TABLE 4.—*Estimated*

Soil and map symbol	Description of soil and site	Depth from surface (typical profile)
		Inches
Rainsboro (RaB, RaC, RaC2)	Deep, moderately well drained soils on terraces; 1 to 2 feet of silt loam underlain by 2 to 5 feet of gravelly sandy loam, over beds of gravel and sand; layers of silt loam or fine loam generally occur at a 4- to 10-foot depth and retard drainage; depth to sandstone or siltstone bedrock ranges from 10 to 30 feet.	0–19 19–43 43–71
Ravenna (RnA, RnB)	Somewhat poorly drained soils on uplands; 1 foot of silt loam underlain by loam; parent material is firm loam glacial till; depth to siltstone or sandstone bedrock is generally more than 10 feet; water table is at a 1- to 2-foot depth.	0–8 8–15 15–32 32–70
Rittman (RsB, RsC2, RsD2, RsE2, RtD3, RtE3).	Moderately well drained soils on uplands; 1 foot of silt loam underlain by 3 feet of clay loam; parent material is firm coarse clay loam glacial till; a periodic water table is at a 2-foot depth; bedrock is at a depth of more than 10 feet.	0–7 7–22 22–49 49–78
Sebring (Sb, Sc)	Poorly drained soils on terraces having slopes of 0 to 2 percent; about 1 foot of silt loam over 3 feet of silty clay loam, underlain by at least 5 feet of silt loam or loam; depth to bedrock is more than 10 feet and may be more than 100 feet; occasionally ponded.	0–8 8–43 43–60
Strip mine spoil:		
Glacial materials, rolling (SgD)	Loam glacial till mixed with some siltstone and sandstone rock material to a depth of more than 30 feet.	
Sandstone and shale materials, rolling (SmD).	Excavated siltstone, shale, and sandstone materials more than 30 feet deep	
Steep (SpF)	A mixture of glacial till, siltstone, shale, and sandstone; materials are more than 30 feet deep.	
Very acid (Ss)	A mixture of siltstone, shale, sandstone, and glacial till; materials are more than 30 feet deep.	
Summitville (SuB, SuC, SuC2, SuD2)	Moderately well drained soils on uplands; 1 foot of silt loam over 2 feet of silty clay loam, underlain by red clay shale, siltstone, or sandstone; depth to bedrock is 3 to 5 feet.	0–7 7–25 25–50
Titusville (TuB, TuC, TuC2, TuD, TuD2)	Moderately well drained soils on uplands, 2 feet of silt loam underlain by 1 foot of clay loam; parent material is firm loam glacial till; bedrock occurs at a 6- to 30-foot depth.	0–19 19–30 30–70
Tyler (TyA, TyB)	Somewhat poorly drained soils on terraces; 1 foot of silt loam underlain by silty clay loam; thin sandy or gravelly layers may occur; siltstone or sandstone bedrock is at a depth of 4 to 15 feet; water table is at a 1-foot depth.	0–16 16–73
Upshur (UmB2, UmC2, UmD2, UmE2, UmF2, UmF3). (For properties of the Muskingum soil in mapping units UmB2, UmC2, UmD2, UmE2, UmF2, and UmF3, refer to the Muskingum soil series in this table.)	Well-drained soils; 2 to 3 feet of clay over clay shale, siltstone, or sandstone	0–7 7–30
Wadsworth (WaA, WaB)	Somewhat poorly drained soils on uplands; 1 foot of silt loam underlain by 1 foot of silty clay loam, over a clay loam fragipan; parent material is firm clay loam glacial till; water table is at a 1-foot depth; bedrock is at a depth of more than 10 feet.	0–14 14–23 23–41 41–72
Wayland (Wc, Wd)	Poorly drained soils from alluvium on bottom lands; slopes ranges from 0 to 2 percent; 1 foot of silt loam or silty clay loam underlain by silt loam or loam parent material; sandy and gravelly layers may be present; bedrock is at a depth of more than 30 feet; water table is at surface; subject to frequent flooding.	0–10 10–22 22–37

properties of soils—Continued

Engineering classification		Percentage passing sieve—			Range in permeability	Estimated available moisture capacity	Range in reaction	Shrink-swell potential
Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				
					Inches per hour	*Inches per inch of soil*	*pH*	
ML	A-4	----------	100	65–100	2. 0–6. 3	0. 18	4. 8–5. 0	Low.
ML	A-4	100	80–100	65–100	0. 63–2. 0	. 17	4. 5–5. 0	Low.
SM	A-2 or A-4	85–100	80–100	25–45	2. 0–6. 3	. 10	4. 4–5. 5	Low.
ML	A-4	95–100	80–95	70–80	0. 63–2. 0	. 18	5. 0–5. 5	Moderate.
ML-CL or ML	A-4	95–100	80–100	60–75	0. 20–0. 63	. 15	5. 0–5. 5	Moderate.
ML-CL or ML	A-4	95–100	80–95	50–60	<0. 2	. 12	5. 0–5. 5	Moderate.
SM or ML	A-4	80–90	70–80	40–60	0. 2–0. 63	. 15	7. 0–7. 4	Moderate.
ML	A-4	85–95	80–95	65–85	0. 2–0. 63	. 18	5. 0–5. 4	Low.
CL or ML	A-4 or A-6	85–95	80–95	65–85	0. 2–0. 63	. 17	4. 9–5. 5	Moderate.
CL	A-6	85–95	80–90	55–70	<0. 2	. 12	6. 0–7. 5	Moderate.
CL	A-6	85–95	80–90	55–70	<0. 2	. 17	7. 0–7. 6	Moderate.
ML or CL	A-4 or A-6	----------	100	70–90	0. 63–2. 0	. 18	4. 2–5. 2	Low.
ML or CL	A-4 or A-6	80–100	80–95	70–90	0. 20–0. 63	. 17	4. 3–5. 6	Moderate.
ML or CL	A-4 or A-6	80–100	80–95	70–80	<0. 2–0. 63	. 17	6. 0–7. 4	Moderate.
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ML	A-4	80–95	75–90	70–80	0. 2–0. 63	. 18	4. 8–5. 0	Moderate.
MH or CH	A-7	80–90	75–90	70–80	0. 2–0. 63	. 17	4. 8–5. 0	High.
CH	A-7	80–90	70–80	70–80	<0. 2	. 14	5. 0–7. 5	High.
ML	A-4	100	80–100	70–90	0. 63–2. 0	. 18	4. 4–5. 0	Low.
ML or CL	A-4	80–100	80–100	60–85	0. 63–2. 0	. 17	4. 3–5. 0	Moderate.
ML or CL	A-4	80–90	80–90	60–80	0. 2–0. 63	. 14	4. 8–5. 2	Moderate.
ML	A-4	----------	100	70–85	0. 63–2. 0	. 18	4. 6–5. 0	Low.
CL or CH	A-6	----------	100	75–90	<0. 2	. 17	5. 0–5. 5	Moderate.
CH or CL	A-7	100	90–100	75–95	0. 2–0. 63	. 15	4. 5–7. 0	High.
CH	A-7	100	90–100	75–95	<0. 2	. 14	4. 6–7. 0	High.
ML	A-4	----------	90–100	70–90	0. 2–0. 63	. 17	5. 0–5. 4	Low.
CL	A-6	95–100	90–100	80–90	0. 2–0. 63	. 17	4. 8–5. 4	Moderate.
CL	A-6	95–100	80–100	65–75	<0. 2	. 14	5. 0–5. 5	Low.
CL	A-6	85–95	80–100	60–85	<0. 2	. 17	7. 0–7. 5	Low.
ML	A-4	100	90–100	70–80	0. 63–2. 0	. 18	5. 5–6. 5	Low.
CL or ML	A-4 or A-6	100	90–100	70–80	0. 2–0. 63	. 18	5. 2–7. 0	Moderate.
CL, ML, or SM	A-6 or A-4	90–100	80–95	45–70	0. 63–2. 0	. 15	5. 6–7. 4	Low.

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TABLE 4.—*Estimated*

Soil and map symbol	Description of soil and site	Depth from surface (typical profile)
		Inches
Weikert (WmB, WmB2, WmC, WmC2, WmC3, WmD, WmD2, WmD3, WmE2, WmE3, WmF, WmF3, WmG, WmG3). (For properties of the Muskingum soil in mapping units WmB, WmB2, WmC, WmC2, WmC3, WmD, WmD2, WmD3, WmE2, WmE3, WmF, WmF3, WmG, and WmG3, refer to the Muskingum soil series in this table.)	Shallow soils on uplands; about 1 foot of silt loam underlain by 1 foot of very shaly silty loam and several feet of weathered black clay shale bedrock; water table is below a 3-foot depth.	0–8 8–18
Wellston (WnB, WnC, WnC2, WnD2, WnE2)	Moderately deep soils on uplands; 2 to 3 feet of channery silt loam underlain by weathered siltstone bedrock; bedrock is at a depth of 2½ to 3½ feet.	0–8 8–37
Wharton (WoB, WoC, WoC2, WoD2)	Moderately well drained soils on uplands; 1 foot of silt loam underlain by 2 to 3 feet of silty clay loam; parent material is soft weathered clay shale; bedrock is at a depth of 3 feet.	0–13 13–22 22–38
Willette (Wp)	2 to 3 feet of muck in swamps; underlain by clayey material; water table is at surface; bedrock is at a depth of 10 to 100 feet; ponded.	0–26 26–60
Wooster (WrC2, WsB, WsB2, WsC, WsC2, WtD, WtD2, WtD3, WtE2, WtE3, WtF2, WtF3, WtG2).	Well-drained soils on uplands; 1 foot of loam or silt loam, underlain by 4 feet of loam; parent material is firm loam glacial till; depth to bedrock is generally more than 10 feet.	0–5 5–56 56–60

The shrink-swell potential indicates how much a soil changes in volume when its moisture content changes. It is estimated primarily on the basis of the amount and kind of clay the soil contains.

Engineering interpretations of soils

In table 5 the soils of the county are rated according to their suitability as a source of topsoil and of sand and gravel. In addition, table 5 lists soil features that affect suitability of the soils for road fill, highway location, and selected engineering practices. These interpretations are based on soil test data and on field experience. Following are explanations of the data in the columns of table 5.

Suitability as source of topsoil.—The thickness, texture, and inherent fertility of the surface layer determine the suitability of soil for use as a topdressing.

Suitability as source of sand and gravel.—The amount, quality, and accessibility of granular (coarse-grained) materials are the most important considerations.

Suitability as source of road fill.—Well-graded coarse-grained materials or mixtures of clay and coarse-grained materials are very desirable for road fill. Highly plastic clayey soils, poorly graded silty soils, and organic soils are difficult to compact and are poor in stability; consequently, they are undesirable for road fill.

The following paragraphs explain the columns relating to "Soil features affecting suitability for—."

Highway location.—In this column are given soil features that might influence the selection of routes and highways. The features considered detrimental are a high water table, flooding, seepage, plastic soil material, the presence of muck or rock, unstable slopes, and material that is susceptible to frost action.

Reservoir areas for farm ponds.—Consideration is given primarily to the sealing potential of the soil material that will be covered by water. Also noted are gravelly soil material and shallowness to bedrock.

Dikes, levees, and embankments for farm ponds.—Considered are the stability and permeability of the materials when used in the construction of dikes, levees, and embankments. In addition, the presence of permeable material and shallowness to bedrock are noted.

Agricultural drainage.—The soils are described relative to their natural drainage, their in-place permeability, and the presence of a high water table.

Irrigation.—The rate of water intake, permeability, natural drainage, and available water capacity are the properties of soils that affect irrigation. Little irrigation is practiced in the county at the present time, but there likely will be more in the future.

Terraces, diversions, and waterways.—Erodibility of the soils, the depth to bedrock, and the occurence of seepage are some of the main considerations.

properties of soils—Continued

Engineering classification		Percentage passing sieve—			Range in permeability	Estimated available moisture capacity	Range in reaction	Shrink-swell potential
Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				
					Inches per hour	*Inches per inch of soil*	*pH*	
GM or SM	A–2 or A–4	40–60	35–50	30–45	2. 0–6. 3	0. 15	4. 4–4. 8	Low.
SM, GM, GW–GM, or SW–SM.	A–1 or A–2	20–60	20–45	10–35	2. 0–6. 3	. 10	4. 6–5. 2	Low.
ML	A–4	90–100	85–100	70–95	2. 0–6. 3	. 18	4. 2–5. 0	Moderate.
ML or CL	A–4	70–95	60–80	55–90	0. 63–2. 0	. 17	4. 3–5. 0	Moderate.
ML	A–4	100	95–100	80–90	0. 2–0. 63	. 18	4. 6–5. 0	Low.
ML, CL, or CH	A–7	100	95–100	80–95	<0. 2	. 17	4. 7–5. 0	Moderate.
ML, CL, or CH	A–6 or A–7	75–85	70–85	65–85	<0. 2	. 16	4. 8–5. 5	Moderate.
Pt					0. 63–2. 0	. 25	6. 0–7. 0	High.
CH	A–7		100	90–100	<0. 2	. 14	6. 5–7. 5	High.
ML	A–4	90–100	80–90	70–80	0. 63–2. 0	. 18	5. 0–5. 4	Low.
ML or CL	A–4	90–100	80–100	60–85	0. 63–2. 0	. 17	5. 0–5. 4	Low.
ML	A–4	85–95	80–90	50–80	0. 63–2. 0	. 15	7. 0–7. 5	Low.

Soil test data

To help evaluate the soils for engineering purposes, soil samples from the principal soil types of 11 extensive soil series were tested in accordance with standard AASHO procedures. The test data are given in table 6.

The engineering soil classifications in table 6 are based on data obtained by mechanical analyses and by tests to determine liquid limits and plastic limits. Mechancial analyses were made by combined seive and hydrometer methods. The percentages of silt and clay obtained by the hydrometer method should not be used in naming textural classes of soils.

The tests to determine 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 the plastic state to a liquid. The plastic limit is the moisture content 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 plastic limit and the liquid limit. It indicates the range of moisture content within which a soil material is in a plastic condition.

Table 6 also gives moisture density, or compaction, for the tested soils. If soil material is compacted at a successively higher moisture content, assuming that the compactive effect remains constant, the density of the compacted material will increase until the optimum moisture content is reached. After that the density decreases with increase in moisture content. The highest dry density obtained in the compaction test is termed "maximum dry density." Moisture-density data are important in earthwork, for, as a rule, optimum stability is obtained if the soil is compacted to about the maximum dry density when it is at approximately the optimum moisture content.

Soils and Land Use Planning

Most of Columbiana 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, and commercial areas (fig. 9). As the present trend continues, many additional areas now in crops or pasture will be transformed into community developments, especially along the Ohio River and in the northern part of the county.

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 report. Table 5 in the subsection "Use of Soils in Engineering" gives information on the features of soils in each series that affect the

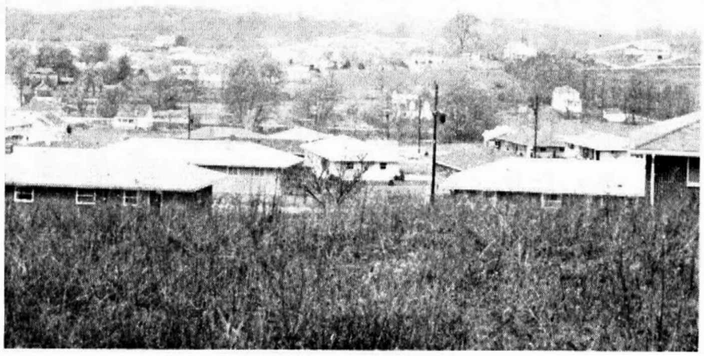

***Figure 9.*—A developing community on Allegheny and Muskingum soils near East Liverpool, Ohio. This area was farmland only a few years ago.**

location of highways, the construction of ponds, and other uses. In table 4 the soil properties important in engineering are estimated.

In table 7 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. 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 7:

Agriculture.—Limitations on the use of soils for agriculture are rated to assist land-use planners in weighing the suitability of an individual area for cultivated crops against the suitability of that area for other sound uses. In rating the limitations for culivated crops and similar uses, the commercial production of general crops and specialty crops is considered. 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. 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 4 for estimates of permeability.)

If filter fields are located on slopes of more than 10 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. Before a septic tank system is installed, an investigation should be made at the proposed site to determine the condition of the soil.

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 feasable 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.

Flooding is a severe hazard when it occurs. For individual houses or small groups of houses, limitations are moderate on slopes of 25 percent or less and are severe on slopes exceeding 25 percent. For homesites in larger developments, limitations are severe on all slopes of more than 15 percent. In areas where drainage is less than good, the foundation should be designed to take this into account. Soils that are somewhat poorly drained to very poorly drained generally have low bearing strength for buildings, and material from soils having moderate or high shrink-swell potential should not be used as back fill around foundations. Sloping soils in the Cavode, Ernest, Fitchville, Guernsey, Laidig, Monongahela, Summitville, Upshur, and Wharton series are unstable and subject to slippage.

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.

Streets and parking lots.—Soil requirements and limitations for streets and parking lots are similar to those for highways (see tables 4 and 5 in the subsection "Use of Soils in Engineering"). Table 4 gives, for major horizons of the soils in each series, the range in permeability, the shrink-swell potential, and other physical properties. In table 5 are shown the features of each soil that affect suitability for road fill and for highway location. The degree of slope that should be designed for the side 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 Columbiana County. Potentially, all the soils of the county are suitable for one or more kinds of recreational development (fig. 10). 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 moderately well drained soils and are severe on somewhat poorly drained to very poorly drained soils. In addition, limitations are severe on muck soils, on soils along streams where flooding is a hazard, and on soils in basinlike areas that are ponded after a heavy rain. As a rule, slopes of 10 to 15 percent are less desirable than milder slopes, and slopes in excess of 15 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 or severe on stony or rocky soils and are severe on loose sand and on very gravelly or very channery soils.

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. Consequently, 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, 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.

***Figure 10.*—The gorge of Little Beaver Creek, a good area for hiking, picnicking, and other forms of recreation.**

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 natural 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 that are deep, well drained or moderately well drained, and on slopes of less than 15 percent 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 that is 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.

TABLE 5.—*Engineering*

Soil series, soil types, land types, and map symbols	Suitability as source of—			Soil features affecting suitability for—
	Topsoil	Sand and gravel	Road fill	Highway location
Allegheny:				
Silt loam (AhC, AhC2, AhD, AhD2, AmB, AmB2). (For interpretations of the Monongahela soil in mapping units AmB and AmB2, see the Monongahela series in this table.)	Fair in surface layer	Unsuitable; some thin layers of poorly graded sand and gravel may occur below a 6-foot depth.	Good	Unstable slopes
Silt loam, sandstone substratum (AIC).	Fair in surface layer	Unsuitable	Fair	Bedrock at 3- to 4-foot depth.
Bogart (BgA, BgB, BoA, BoB, BsC, BsC2).	Good in surface layer	Good; sandy and gravelly layers below a 3-foot depth; layers of silty and clayey material present.	Good	Subject to seepage
Canfield (CaB, CaB2, CaC, CaC2).	Fair in surface layer	Unsuitable	Good	Seasonally high water table.
Carlisle (Cc)	Good in muck layer	Unsuitable	Poor	High water table; muck is unstable.
Cavode (CdB, CdC, CdC2)	Poor to fair in surface layer.	Unsuitable	Poor	Seasonally high water table; bedrock at 4-foot depth; susceptible to frost action; subject to seepage; plastic; unstable slopes.
Chagrin (Ce, Cg)	Good to fair to a 3-foot depth.	Fair; sand and gravel occur at a depth greater than 2 feet; grade is variable; water table at 3- to 4-foot depth; subject to flooding.	Fair	Subject to occasional flooding.
Chili (ChB, ChC2, ChD2, CIA, CIB, CIB2, CIC, CIC2, CID, CID2, CIE2, CmC3, CmD3, CmE3, CnF, CnF3). (For interpretations of the Conotton and Negley soils in mapping units CnF and CnF3, see the Conotton and Negley series in this table.)	Fair in loam and silt loam surface layers.	Good; well-graded sand and gravel in thick layers; contains concretions of iron carbonate.	Good	Steep slopes in some places
Chilo (Co)	Good in surface layer	Fair; some poorly graded sand and fine gravel may occur in thin layers at a depth of 8 feet; high water table.	Poor	High water table; susceptible to frost action; subject to seepage; unstable slopes.

interpretations of the soils

Soil features affecting suitability for—Continued				
Reservoir areas for farm ponds	Dikes, levees, and embankments for farm ponds	Agricultural drainage	Irrigation	Terraces, diversions, and waterways
Permeable; much blending needed.	Fair stability; low piping resistance.	Not needed	Well drained; moderately permeable; medium available water capacity.	Erodible; seepage occurs through berm.
Permeable; bedrock must be blanketed.	Poor stability; bedrock at 3- to 4-foot depth; pervious; low piping resistance.	Not needed	Well drained; moderately permeable; medium to low available water capacity.	Erodible; bedrock at 3- to 4-foot depth; seepage occurs through berm.
Permeable	Permeable; stable; low piping resistance.	Moderately rapidly permeable; random tiling beneficial; ditch walls tend to collapse.	Moderate water intake rate if tile drained.	Difficult to maintain gradient; channels tend to silt; erodible; seepage occurs through berm.
In places there are thin, permeable layers that must be blended.	Fair stability; moderate piping resistance; impervious when compacted.	Moderately well drained; random tile drains are beneficial.	Moderately slowly permeable; moderate water intake rate; medium available water capacity.	Somewhat erodible; other soil properties favorable.
Organic material is thick; underlying soil material is generally impermeable; piping possible through some sandy layers if pressure is great.	Organic material permeable and unstable.	Muck drains well; tile drains must be placed deeper than 36 inches because of shrinkage of muck; high water table.	Very poorly drained; moderate water intake rate if tile drained.	Muck cannot be used in construction.
Impermeable, but exposure of bedrock must be avoided.	Moderate shrink-swell potential; cracks when dry; poor to fair stability; high piping resistance.	Slowly permeable; surface drainage necessary.	Slow water intake rate	Erodible; low fertility; other soil properties favorable.
Sandy and gravelly layers are very permeable; subject to piping.	Pervious; poor stability; low piping resistance.	Not needed	Rapid water intake rate; high available water capacity.	Difficult to maintain gradient; easily excavated.
Rapidly permeable gravelly material.	Very pervious; reasonably stable; low piping resistance.	Not needed	Rapid water intake rate; low available water capacity; frequent application needed.	Difficult to maintain gradient; channels tend to silt; seepage occurs through berm; easily excavated.
Thin sandy and gravelly layers must be blanketed.	Poor stability; very slowly pervious; moderate shrink-swell potential; cracks when dry; moderate to high piping resistance.	High water table; slowly permeable; both tile and surface drainage may be necessary.	Very poorly drained; very slow water intake rate.	Seepage occurs most of year.

TABLE 5.—*Engineering interpretations*

Soil series, soil types, land types, and map symbols	Suitability as source of—			Soil features affecting suitability for—
	Topsoil	Sand and gravel	Road fill	Highway location
Conotton (CnF, CnF3) (For interpretations of the Chili and Negley soils in mapping units CnF and CnF3, see the Chile and the Negley series in this table.)	Unsuitable	Good; well-graded sand and gravel in thick layers; contains iron carbonate concretions.	Good	Steep slopes in some places.
Damascus (Da)	Fair in surface layer.	Fair below a depth of 3 feet; some silty and clayey layers; thin layers of well-graded sand and gravel in places; high water table.	Fair	High water table; susceptible to frost action; subject to seepage.
Dekalb (DeB, DeC, DeC2, DeD2, DeE2, DeF, DeF2, DkF3, DsD, DsF).	Unsuitable; rocky	Unsuitable	Good	Bedrock at 2- to 3-foot depth; large boulders in some areas; steep slopes in some areas.
Ernest (ErC, ErD2, ErE2, ErF2)	Poor to fair in surface layer.	Unsuitable	Fair	Subject to slides; subject to seepage; large boulders in some areas; unstable slopes.
Fitchville (FcA, FcB)	Fair to poor in surface layer.	Unsuitable	Poor	Seasonally high water table; susceptible to frost action; subject to seepage; unstable slopes.
Frenchtown (Fr)	Poor	Unsuitable	Poor	High water table; susceptible to frost action; subject to seepage.
Glenford (GfB, GfC, GfC2)	Fair in surface layer.	Poor, but sand and gravel may occur at depth of more than 6 feet.	Poor	Unstable slopes.
Gresham (GrB, GrC)	Poor to fair in surface layer.	Unsuitable	Fair	Seasonally high water table; susceptible to frost action; subject to seepage.
Guernsey:				
Silt loam (GuB, GuC, GuC2, GuD2).	Good in surface layer.	Unsuitable	Poor	Bedrock at 4-foot depth; susceptible to frost action; subject to seepage; plastic; unstable slopes.
Silty clay loam (GvD2, GvE2).	Fair in surface layer.	Unsuitable	Poor	Bedrock at 2- to 4-foot depth; susceptible to frost action; subject to seepage; plastic.
Hanover (HaB, HaB2, HaC, HaC2, HaD2, HaE2).	Fair in surface layer.	Unsuitable	Good	Steep slopes in some places.

of the soils—Continued

Soil features affecting suitability for—Continued				
Reservoir areas for farm ponds	Dikes, levees, and embankments for farm ponds	Agricultural drainage	Irrigation	Terraces, diversions, and waterways
Rapidly permeable gravelly material.	Very pervious; reasonably stable; low piping resistance.	Not needed.	Very rapid water intake rate; very low to low available water capacity; frequent application needed.	Difficult to maintain gradient; channels tend to silt; seepage occurs through berm; easily excavated.
Permeable layers present; subject to piping.	Pervious; coarse sand and gravel; reasonably stable; fine sand layers must be blended; low piping resistance.	Poorly drained; high water table; moderately permeable if tile drained, and good outlets can be obtained; ditch walls collapse.	Poorly drained; moderate water intake rate if tile drained.	Difficult to maintain gradient; seepage occurs all year and through berm; easily excavated.
Rapidly permeable sandstone layers.	Stony; very pervious; low piping resistance.	Not needed.	Very rapid water intake rate; low available water capacity; frequent application needed.	Bedrock at 2- to 3-foot depth.
Permeable; blending needed if substratum contains shaly layers.	Fair stability; slowly permeable when compacted; low piping resistance.	Slowly permeable; random tiling beneficial.	Moderately well drained; subject to seepage.	No adverse features.
Piping possible through thin sandy and silty layers; some blending necessary.	Moderate piping resistance; poor stability; impervious if properly compacted.	Moderately slowly permeable; both tile and surface drainage may be needed.	Slow water intake rate; moderately slowly permeable.	Erodible; channels tend to silt; other properties favorable.
Some blending may be necessary on thin sandy layers.	Stable; impervious when compacted; high piping resistance.	Slowly permeable; poorly drained; high water table.	Poorly drained; slowly permeable; high water table.	Seepage occurs most of year.
Sandy and gravelly layers must be blanketed.	Moderately slowly permeable; poor stability; low piping resistance.	Moderately slowly permeable; random tiling beneficial.	Moderately well drained; moderately slowly permeable; medium available water capacity.	Erodible; channels tend to silt.
Some blending may be necessary on thin sandy layer.	Stable; impervious when compacted; high piping resistance.	Slowly permeable; somewhat poorly drained; high water table.	Somewhat poorly drained; slowly permeable.	Seepage occurs during wet periods.
Impermeable; any exposed bedrock must be blanketed.	Impervious when properly compacted; fair stability; moderate shrink-swell potential; subject to cracking; high piping resistance.	Slowly permeable; random tiling beneficial.	Moderately well drained; slowly permeable; medium available water capacity.	Erodible.
Bedrock may be pervious and must be blanketed.	Shallow to rock; high shrink-swell potential; subject to cracking.	Slowly permeable; bedrock at 2- to 4-foot depth.	Moderately well drained; slowly permeable; steep slopes.	Bedrock at 2- to 4-foot depth.
Moderately permeable; some blending may be necessary.	Fair stability; moderate piping resistance; impervious when compacted.	Not needed.	Well drained; moderately permeable; medium available water capacity.	Erodible.

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TABLE 5.—*Engineering interpretations*

Soil series, soil types, land types, and map symbols	Suitability as source of—			Soil features affecting suitability for—
	Topsoil	Sand and gravel	Road fill	Highway location
Jimtown (JtA, JtB, JwA, JwB)	Fair in surface layer.	Fair below a depth of 5 to 6 feet; well-graded sand and gravel in thick layers; some silty and clayey layers; in places there are layers of poorly graded sand and gravel in substratum; high water table.	Fair	Seasonally high water table; susceptible to frost action; subject to seepage.
Kerston (Km)	Good	Unsuitable	Unsuitable	Bog; high water table
Laidig (LaC, LaD, LaE, LaF)	Unsuitable	Unsuitable	Good	Subject to slides; large boulders.
Lobdell (Lb, Ld)	Fair in surface layer	Sand may occur at a depth greater than 3 to 4 feet; grade is variable; high water table.	Fair to poor	Subject to floods; susceptible to frost action.
Lorain (Ln)	Surface layer good but difficult to work.	Unsuitable	Poor	High water table; susceptible to frost action; subject to ponding; plastic; unstable.
Loudonville (LoB, LoB2, LoC, LoC2, LoD2, LoE2, LuB, LuB2, LuC2, LuC3, LuD2, LuE, LuE3) (For interpretations of the Muskingum soils in mapping units LuB, LuB2, LuC2, LuC3, LuD2, LuE, and LuE3, see the Muskingum series in this table.)	Fair in surface layer	Unsuitable	Fair	Bedrock at 2- to 3-foot depth.
Luray (Lv, Lw) (For interpretations of the Marengo soils in mapping units Lv and Lw, see the Marengo series in this table.)	Good in surface layer.	Unsuitable	Poor	High water table; susceptible to frost action; subject to seepage; plastic; unstable.
Marengo (Lv, Lw) (For interpretations of the Luray soil in mapping units Lv and Lw, see the Luray series in this table.)	Good in surface layer.	Unsuitable	Poor	High water table; susceptible to frost action; subject to seepage; plastic; unstable.
Monongahela (MoB, MoC, MoC2, MoD, MoD2, AmB, AmB2. (For interpretations of the Allegheny soil in mapping units AmB and AmB2, see the Allegheny series in this table.)	Fair in surface layer	Unsuitable; some thin layers of poorly graded sand and gravel may occur below a 6-foot depth.	Fair	Unstable slopes.

of the soils—Continued

Soil features affecting suitability for—Continued				
Reservoir areas for farm ponds	Dikes, levees, and embankments for farm ponds	Agricultural drainage	Irrigation	Terraces, diversions, and waterways
Permeable sandy and gravelly layers present.	Reasonably stable; pervious; low piping resistance.	Moderately permeable if tile drained; high water table; ditch walls tend to collapse.	Somewhat poorly drained; moderately permeable.	Difficult to shape; channels silt; seepage occurs through berm.
Permeable; much blending and sealing necessary.	High organic-matter content; low piping resistance; unstable.	Moderately permeable if tile drained; high water table; very poorly drained.	Very poorly drained; moderately permeable if tile drained.	Muck cannot be used in construction.
Permeable material	Stable; permeable; large stones present; low piping resistance.	Not needed	Not used for farming	Not used for farming.
Sandy and gravelly layers are very permeable; subject to piping.	Sandy layers are permeable; subject to piping; poor stability.	Moderately permeable; random tile drains beneficial; ditch walls tend to collapse.	High water intake rate; high available water capacity.	May be needed to control runoff from upland; difficult to maintain gradient; channels tend to silt.
Impermeable	Impermeable when compacted; high shrink-swell potential; cracks when dry; poor stability.	High water table; very slowly permeable; tile and surface drainage needed; outlets often lacking.	Very poorly drained	Ponded during most of year; other properties favorable.
Bedrock is permeable	Permeable; shallow to bedrock; fair stability; low piping resistance.	Not needed	Moderate to rapid water intake rate; medium available water capacity.	Bedrock at 2- to 3-foot depth.
Slowly permeable; some blending needed.	Slowly permeable; thin sandy layers, if present, must be blanketed; fair to poor stability; moderate piping resistance.	High water table; slowly permeable.	Very poorly drained; slowly permeable.	Seepage occurs most of year; other properties favorable.
Slowly permeable	Slowly permeable; thin sandy layers, if present, must be blanketed; fair to poor stability; moderate piping resistance.	High water table; slowly permeable.	Very poorly drained; slowly permeable.	Seepage occurs most of year; other properties favorable.
Much blending and blanketing needed on layers of sand and gravel.	Sandy layers must be blended; fair to poor stability; low piping resistance.	Moderately slowly permeable; random tiling beneficial.	Moderate water intake rate; medium available water capacity.	Channels tend to silt; erodible; seepage occurs through berm.

TABLE 5.—*Engineering interpretations*

Soil series, soil types, land types, and map symbols	Suitability as source of—			Soil features affecting suitability for—
	Topsoil	Sand and gravel	Road fill	Highway location
Muskingum (LuB, LuB2, LuC2, LuC3, LuD2, LuE, LuE3, UmB2, UmC2, UmD2, UmE2, UmF2, UmF3, WmB, WmB2, WmC, WmC2, WmC3, WmD, WmD2, WmD3, WmE2, WmE3, WmF, WmF3, WmG, WmG3). (For interpretations of the Loudonville soil in mapping units LuB, LuB2, LuC2, LuC3, LuD2, LuE, and LuE3, see the Loudonville series in this table. For interpretations of the Upshur soil in mapping units UmB2, UmC2, UmD2, UmF2, and UmF3, see the Upshur series. For interpretations of the Weikert soil in mapping units, WmB, WmB2, WmC, WmC2, WmC3, WmD, WmD2, WmD3, WmE2, WmE3, WmF, WmF3, WmG, and WmG3, see the Weikert series.)	Poor	Unsuitable	Fair	Bedrock at 1- to 3-foot depth.
Negley (NeB, NeC2, NeD2, NgB, NgC, NgC2, NgD2, NlB, NlC2, NlD2, NsE2, NsE3, CnF, CnF3). (For interpretations of the Chili and Conotton soils in mapping units CnF and CnF3, see the Chili and Conotton series in this table.)	Unsuitable	Good; well-graded sand and gravel in thick layers; contains iron carbonate concretions.	Good	Steep slopes in some places.
Olmsted (Od, Om)	Good in surface layer.	Fair; possible source of sand and gravel, but unconformable silty and clayey layers occur at various depths; high water table.	Fair	High water table; susceptible to frost action; subject to seepage.
Orrville (Or, Ov)	Fair	Poor; subject to flooding	Poor	High water table; subject to flooding; susceptible to frost action; subject to seepage.
Papakating (Pa, Pc)	Good	Unsuitable	Poor	High water table; subject to flooding; susceptible to frost action; subject to ponding.
Parke (PkB, PkC, PkC2)	Fair in surface layer	Good; well-graded sand and gravel in thick layers at depth of more than 6 feet; contains iron carbonate concretions.	Good	No adverse features
Purdy (Pu)	Poor	Unsuitable	Poor	High water table; susceptible to frost action; subject to seepage; unstable slopes.

of the soils—Continued

Soil features affecting suitability for—Continued				
Reservoir areas for farm ponds	Dikes, levees, and embankments for farm ponds	Agricultural drainage	Irrigation	Terraces, diversions, and waterways
Shallow to rock; bedrock is permeable.	Permeable; shallow to bedrock; fair stability.	Not needed	Rapid water intake rate: low available moisture capacity; frequent application needed.	Bedrock at 1- to 3-foot depth.
Moderately rapidly permeable.	Low piping resistance; gravelly and sandy; very permeable; stable.	Not needed	Rapid water intake rate; low available water capacity; frequent application needed.	Difficult to maintain gradient; channels tend to silt; seepage occurs through berm.
Sandy and gravelly areas must be blanketed.	Pervious; fair stability; low piping resistance; wet most of the year.	High water table; ditches tend to collapse; other soil properties favorable.	Very poorly drained; slow water intake rate unless tile drained.	Difficult to maintain gradient; seepage occurs most of year.
Some blending and blanketing needed on sandy layers.	Moderately slowly permeable; subject to piping; poor stability.	High water table; moderately slowly permeable; ditch walls tend to collapse.	Somewhat poorly drained; moderately slowly permeable.	May be needed to control runoff from upland; difficult to maintain gradient; channels tend to silt.
Moderately slowly permeable; some blending and blanketing needed on sandy layers.	Subject to piping; must be blended; poor stability.	High water table; moderately slowly permeable; ditch walls tend to collapse; outlets often are lacking.	Very poorly drained	Needed to control runoff from upland; difficult to maintain gradient; channels tend to silt; wet most of year.
Rapidly permeable in sand and gravel.	Gravelly and sandy; very permeable; subject to piping.	Not needed	Moderate water intake rate; medium available water capacity.	Difficult to maintain gradient; channels tend to silt; seepage occurs through berm.
Some blending needed on sandy layers.	Sandy layers, if present, must be blended; poor stability; impervious if properly compacted; low to moderate piping resistance.	High water table; slowly permeable; both tile and surface drainage needed.	Poorly drained; slowly permeable.	Seepage occurs most of year; other properties favorable.

TABLE 5.—*Engineering interpretations*

Soil series, soil types, land types, and map symbols	Suitability as source of—			Soil features affecting suitability for—
	Topsoil	Sand and gravel	Road fill	Highway location
Rainsboro (RaB, RaC, RaC2)	Fair in surface layer	Fair; unsuitable material above a 6-foot depth; well-graded sand and gravel may occur at greater depths but contains unconformable silty and clayey layers.	Good	Seasonally high water table
Ravenna (RnA, RnB)	Fair in surface layer	Unsuitable	Fair	Seasonally high water table; susceptible to frost action; subject to seepage.
Rittman (RsB, RsC2, RsD2, RsE2, RtD3, RtE3).	Fair in surface layer	Unsuitable	Fair	Susceptibility to frost action; subject to seepage.
Sebring (Sb, Sc)	Poor in surface layer	Unsuitable	Poor	High water table; susceptible to frost action; subject to seepage; unstable slopes.
Strip mine spoil: Glacial materials, rolling (SgD)	Unsuitable	Unsuitable	Good	Variable material; susceptible to frost action; unstable slopes.
Sandstone and shale materials, rolling (SmD).	Unsuitable	Unsuitable	Good	Variable material
Steep (SpF)	Unsuitable	Unsuitable	Good	Variable material
Very acid (Ss)	Unsuitable	Unsuitable	Poor	Variable material
Summitville (SuB, SuC, SuC2, SuD2).	Good in surface layer	Unsuitable	Poor	Susceptible to frost action; subject to seepage; plastic; unstable slopes.
Titusville (TuB, TuC, TuC2, TuD, TuD2).	Fair in surface layer	Unsuitable	Fair to good	Subject to seepage
Tyler (TyA, TyB)	Fair in surface layer	Unsuitable; thin, poorly graded layers of sand may occur; high water table.	Poor	Seasonally high water table; susceptible to frost action; subject to seepage; unstable slopes.
Upshur (UmB2, UmC2, UmD2, UmE2, UmF2, UmF3). (For interpretations of the Muskingum soil in mapping units (UmB2, UmC2, UmD2, UmE2, UmF2, and UmF3, see the Muskingum series in this table.)	Unsuitable	Unsuitable	Poor	Subject to slipping; 2 to 3 feet to bedrock; susceptible to frost action; subject to seepage; plastic; unstable slopes.

of the soils—Continued

Soil features affecting suitability for—Continued				
Reservoir areas for farm ponds	Dikes, levees, and embankments for farm ponds	Agricultural drainage	Irrigation	Terraces, diversions, and waterways
Permeable layers present; subject to piping; unsuitable unless entire area can be blanketed.	Pervious; fair stability; poor compaction; low resistance to piping.	Moderately well drained and permeable; random tile drains are beneficial.	Moderate rate of water intake; moderate permeability; medium available water capacity.	Difficult to maintain gradient; channels tend to silt; seepage occurs through berm; easily excavated.
Slowly permeable; possible thin sandy and gravelly layers need blending.	Fair stability; slowly permeable; high piping resistance; impervious when compacted.	Seasonally high water table; slowly permeable.	Slow water intake rate; somewhat poorly drained.	Erodible; other properties favorable.
Slowly permeable; possible thin sandy and gravelly layers need blending.	Stable; slowly permeable; high piping resistance; impervious when compacted.	Slowly permeable; random tile drains beneficial.	Slow to moderate water intake rate; medium available water capacity.	Erodible; other properties favorable.
Slowly permeable; possible thin sandy layers need blending.	Poor stability; very slowly permeable; low to moderate piping resistance.	High water table; slowly permeable; both tile and surface drainage needed.	Slowly permeable; poorly drained.	Seepage occurs most of year; other properties favorable.
Slowly permeable	Fair stability; slowly permeable; impervious when compacted; moderate piping resistance.	Not used for farming	Not used for farming	Not used for farming.
Permeable	Fair stability; permeable; low to moderate piping resistance.	Not used for farming	Not used for farming	Not used for farming.
Permeable	Low to moderate piping resistance; fair stability; permeable.	Not used for farming	Not used for farming	Not used for farming.
Permeable	Fair stability; permeable; low to moderate piping resistance.	Not used for farming	Not used for farming	Not used for farming.
Impermeable	High shrink-swell potential; cracks when dry; impermeable; poor stability; plastic material; high piping resistance.	Slowly permeable; random tile drains beneficial.	Slow water intake; moderate water holding capacity.	Very erodible; other properties favorable.
Moderately slowly permeable; possible thin sandy and gravelly layers need blending.	Moderately slowly permeable; stable; impervious when compacted; high piping resistance.	Moderately slowly permeable; random tile drains beneficial.	Moderate water intake; medium water holding capacity.	Erodible; other properties favorable.
Slowly permeable; thin sandy layers, if present, need blending.	Poor stability; slowly permeable; low to moderate piping resistance.	High water table; slowly permeable.	Slow intake rate; needs drainage first.	Difficult to maintain gradient; channels tend to silt; erodible; seepage occurs through berm.
Bedrock at 2- to 3-foot depth.	Plastic and impervious when compacted; high shrink-swell potential.	Not needed	Not normally irrigated	Bedrock at 2- to 3-foot depth; erodible.

TABLE 5.—*Engineering interpretations*

Soil series, soil types, land types, and map symbols	Suitability as source of—			Soil features affecting suitability for—
	Topsoil	Sand and gravel	Road fill	Highway location
Wadsworth (WaA, WaB)	Fair in surface layer	Unsuitable	Fair	High water table; susceptible to frost action; subject to seepage.
Wayland (Wc, Wd)	Fair in surface layer	Unsuitable; poorly graded, thin sandy layers in places below a 3-foot depth; high water table.	Poor	High water table; susceptible to frost action; subject to flooding.
Weikert (WmB, WmB2, WmC, WmC2, WmC3, WmD, WmD2, WmD3, WmE2, WmE3, WmF, WmF3, WmG, WmG3). (For interpretations of the Muskingum soil in mapping units WmB, WmB2, WmC, WmC2, WmC3, WmD, WmD2, WmD3, WmE2, WmE3, WmF, WmF3, WmG, and WmG3, see the Muskingum series in this table.)	Poor	Unsuitable	Fair	Low bearing strength; bedrock at 1-to 2- foot depth.
Wellston (WnB, WnC, WnC2, WnD2, WnE2).	Good in surface layer	Unsuitable	Fair to good	Bedrock at 2½- to 3-foot depth.
Wharton (WoB, WoC, WoC2, WoD2).	Fair in surface layer	Unsuitable	Poor	Bedrock at about 3-foot depth; susceptible to frost action; subject to seepage; plastic; unstable slopes.
Willette (Wp)	Very good in entire muck layer.	Unsuitable	Poor	High water table; muck is unsuitable and must be removed.
Wooster (WrC2, WsB, WsB2, WsC, WsC2, WtD, WtD2, WtD3, WtE2, WtE3, WtF2, WtF3, WtG2).	Fair in surface layer	Unsuitable	Good	Steep slopes in some places

of the soils—Continued

Soil features affecting suitability for—Continued				
Reservoir areas for farm ponds	Dikes, levees, and embankments for farm ponds	Agricultural drainage	Irrigation	Terraces, diversions, and waterways
Slowly permeable; some blending may be needed.	Stable; slowly permeable; impervious when compacted; high piping resistance.	High water table; slowly permeable.	Slow water intake rate	Erodible; other properties favorable.
Slowly permeable; some sandy layers need blending.	Poor stability; slowly permeable; sandy layers below 3 feet; low to moderate piping resistance.	High water table; moderately slowly permeable; ditch walls tend to collapse; other soil properties favorable if outlet is secured; tile and surface drainage needed.	Poorly drained	Needed to control runoff from upland; difficult to maintain gradient; channels tend to silt; wet most of year.
Permeable; bedrock at 1- to 2-foot depth; bedrock must be blanketed.	Poor stability; pervious; 1 to 2 feet to rock.	Not needed	Well drained; steep slopes; low available water capacity.	Bedrock at 1- to 2-foot depth.
Permeable	Stable; permeable; low piping resistance.	Not needed	Rapid water intake rate; medium available water capacity.	Soil properties favorable.
Slowly permeable; any exposed bedrock must be blanketed.	Poor stability; slowly permeable; moderate shrink-swell potential; poor compaction but impervious when compacted.	Slowly permeable; random tiling beneficial.	Slow water intake rate	Soil properties favorable.
Muck is permeable but is only 2 to 3 feet thick; underlying mineral soil is impermeable.	High organic-matter content; unstable.	High water table; mineral soil below muck is slowly permeable; soil properties favorable if muck is more than 30 inches thick.	Moderate water intake rate if drained; very high available water capacity.	Muck cannot be used for construction.
Slowly permeable if blended and if porous layers are blanketed.	Moderately slowly permeable; fair stability; impervious when compacted; moderate piping resistance.	Not needed	Moderate water intake rate; high available water capacity.	Erodible; other properties favorable.

TABLE 6.—*Engineering test data for*

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

Soil name and location	Parent material	Ohio report No. SO	Depth	Horizon	Moisture-density[1] Maximum dry density	Moisture-density[1] Optimum moisture
			Inches		*Lb. per cu. ft.*	*Percent*
Allegheny silt loam: NW¼ sec. 22, Yellow Creek Twp., T. 9 N., R. 2 W.	Alluvium on upland benches (very early Pleistocene).	92837	0–8	A2	95	22
		92838	12–17	B21t	99	21
		92839	23–40	B22t	103	20
Canfield silt loam: NW¼ sec. 1, Fairfield Twp., T. 12 N., R. 2 W.	Loam till of Wisconsin age.	92846	0–9	Ap	104	18
		92847	13–24	B21t	118	13
		92848	24–30	Bx1	119	13
		92849	30–40	Bx2	120	12
Hanover silt loam: SE¼ sec. 21, Middleton Twp., T. 7 N., R. 1 W. (Coarser textured than modal.)	Glacial till of Illinoian age.	90886	0–10	A2	110	15
		90887	10–20	B1t	118	12
		90888	20–62	B2t	123	11
		90889	62–90	B3		
Monongahela silt loam: SE¼ sec. 8, St. Clair Twp., T. 6 N., R. 1 W.	Alluvium on upland benches (very early Pleistocene).	90868	0–8	Ap	100	21
		90869	25–31	Bx1	107	19
		90870	31–56	Bx2	117	13
Orrville silt loam: SW¼ sec. 15, Salem Twp., T. 14 N., R. 3 W.	Alluvium on flood plains.	92850	0–8	Ap	99	21
		92851	8–16	C1g	110	15
		92852	16–34	C2g	110	16
Parke silt loam: NW¼ sec. 19, Elk Run Twp., T. 11 N., R. 2 W. (Finer textured than modal.)	Glacial outwash of Illinoian age.	90883	0–7	Ap	104	17
		90884	20–36	B2t	106	19
		90885	93–108	C	124	11
Ravenna silt loam: SW. corner of sec. 3, Elk Run Twp., T. 11 N., R. 2 W. (Finer textured than modal.)	Loam till of Wisconsin age.	96653	0–10	Ap	102	20
		96654	14–23	B21	104	20
		96655	28–35	Bx	117	14
		96656	144+	C3	126	10
Titusville silt loam: SE¼NE¼ sec. 28, Center Twp., T. 14 N., R. 3 W. (Finer textured than modal.)	Glacial till of Illinoian age.	92840	0–13	Ap, A3	101	20
		92841	16–25	B2	102	22
		92842	25–38	Bx	105	19
Wadsworth silt loam: SE¼SE¼ sec. 21, Knox Twp., T. 17 N., R. 5 W.	Clay loam till of Wisconsin age.	92853	0–9	Ap		
		92854	14–23	B21t & Bx1		
		92855	23–36	Bx2 & Bx3		
		92856	60–72	C2		
Weikert channery silt loam: NW. corner of sec. 34, Madison Twp., T. 10 N., R. 2 W. (Coarser textured than modal.)	Thin-bedded siltstone.	90877	1–9	A		
		90878	13–22	B2, C1		
		90879	22–26	C		
Wellston silt loam: NW. corner of NW¼ sec. 34, Madison Twp., T. 10 N., R. 2 W.	Thin-bedded micaceous siltstone or sandstone.	90874	0–6	A2	96	20
		90875	9–31	B2t	110	17
		90876	31–37	B3t	110	16

[1] Based on AASHO Designation T 99–57, The Moisture-Density Relations of Soils, Method A (*1*).

[2] According to the AASHO Designation T 88–57 (*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 analyses data used in this table are not suitable for use in naming textural classes for soils.

soil samples taken from 11 soil profiles

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

Mechanical analyses [2]							Liquid limit	Plastic index	Classification		
Percentage passing sieve—						Percentage smaller than 0.005 mm.			AASHO [3]	Unified [4]	Ohio [5]
2 in.	¾ in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)						
			100	98	92	28	[6] NP	NP	A-4(8)	ML	A-4b.
			100	97	92	45	34	12	A-6(9)	ML-CL	A-6a.
			100	98	94	38	28	8	A-4(8)	CL	A-4b.
		98	95	89	73	23	NP	NP	A-4(8)	ML	A-4b.
		98	91	83	64	27	NP	NP	A-4(6)	ML	A-4a.
	100	93	88	78	59	26	22	5	A-4(5)	ML-CL	A-4a.
	100	96	93	84	62	30	21	7	A-4(5)	ML-CL	A-4a.
100	81	75	66	62	50	17	NP	NP	A-4(3)	SM	A-4a.
	96	81	66	57	37	17	NP	NP	A-4(0)	SM	A-4a.
	93	59	45	38	21	8	NP	NP	A-1-b(0)	GM	A-1-b.
	96	75	63	52	28	9	NP	NP	A-2-4(0)	SM	A-2-4.
			100	97	93	32	31	4	A-4(8)	ML	A-4b.
			100	97	91	41	31	7	A-4(8)	ML-CL	A-4b.
			100	95	92	54	32	13	A-6(9)	CL	A-6a.
			100	98	82	33	34	8	A-4(8)	ML	A-4a.
			100	96	68	27	NP	NP	A-4(7)	ML	A-4a.
			100	98	71	26	NP	NP	A-4(7)	ML	A-4a.
			100	98	92	27	NP	NP	A-4(8)	ML	A-4b.
		100	99	98	95	35	35	12	A-6(9)	ML-CL	A-6a.
	90	71	58	26	10	5	NP	NP	A-1-b(0)	SW-SM	A-1-b.
		97	94	88	77	29	NP	NP	A-4(8)	ML	A-4a.
			100	98	94	39	34	9	A-4(8)	ML-CL	A-4b.
	100	90	88	80	56	22	26	7	A-4(4)	ML-CL	A-4a.
	100	88	83	73	45	22	NP	NP	A-4(2)	SM	A-4a.
			100	97	89	34	NP	NP	A-4(8)	ML	A-4b.
			100	99	94	48	34	13	A-6(9)	CL	A-6a.
	100	91	88	84	72	36	31	13	A-6(9)	CL	A-6a.
			100	94	79	35	NP	NP	A-4(8)	ML	A-4a.
	100	97	94	90	80	40	38	19	A-6(12)	CL	A-6b.
			100	86	68	35	29	13	A-6(8)	CL	A-6a.
			100	95	83	47	29	11	A-6(8)	CL	A-6a.
	83	51	41	37	35	12	NP	NP	A-2-4(0)	GM	A-2-4.
100	59	27	20	18	17	6	NP	NP	A-1-b(0)	GM	A-1-b.
100	63	28	21	17	15	6	NP	NP	A-1-a(0)	GM	A-1-a.
	100	91	81	75	71	26	NP	NP	A-4(7)	ML	A-4a.
	100	73	64	60	56	25	30	9	A-4(4)	ML-CL	A-4a.
	92	78	66	63	58	26	35	8	A-4(5)	ML	A-4a.

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

[4] Based on the Unified Soil Classification System, Tech. Memo. No. 3-357 v. 1, Corps of Engineers (*18*). 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. Feb. 1, 1955.

[6] Nonplastic.

TABLE 7.—*Estimated degree and kind of*

[Gravel pit (Gp) generally is not suitable for

Soil series	Agriculture (cultivated crops)	Disposal of sewage effluent from septic tanks	Sewage lagoons	Homesite locations for homes of 3 stories or less
Allegheny:				
(AhC, AhC2)	Moderate	Slight	Moderate: slope	Slight
(AhD)	Moderate	Moderate: slope	Severe: slope	Moderate: slope
(AhD2)	Moderate	Moderate: slope	Severe: slope	Moderate: slope
(AlC)	Moderate	Moderate: limited depth to rock.	Moderate: slope	Slight
(AmB)	Slight	Slight	Moderate: slope, permeability.	Slight
(AmB2) (For limitations to use of Monongahela soil in mapping units AmB and AmB2, see the Monongahela series in this table.)	Slight	Slight	Moderate: slope, permeability.	Slight
Bogart:				
(BgA, BgB, BoA, BoB)	Slight	Moderate: seasonally high water table.	Severe: permeability.	Moderate: seasonally high water table.
(BsC, BsC2)	Moderate	Moderate: seasonally high water table.	Severe: permeability.	Moderate: seasonally high water table.
Canfield:				
(CaB, CaB2)	Slight	Severe: moderately slow permeability.	Slight	Moderate: seasonally high water table.
(CaC, CaC2)	Moderate	Severe: moderately slow permeability.	Moderate: slope	Moderate: seasonally high water table.
Carlisle (Cc)	Moderate	Severe: high water table.	Severe: organic material.	Severe: high water table.
Cavode:				
(CdB)	Moderate	Severe: slow permeability.	Slight	Severe: seasonally high water table.
(CdC, CdC2)	Moderate	Severe: slow permeability.	Moderate slope	Severe: seasonally high water table.
Chagrin (Ce, Cg)	Slight	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
Chili:				
(ChB, ChC2)	Slight for ChB; moderate for ChC2.	Slight: possible ground water contamination.	Severe: permeability.	Slight
(ChD2)	Severe	Moderate: slope, possible ground water contamination.	Severe: permeability, slope.	Moderate: slope
(ClA)	Slight	Slight: possible ground water contamination.	Severe: permeability.	Slight
(ClB, ClB2, ClC, ClC2)	Slight for ClB, ClB2; moderate for ClC, ClC2.	Slight: possible ground water contamination.	Severe: permeability.	Slight
(ClD, ClD2)	Severe	Moderate: slope, possible ground water contamination.	Severe: permeability, slope.	Moderate: slope
(ClE2, CmE3)	Severe	Severe: slope	Severe: slope	Moderate: slope

See footnote at end of table.

limitations for land use planning

the uses shown in this table and is not rated]

Lawns, landscaping, and golf fairways	Streets and parking lots [1]	Recreation			Cemeteries and sanitary land fills
		Campsites (tents)	Athletic fields and other intensive play areas	Picnic areas and extensive play areas	
Slight	Slight	Slight	Moderate: slope	Slight	Slight.
Moderate: slope	Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope.
Moderate: slope	Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope.
Slight	Slight	Slight	Moderate: slope	Slight	Moderate: limited depth to rock.
Slight	Slight	Slight	Moderate: slope	Slight	Slight.
Slight	Slight	Slight	Moderate: slope	Slight	Slight.
Slight	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Slight	Moderate: seasonally high water table.
Slight	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Slight	Moderate: seasonally high water table.
Slight	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Slight	Severe for cemeteries (moderately slow permeability); moderate for sanitary land fills (seasonally high water table).
Slight	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Slight	Severe for cemeteries (moderately slow permeability); moderate for sanitary land fills (seasonally high water table).
Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.
Moderate: seasonally high water table.	Moderate: seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.	Moderate: seasonally high water table.	Severe: seasonally high water table.
Moderate: seasonally high water table.	Moderate: seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.	Moderate: seasonally high water table.	Severe: seasonally high water table.
Severe: subject to flooding.	Severe: subject to flooding.	Moderate: subject to flooding.	Moderate: subject to flooding.	Moderate: subject to flooding.	Severe: subject to flooding.
Slight	Slight	Moderate: surface texture.	Moderate: slope, surface texture.	Slight	Slight.
Moderate: slope	Moderate: slope	Moderate: slope, texture of surface layer.	Severe: slope	Moderate: slope	Moderate: slope.
Slight	Slight	Slight	Slight	Slight	Slight.
Slight	Slight	Slight	Moderate: slope	Slight	Slight.
Moderate: slope	Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope.
Severe: slope, erosion hazard.	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.

TABLE 7.—*Estimated degree and kind of*

Soil series	Agriculture (cultivated crops)	Disposal of sewage effluent from septic tanks	Sewage lagoons	Homesite locations for homes of 3 stories or less
Chili—Continued				
(CmC3)	Severe	Slight: possible ground water contamination.	Severe: permeability.	Slight
(CmD3)	Severe	Moderate: slope, possible ground water contamination.	Severe: slope	Moderate: slope
(CnF, CnF3) (For limitations to use of Conotton and Negley soils in mapping units CnF and CnF3, see the Conotton and Negley series in this table.)	Severe	Severe: slope	Severe: slope	Severe: slope
Chilo (Co)	Moderate	Severe: slow permeability.	Moderate: permeable layers in substratum.	Severe: very poorly drained.
Conotton (CnF, CnF3) (For limitations to use of Chili and Negley soils in mapping units CnF and CnF3, see the Chili and Negley series in this table.)	Severe	Severe: slope	Severe: slope	Severe: slope
Damascus (Da)	Moderate	Severe: seasonally high water table.	Moderate: permeable layers in substratum.	Severe: seasonally high water table.
Dekalb:				
(DeB, DeC, DeC2)	Slight for DeB; moderate for DeC, DeC2.	Severe: shallow to rock.	Severe: rapidly permeable.	Severe: shallow to rock.
(DeD2)	Moderate	Severe: shallow to rock.	Severe: slope	Severe: shallow to rock.
(DeE2, DeF, DeF2, DkF3, DsF)	Severe	Severe: shallow to rock, slope.	Severe: slope	Severe: slope
(DsD)	Severe	Severe: shallow to rock.	Severe: rapidly permeable.	Severe: shallow to rock.
Ernest:				
(ErC)	Moderate	Severe: slow permeability.	Moderate: slope	Moderate: seasonally high water table.
(ErD2)	Severe	Severe: slow permeability.	Severe: slope	Moderate: seasonally high water table.
(ErE2, ErF2)	Severe	Severe: slope	Severe: slope	Moderate: seasonally high water table, slope.
Fitchville (FcA, FcB)	Slight	Severe: moderately slow permeability.	Slight	Severe: seasonally high water table.
Frenchtown (Fr)	Moderate	Severe: slow permeability.	Slight	Severe: poorly drained.
Glenford:				
(GfB)	Slight	Severe: moderately slow permeability.	Slight	Moderate: seasonally high water table.
(GfC, GfC2)	Moderate	Severe: moderately slow permeability.	Moderate: slope	Moderate: seasonally high water table.

See footnote at end of table.

limitations for land use planning—Continued

Lawns, landscaping, and golf fairways	Streets and parking lots [1]	Recreation: Campsites (tents)	Recreation: Athletic fields and other intensive play areas	Recreation: Picnic areas and extensive play areas	Cemeteries and sanitary land fills
Moderate: erosion hazard.	Slight	Moderate: texture of surface layer.	Moderate: slope, texture of surface layer.	Slight	Severe for cemeteries (erosion hazard); slight for sanitary land fills.
Severe: erosion hazard.	Moderate: slope	Severe: texture of surface layer.	Severe: slope	Moderate: slope	Severe for cemeteries (erosion hazard); moderate for sanitary land fills (slope).
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.	Severe: slow permeability.	Severe: seasonally high water table.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.
Moderate: shallow to rock.	Moderate: shallow to rock.	Slight	Moderate: slope	Moderate: limited depth to rock.	Severe: shallow to rock.
Moderate: slope	Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope	Severe: shallow to rock.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: shallow to rock.
Moderate: shallow to rock.	Moderate: shallow to rock.	Moderate: slope	Severe: slope	Moderate: slope	Severe: shallow to rock.
Slight	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Moderate: slope, seasonally high water table.	Slight	Severe for cemeteries (moderately slow permeability); moderate for sanitary land fills.
Moderate: slope	Moderate: slope, seasonally high water table.	Moderate: slope, seasonally high water table.	Severe: slope	Moderate: slope	Severe for cemeteries (moderately slow permeability); moderate for sanitary land fills.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Moderate: seasonally high water table.	Moderate: seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.	Moderate: seasonally high water table.	Severe: seasonally high water table.
Severe: poorly drained.	Severe: poorly drained.	Severe: poorly drained.	Severe: poorly drained.	Severe: poorly drained.	Severe: poorly drained.
Slight	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Moderate: slope	Slight	Severe for cemeteries (moderately slow permeability); moderate for sanitary land fills.
Slight	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Moderate: slope	Slight	Severe for cemeteries (moderately slow permeability); moderate for sanitary land fills.

TABLE 7.—*Estimated degree and kind of*

Soil series	Agriculture (cultivated crops)	Disposal of sewage effluent from septic tanks	Sewage lagoons	Homesite locations for homes of 3 stories or less
Gresham:				
(GrB)	Moderate	Severe: slow permeability.	Slight	Severe: seasonally high water table.
(GrC)	Moderate	Severe: slow permeability.	Moderate: slope	Severe: seasonally high water table.
Guernsey:				
(GuB)	Slight	Severe: slow permeability.	Moderate: limited depth to rock.	Moderate: seasonally high water table, limited depth to rock.
(GuC, GuC2)	Moderate	Severe: slow permeability.	Moderate: slope	Moderate: seasonally high water table, limited depth to rock.
(GuD2)	Severe	Severe: slow permeability.	Severe: slope	Moderate: slope
(GvD2)	Severe	Severe: slow permeability, shallow to rock.	Severe: slope	Severe: limited depth to rock.
(GvE2)	Severe	Severe: slope, slow permeability.	Severe: slope	Severe: slope
Hanover:				
(HaB, HaB2, HaC, HaC2)	Slight for HaB, HaB2; moderate for HaC, HaC2.	Slight	Moderate: moderate permeability.	Slight
(HaD2)	Severe	Moderate: slope	Severe: slope	Moderate: slope
(HaE2)	Severe	Severe: slope	Severe: slope	Moderate: slope
Jimtown (JtA, JtB, JwA, JwB)	Slight	Severe: seasonally high water table.	Moderate: moderate permeability.	Severe: seasonally high water table.
Kerston (Km)	Moderate	Severe: high water table.	Severe: organic material.	Severe: high water table.
Laidig:				
(LaC)	Severe	Severe: permeability.	Moderate: slope	Slight
(LaD)	Severe	Severe: permeability.	Severe: slope	Moderate: slope
(LaE, LaF)	Severe	Severe: slope	Severe: slope	Moderate: slope
Lobdell (Lb, Ld)	Slight	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
Lorain (Ln)	Moderate	Severe: high water table.	Slight	Severe: high water table.
Loudonville:				
(LoB, LoB2, LoC, LoC2, LuB, LuB2, LuC2)	Slight for LoB, LoB2, LuB, LuB2; moderate for LoC, LoC2, LuC2.	Moderate: limited depth to rock.	Severe: moderately rapid permeability.	Moderate: limited depth to rock.
(LoD2, LuD2)	Moderate	Moderate: slope	Severe: slope	Moderate: slope
(LoE2, LuE, LuE3)	Severe	Severe: slope	Severe: slope	Moderate: slope
(LuC3) (For limitations to use of Muskingum soil in mapping units LuB2, LuC2, LuC3, LuD2, LuE, and LuE3, see the Muskingum series in this table.)	Severe	Moderate: limited depth to rock.	Severe: moderately rapid permeability.	Moderate: limited depth to rock.

See footnote at end of table.

limitations for land use planning—Continued

Lawns, landscaping, and golf fairways	Streets and parking lots [1]	Recreation			Cemeteries and sanitary land fills
		Campsites (tents)	Athletic fields and other intensive play areas	Picnic areas and extensive play areas	
Moderate: seasonally high water table.	Moderate: seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.	Moderate: seasonally high water table.	Severe: seasonally high water table.
Moderate: seasonally high water table.	Moderate: seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.	Moderate: seasonally high water table.	Severe: seasonally high water table.
Slight	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Severe: slow permeability.	Slight	Severe: slow permeability.
Slight	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Severe: slow permeability.	Slight	Severe: slow permeability.
Moderate: slope	Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope	Severe: slow permeability.
Moderate: slope	Moderate: slope, limited depth to rock.	Moderate: slope	Severe: slope	Moderate: slope	Severe: limited depth to rock.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Slight	Slight	Slight	Moderate: slope	Slight	Slight.
Moderate: slope	Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Moderate: seasonally high water table.	Moderate: seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.	Moderate: seasonally high water table.	Severe: seasonally high water table.
Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.
Slight	Slight	Slight	Moderate: slope	Slight	Severe for cemeteries (moderately slow permeability); moderate for sanitary land fills.
Moderate: slope	Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope	Severe for cemeteries (moderately slow permeability); moderate for sanitary land fills.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Moderate: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Moderate: subject to flooding.	Moderate: subject to flooding.	Severe: subject to flooding.
Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.
Slight	Moderate: limited depth to bedrock.	Slight	Moderate: slope	Slight	Moderate: limited depth to rock.
Moderate: slope	Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Moderate: erosion	Moderate: limited depth to rock.	Moderate: erosion	Moderate: slope	Moderate: erosion	Moderate: limited depth to rock.

TABLE 7.—*Estimated degree and kind of*

Soil series	Agriculture (cultivated crops)	Disposal of sewage effluent from septic tanks	Sewage lagoons	Homesite locations for homes of 3 stories or less
Luray (Lv, Lw) (For limitations to use of Marengo soil in mapping units Lv and Lw, see the Marengo series in this table).	Moderate	Severe: high water table.	Slight	Severe: high water table.
Made Land (Ma)	Variable	Variable	Variable	Variable
Marengo (Lv, Lw) (For limitations to use of Luray soil in mapping units Lv and Lw, see the Luray series in this table.)	Moderate	Severe: high water table.	Slight	Severe: high water table.
Monongahela:				
(MoB, AmB, AmB2) (For limitations to use of Allegheny soil in mapping units AmB and AmB2 see the Allegheny series in this table.)	Slight	Severe: slow permeability.	Slight	Moderate: seasonally high water table.
(MoC, MoC2)	Moderate	Severe: slow permeability.	Moderate: slope	Moderate: seasonally high water table.
(MoD, MoD2)	Moderate	Severe: slow permeability.	Severe: slope	Moderate: seasonally high water table.
Muskingum:				
(LuB, LuB2, LuC2, UmB2, UmC2, WmB, WmB2 WmC, WmC2).	Moderate	Severe: limited depth to shale.	Severe: too permeable.	Moderate: limited depth to shale.
(LuD2, UmD2, WmD, WmD2)	Severe	Severe: limited depth to shale.	Severe: slope	Moderate: slope, depth to shale.
(LuE, UmE2, WmE2)	Severe	Severe: slope	Severe: slope	Moderate: slope, depth to shale.
(UmF2, WmF, WmG)	Severe	Severe: slope	Severe: slope	Severe: slope
(LuC3, LuE3, UmF3, WmC3, WmD3, WmE3, WmF3, WmG3). (For limitations to use of Loudonville soil in mapping units LuB, LuB2, LuC2, LuC3, LuD2, LuE, and LuE3, see the Loudonville series in this table. For limitations of Upshur soil in units UmB2, UmC2, UmD2, UmE2, UmF2, and UmF3, see the Upshur series. For limitations of Weikert soil in units WmB, WmB2, WmC, WmC2, WmC3, WmD, WmD2, WmD3, WmE2, WmE3, WmF, WmF3, WmG, and WmG3, see the Weikert series.)	Severe	Severe: limited depth to shale.	Severe: too permeable.	Moderate: limited depth to shale.
Negley:				
(NeB, NeC2)	Slight for NeB; moderate for NeC2.	Slight: possible ground water contamination.	Severe: permeable material.	Slight
(NeD2, NgD2, NlD2)	Severe	Moderate: slope, possible gound water contamination.	Severe: permeable material, slope.	Moderate: slope
(NgB, NlB)	Slight	Slight: possible ground water contamination.	Severe: permeable material.	Slight
(NgC, NgC2, NlC2)	Moderate	Slight: possible ground water contamination.	Severe: moderately rapid permeability.	Slight
(NsE2, NsE3, CnF, CnF3) (For limitations to use of Chili and Conotton soils in mapping units CnF and CnF3, see the Chili and Conotton series in this table.)	Severe	Severe: slope	Severe: slope	Moderate: slope

See footnote at end of table.

limitations for land use planning—Continued

Lawns, landscaping, and golf fairways	Streets and parking lots [1]	Recreation: Campsites (tents)	Recreation: Athletic fields and other intensive play areas	Recreation: Picnic areas and extensive play areas	Cemeteries and sanitary land fills
Severe: high water table.	Severe: high water table.	Severe: high water table	Severe: high water table.	Severe: high water table.	Severe: high water table.
Variable	Variable	Variable	Variable	Variable	Variable.
Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.
Slight	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Slight	Severe for cemeteries (moderately slow permeability); moderate for sanitary land fills.
Slight	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Moderate: slope, seasonally high water table.	Slight	Severe for cemeteries (moderately slow permeability); moderate for sanitary land fills.
Moderate: slope	Moderate: slope, seasonally high water table.	Moderate: slope, seasonally high water table.	Severe: slope	Moderate: slope	Moderate: slope.
Moderate: limited depth.	Slight	Slight	Moderate: limited depth.	Slight	Moderate: limited depth to shale.
Moderate: 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: slope	Severe: slope.
Severe: erosion	Moderate: limited depth to shale.	Severe: slope, erosion.	Severe: limited depth.	Severe: erosion	Moderate: limited depth to shale.
Slight	Slight	Moderate: surface texture.	Moderate: slope, surface texture.	Slight	Slight.
Moderate: slope	Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope.
Slight	Slight	Slight	Moderate: slope	Slight	Slight.
Slight	Slight	Slight	Moderate: slope	Slight	Slight.
Severe: slope, erosion hazard.	Severe: slope	Severe: slope, erosion hazard.	Severe: slope	Severe: slope	Severe: slope.

TABLE 7.—*Estimated degree and kind of*

Soil series	Agriculture (cultivated crops)	Disposal of sewage effluent from septic tanks	Sewage lagoons	Homesite locations for homes of 3 stories or less
Olmsted (Od, Om)	Slight	Severe: seasonally high water table.	Moderate: moderate permeability.	Severe: seasonally high water table.
Orrville (Or, Ov)	Moderate	Severe: seasonally high water table.	Severe: subject to flooding.	Severe: subject to flooding.
Papakating (Pa, Pc)	Moderate	Severe: high water table.	Severe: subject to flooding.	Severe: subject to flooding.
Parke:				
(PkB)	Slight	Slight	Moderate: moderate permeability.	Slight
(PkC, PkC2)	Moderate	Slight	Moderate: slope	Slight
Purdy (Pu)	Severe	Severe: slowly permeable.	Slight	Severe: seasonally high water table.
Rainsboro:				
(RaB)	Slight	Severe: moderately slow permeability.	Slight	Moderate: seasonally high water table.
(RaC, RaC2)	Moderate	Severe: moderately slow permeability.	Moderate: slope	Moderate: seasonally high water table.
Ravenna (RnA, RnB)	Slight	Severe: slowly permeable.	Slight	Severe: seasonally high water table.
Rittman:				
(RsB)	Slight	Severe: slowly permeable.	Slight	Moderate: seasonally high water table.
(RsC2)	Moderate	Severe: slowly permeable.	Moderate: slope	Moderate: seasonally high water table.
(RsD2)	Severe	Severe: slowly permeable.	Severe: slope	Moderate: slope
(RsE2, RtE3)	Severe	Severe: slope	Severe: slope	Moderate: seasonally high water table.
(RtD3)	Severe	Severe: seasonally high water table.	Severe: slope	Moderate: seasonally high water table.
Sebring (Sb, Sc)	Moderate	Severe: slow permeability.	Slight	Severe: seasonally high water table.
Strip mine spoil (SgD, SmD, SpF, Ss)	Variable	Variable	Variable	Variable
Summitville:				
(SuB)	Slight	Severe: slowly permeable.	Moderate: slope	Moderate: seasonally high water table.
(SuC, SuC2)	Moderate	Severe: slowly permeable.	Moderate: slope	Moderate: seasonally high water table.

See footnote at end of table.

limitations for land use planning—Continued

Lawns, landscaping, and golf fairways	Streets and parking lots [1]	Recreation: Campsites (tents)	Recreation: Athletic fields and other intensive play areas	Recreation: Picnic areas and extensive play areas	Cemeteries and sanitary land fills
Severe: seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.
Severe: subject to flooding.	Severe: seasonally high water table, flooding.	Severe: seasonally high water table.	Severe: seasonally high water table.	Moderate: seasonally high water table, flooding.	Severe: seasonally high water table.
Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.
Slight	Slight	Slight	Moderate: slope	Slight	Slight.
Slight	Slight	Slight	Moderate: slope	Slight	Slight.
Severe: seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.
Slight	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Moderate: slope	Slight	Moderate: seasonally high water table.
Moderate: slope	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Moderate: slope	Slight	Moderate: seasonally high water table.
Severe: seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.	Moderate: seasonally high water table.	Severe: seasonally high water table.
Slight	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Severe: slow permeability.	Slight	Severe: slow permeability.
Slight	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Severe: slow permeability.	Slight	Severe: slow permeability.
Moderate: slope	Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: erosion	Moderate: slope, seasonally high water table.	Severe: slope, erosion.	Severe: slope	Severe: slope, erosion.	Severe: seasonally high water table, slow permeability.
Severe: seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.
Variable	Variable	Variable	Variable	Variable	Variable.
Slight	Moderate: seasonally high water table.	Severe: seasonally high water table.	Severe: slowly permeable.	Slight	Severe for cemeteries (slowly permeable); moderate for sanitary land fills (seasonally high water table.)
Slight	Moderate: seasonally high water table.	Severe: seasonally high water table.	Severe: slowly permeable.	Slight	Severe for cemeteries (slowly permeable); moderate for sanitary land fills (seasonally high water table.)

TABLE 7.—*Estimated degree and kind of*

Soil series	Agriculture (cultivated crops)	Disposal of sewage effluent from septic tanks	Sewage lagoons	Homesite locations for homes of 3 stories or less
Summitville—Continued				
(SuD2)	Severe	Severe: slowly permeable.	Severe: slope	Moderate: slope
Titusville:				
(TuB)	Slight	Severe: moderately slowly permeable.	Moderate: slope	Moderate: seasonally high water table.
(TuC, TuC2)	Moderate	Severe: moderately slowly permeable.	Moderate: slope	Moderate: seasonally high water table.
(TuD, TuD2)	Moderate	Severe: moderately slowly permeable.	Severe: slope	Moderate: slope
Tyler:				
(TyA)	Moderate	Severe: slowly permeable.	Slight	Severe: seasonally high water table.
(TyB)	Moderate	Severe: slowly permeable.	Moderate: slope	Severe: seasonally high water table.
Upshur:				
(UmB2)	Slight	Severe: slowly permeable.	Slight	Severe: high shrink-swell potential.
(UmC2)	Moderate	Severe: slowly permeable.	Moderate: slope	Severe: subject to slipping.
(UmD2, UmE2, UmF2, UmF3) (For limitations to use of Muskingum soil in mapping units UmB2, UmC2, UmD2, UmE2, UmF2, and UmF3, see the Muskingum series in this table.)	Severe	Severe: slowly permeable, slope.	Severe: slope	Severe: subject to slipping, slope.
Wadsworth:				
(WaA)	Moderate	Severe: slowly permeable.	Slight	Severe: seasonally high water table.
(WaB)	Moderate	Severe: slowly permeable.	Moderate: slope	Severe: seasonally high water table.
Wayland (Wc, Wd)	Moderate	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
Weikert:				
(WmB, WmB2, WmC, WmC2)	Moderate	Severe: shallow to rock.	Severe: shallow to rock.	Moderate: limited depth to rock.
(WmC3)	Severe	Severe: shallow to rock.	Severe: shallow to rock.	Moderate: limited depth to rock.
(WmD, WmD2)	Severe	Severe: shallow to rock.	Severe: shallow to rock.	Moderate: slope
(WmD3)	Severe	Severe: shallow to rock.	Severe: shallow to rock.	Moderate: slope
(WmE2, WmE3)	Severe	Severe: slope	Severe: slope	Moderate: slope
(WmF, WmF3, WmG, WmG3) (For limitations to use of Muskingum soil in mapping units WmB, WmB2, WmC, WmC2, WmC3, WmD, WmD2, WmD3, WmE2, WmE3, WmF, WmF3, WmG, and WmG3, see the Muskingum series in this table.)	Severe	Severe: slope	Severe: slope	Severe: slope

See footnote at end of table.

limitations for land use planning—Continued

Lawns, landscaping, and golf fairways	Streets and parking lots [1]	Recreation			Cemeteries and sanitary land fills
		Campsites (tents)	Athletic fields and other intensive play areas	Picnic areas and extensive play areas	
Moderate: slope	Moderate: slope	Severe: seasonally high water table.	Severe: slope	Moderate: slope	Severe for cemeteries (slowly permeable); moderate for sanitary land fills (seasonally high water table.)
Slight	Moderate: seasonally high water table.	Severe: seasonally high water table.	Moderate: seasonally high water table.	Slight	Severe for cemeteries (moderately slowly permeable); moderate for sanitary land fills (seasonally high water table.)
Slight	Moderate: seasonally high water table.	Severe: seasonally high water table.	Moderate: slope	Slight	Severe for cemeteries (moderately slowly permeable); moderate for sanitary land fills (seasonally high water table.
Moderate: slope	Moderate: slope	Severe: seasonally high water table.	Severe: slope	Moderate: slope	Severe for cemeteries (moderately slowly permeable); moderate for sanitary land fills (slope).
Moderate: seasonally high water table.	Moderate: seasonally high water table.	Severe: slowly permeable.	Severe: seasonally high water table.	Moderate: seasonally high water table.	Severe: slowly permeable, seasonally high water table.
Moderate: seasonally high water table.	Moderate: seasonally high water table.	Severe: slowly permeable.	Severe: seasonally high water table.	Moderate: seasonally high water table.	Severe: slowly permeable, seasonally high water table.
Severe: texture of surface soil.	Severe: high shrink-swell potential.	Severe: slowly permeable.	Severe: texture of surface layer.	Severe: texture of surface layer.	Severe: slowly permeable.
Severe: texture of surface soil.	Severe: subject to slipping.	Severe: slowly permeable.	Severe: texture of surface layer.	Severe: surface texture.	Severe: slowly permeable.
Severe: texture of surface soil, slope.	Severe: subject to slipping, slope.	Severe: slowly permeable, slope.	Severe: slope	Severe: texture of surface layer, slope.	Severe: slowly permeable, slope.
Moderate: seasonally high water table.	Moderate: seasonally high water table.	Severe: slowly permeable.	Severe: seasonally high water table.	Moderate: seasonally high water table.	Severe: slowly permeable.
Moderate: seasonally high water table.	Moderate: seasonally high water table.	Severe: slowly permeable.	Severe: seasonally high water table.	Moderate: seasonally high water table.	Severe: slowly permeable.
Severe: high water table.	Severe: subject to flooding.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: subject to flooding.
Slight	Moderate: limited depth to rock.	Slight	Severe: shallow to rock.	Moderate: limited depth to rock.	Moderate: shallow to shale.
Severe: erosion	Moderate: limited depth to rock.	Moderate: slope, erosion.	Severe: shallow to rock.	Severe: limited depth to rock.	Severe: shallow to shale.
Moderate: slope	Moderate: slope	Moderate: slope	Severe: slope	Severe: limited depth to rock.	Severe: shallow to shale.
Severe: erosion	Moderate: slope	Severe: slope, erosion.	Severe: slope	Severe: limited depth to rock.	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 7.—*Estimated degree and kind of*

Soil series	Agriculture (cultivated crops)	Disposal of sewage effluent from septic tanks	Sewage lagoons	Homesite locations for homes of 3 stories or less
Wellston:				
(WnB, WnC, WnC2)	Slight for WnB; moderate for WnC, WnC2.	Severe: shallow to shale.	Severe: permeability.	Slight
(WnD2)	Moderate	Severe: shallow to shale.	Severe: permeable.	Moderate: slope
(WnE2)	Severe	Severe: slope, shallow to shale.	Severe: slope	Moderate: slope
Wharton:				
(WoB)	Slight	Severe: slowly permeable.	Slight	Severe: high shrink-swell potential.
(WoC, WoC2)	Moderate	Severe: slowly permeable.	Moderate: slope	Severe: high shrink-swell potential.
(WoD2)	Severe	Severe: slowly permeable.	Severe: slope	Severe: subject to slipping.
Willette (Wp)	Moderate	Severe: high water table.	Severe: organic material.	Severe: high water table.
Wooster:				
(WsB, WsB2)	Slight	Moderate: moderate permeability.	Moderate: moderately permeable.	Slight
(WrC2, WsC, WsC2)	Moderate	Moderate; slope	Moderate: slope	Slight
(WtD, WtD2)	Moderate	Moderate: slope	Severe: slope	Moderate: slope
(WtD3)	Severe	Moderate: slope	Severe: slope	Moderate: slope
(WtE2, WtE3, WtF2, WtF3, WtG2)	Severe	Severe: slope	Severe: slope	Moderate: slope

[1] The limitation to use of soils for parking lots is moderate on slopes of 2 to 6 percent and is severe on slopes of more than 6 percent.

Descriptions of the Soils

This section describes the soil series (groups of soils) and single soils (mapping units) of Columbiana County. The acreage and proportionate extent of each mapping unit are given in table 8.

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 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. Made land, 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.

The profile of most soils described has been located in cultivated fields. In areas where the same soil is forested, it has a dark-colored surface layer that is high in organic-matter content. Generally, this dark layer is destroyed when the soil is cultivated. Unless otherwise stated, the colors given in the descriptions are for the soils when moist.

Adjective ratings of productivity indicate the relative capacity of the soils to produce crops under good management. The ratings do not indicate the natural fertility of the soils.

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

limitations for land use planning—Continued

Lawns, landscaping, and golf fairways	Streets and parking lots [1]	Recreation			Cemeteries and sanitary land fills
		Campsites (tents)	Athletic fields and other intensive play areas	Picnic areas and extensive play areas	
Slight	Slight	Slight	Moderate; limited depth to shale, slope.	Slight	Moderate: limited depth to shale.
Moderate: slope	Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Slight	Moderate: seasonally high water table.	Severe; slowly permeable.	Severe: slowly permeable.	Slight	Severe: slowly permeable.
Moderate: slope	Moderate: seasonally high water table.	Severe: slowly permeable.	Severe; slowly permeable.	Slight	Severe: slowly permeable.
Severe: slope	Moderate: slope	Severe: slowly permeable.	Severe: slope	Moderate: slope	Severe: slowly permeable.
Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.
Slight	Slight	Slight	Moderate: moderately permeable, slope.	Slight	Slight for cemeteries; moderate for sanitary land fills (moderately permeable.)
Slight	Slight	Slight	Moderate: slope.	Slight	Slight for cemeteries; moderate for sanitary land fills (moderately permeable).
Moderate: slope	Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope.
Severe: erosion	Moderate: slope	Severe: slope, erosion.	Severe: slope	Moderate: slope	Severe for cemeteries (slope, erosion); moderate for sanitary land fills (slope).
Severe: slope, erosion.	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.

Allegheny Series

The Allegheny series consists of deep, gently sloping to strongly sloping, well-drained soils that develop from silty alluvium having layers of sand and gravel at various depths. The alluvium washed from soils derived from sandstone, siltstone, and shale. Allegheny soils occupy high terraces and, 100 to 250 feet above the terraces, high benches in the central and southern parts of the county, an area that was unglaciated.

Typical profile of an Allegheny silt loam in a cultivated field:

0 to 8 inches, brown, friable silt loam; strongly acid.
8 to 14 inches, dark-brown, friable silt loam; strongly acid.
14 to 24 inches, dark-brown, gritty silt loam with common, small, rotted pebbles; friable; strongly acid.
24 to 41 inches, dark-brown, friable sandy clay loam; few weathered pebbles; strongly acid.
41 to 60 inches +, dark-brown sandy loam; strongly acid.

The Allegheny soils occur with the moderately well drained Monongahela soils. They also occur with the Parke soils but have a less gravelly lower subsoil than Parke soils. Allegheny soils are moderately permeable and have high available moisture capacity. They are easily managed and are moderately productive. The native vegetation was a forest of mixed hardwoods, chiefly white oak and sugar maple.

Allegheny silt loam, 5 to 10 percent slopes (AhC).—This soil is on sloping terraces. Included in mapping are small areas that have a surface layer of loam. Runoff is medium to rapid on this soil, and the erosion hazard is moderate. Erosion in cultivated areas can be controlled by contour stripcropping and a rotation that provides an equal number of years in hay and in grain. (Capability unit IIIe-1; woodland suitability group 4)

Allegheny silt loam, 5 to 10 percent slopes, moderately eroded (AhC2).—This soil occurs on sloping terraces and has a plow layer that contains material brought up from the subsoil. Small areas with a loam surface layer are included. Runoff is rapid, and the hazard of erosion is moderate. Contour stripcropping and a rotation that provides an equal number of years in hay and in grain

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

Soil	Acres	Percent
Allegheny silt loam, 5 to 10 percent slopes	1, 936	0. 6
Allegheny silt loam, 5 to 10 percent slopes, moderately eroded	2, 901	. 8
Allegheny silt loam, 10 to 15 percent slopes	173	. 1
Allegheny silt loam, 10 to 15 percent slopes, moderately eroded	688	. 2
Allegheny silt loam, sandstone substratum, 5 to 10 percent slopes	129	(1)
Allegheny and Monongahela silt loams, 2 to 5 percent slopes	2, 887	. 8
Allegheny and Monongahela silt loams, 2 to 5 percent slopes, moderately eroded	304	. 1
Bogart loam, 0 to 2 percent slopes	148	(1)
Bogart loam, 2 to 5 percent slopes	2, 521	. 7
Bogart silt loam, 0 to 2 percent slopes	137	(1)
Bogart silt loam, 2 to 5 percent slopes	1, 841	. 5
Bogart soils, 5 to 10 percent slopes	357	. 1
Bogart soils, 5 to 10 percent slopes, moderately eroded	207	. 1
Canfield silt loam, 2 to 5 percent slopes	24, 984	7. 2
Canfield silt loam, 2 to 5 percent slopes, moderately eroded	2, 778	. 8
Canfield silt loam, 5 to 10 percent slopes	2, 096	. 6
Canfield silt loam, 5 to 10 percent slopes, moderately eroded	4, 968	1. 4
Carlisle muck	207	. 1
Cavode silt loam, 2 to 5 percent slopes	411	. 1
Cavode silt loam, 5 to 10 percent slopes	185	. 1
Cavode silt loam, 5 to 10 percent slopes, moderately eroded	87	(1)
Chagrin loam	2, 654	. 8
Chagrin silt loam	1, 160	. 3
Chili gravelly loam, 2 to 5 percent slopes	519	. 1
Chili gravelly loam, 5 to 10 percent slopes, moderately eroded	1, 099	. 3
Chili gravelly loam, 10 to 15 percent slopes, moderately eroded	393	. 1
Chili loam, 0 to 2 percent slopes	286	. 1
Chili loam, 2 to 5 percent slopes	6, 153	1. 8
Chili loam, 2 to 5 percent slopes, moderately eroded	392	. 1
Chili loam, 5 to 10 percent slopes	1, 367	. 4
Chili loam, 5 to 10 percent slopes, moderately eroded	8, 540	2. 4
Chili loam, 10 to 15 percent slopes	245	. 1
Chili loam, 10 to 15 percent slopes, moderately eroded	3, 817	1. 1
Chili loam, 15 to 20 percent slopes, moderately eroded	1, 546	. 5
Chili soils, 5 to 10 percent slopes, severely eroded	174	. 1
Chili soils, 10 to 15 percent slopes, severely eroded	190	. 1
Chili soils, 15 to 20 percent slopes, severely eroded	201	. 1
Chili, Conotton, and Negley soils, 20 to 50 percent slopes	1, 471	. 4
Chili, Conotton, and Negley soils, 20 to 50 percent slopes, severely eroded	400	. 1
Chilo silty clay loam	134	(1)
Damascus silt loam	657	. 2
Dekalb loam, 2 to 5 percent slopes	265	. 1
Dekalb loam, 5 to 10 percent slopes	217	. 1
Dekalb loam, 5 to 10 percent slopes, moderately eroded	1, 428	. 4
Dekalb loam, 10 to 15 percent slopes, moderately eroded	1, 066	. 3
Dekalb loam, 15 to 20 percent slopes, moderately eroded	1, 230	. 4
Dekalb loam, 20 to 35 percent slopes	475	. 1
Dekalb loam, 20 to 35 percent slopes, moderately eroded	1, 684	. 5
Dekalb soils, 20 to 35 percent slopes, severely eroded	245	. 1
Dekalb stony loam, 5 to 20 percent slopes	393	0. 1
Dekalb stony loam, 20 to 50 percent slopes	9, 984	2. 9
Ernest silt loam, 5 to 10 percent slopes	183	. 1
Ernest silt loam, 10 to 15 percent slopes, moderately eroded	382	. 1
Ernest silt loam, 15 to 20 percent slopes, moderately eroded	222	. 1
Ernest silt loam, 20 to 35 percent slopes, moderately eroded	97	(1)
Fitchville silt loam, 0 to 2 percent slopes	471	. 1
Fitchville silt loam, 2 to 5 percent slopes	1, 918	. 5
Frenchtown silt loam	1, 602	. 5
Glenford silt loam, 2 to 5 percent slopes	633	. 2
Glenford silt loam, 5 to 10 percent slopes	200	. 1
Glenford silt loam, 5 to 10 percent slopes, moderately eroded	139	(1)
Gravel pit	107	(1)
Gresham silt loam, 2 to 5 percent slopes	365	. 1
Gresham silt loam, 5 to 10 percent slopes	680	. 2
Guernsey silt loam, 2 to 5 percent slopes	154	(1)
Guernsey silt loam, 5 to 10 percent slopes	442	. 1
Guernsey silt loam, 5 to 10 percent slopes, moderately eroded	844	. 2
Guernsey silt loam, 10 to 15 percent slopes, moderately eroded	576	. 2
Guernsey silty clay loam, thin solum variant, 10 to 15 percent slopes, moderately eroded	129	(1)
Guernsey silty clay loam, thin solum variant, 15 to 20 percent slopes, moderately eroded	123	(1)
Hanover silt loam, 2 to 5 percent slopes	894	. 3
Hanover silt loam, 2 to 5 percent slopes, moderately eroded	399	. 1
Hanover silt loam, 5 to 10 percent slopes	765	. 2
Hanover silt loam, 5 to 10 percent slopes, moderately eroded	3, 713	1. 1
Hanover silt loam, 10 to 15 percent slopes, moderately eroded	1, 040	. 3
Hanover silt loam, 15 to 20 percent slopes, moderately eroded	229	. 1
Jimtown loam, 0 to 2 percent slopes	188	. 1
Jimtown loam, 2 to 5 percent slopes	938	. 3
Jimtown silt loam, 0 to 2 percent slopes	333	. 1
Jimtown silt loam, 2 to 5 percent slopes	1, 674	. 5
Kerston muck	863	. 3
Laidig stony loam, 5 to 10 percent slopes	92	(1)
Laidig stony loam, 10 to 15 percent slopes	118	(1)
Laidig stony loam, 15 to 20 percent slopes	141	. 1
Laidig stony loam, 20 to 35 percent slopes	255	. 1
Lobdell loam	1, 171	. 3
Lobdell silt loam	1, 696	. 5
Lorain clay	546	. 1
Loudonville silt loam, 2 to 5 percent slopes	681	. 2
Loudonville silt loam, 2 to 5 percent slopes, moderately eroded	209	. 1
Loudonville silt loam, 5 to 10 percent slopes	364	. 1
Loudonville silt loam, 5 to 10 percent slopes, moderately eroded	3, 880	1. 1
Loudonville silt loam, 10 to 15 percent slopes, moderately eroded	3, 103	. 9
Loudonville silt loam, 15 to 20 percent slopes, moderately eroded	968	. 3
Loudonville and Muskingum soils, 2 to 5 percent slopes	180	. 1
Loudonville and Muskingum soils, 2 to 5 percent slopes, moderately eroded	270	. 1
Loudonville and Muskingum soils, 5 to 10 percent slopes, moderately eroded	2, 985	. 9
Loudonville and Muskingum soils, 5 to 15 percent slopes, severely eroded	339	. 1
Loudonville and Muskingum soils, 10 to 15 percent slopes, moderately eroded	3, 099	. 9

See footnote at end of table.

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

Soil	Acres	Percent	Soil	Acres	Percent
Loudonville and Muskingum soils, 15 to 20 percent slopes	4, 360	1. 3	Summitville silt loam, 5 to 10 percent slopes, moderately eroded	671	0. 2
Loudonville and Muskingum soils, 15 to 20 percent slopes, severely eroded	487	. 1	Summitville silt loam, 10 to 15 percent slopes, moderately eroded	165	(1)
Luray and Marengo silty clay loams	1, 685	. 5	Titusville silt loam, 2 to 5 percent slopes	752	. 2
Luray and Marengo silt loams	828	. 2	Titusville silt loam, 5 to 10 percent slopes	2, 558	. 7
Made land	310	. 1	Titusville silt loam, 5 to 10 percent slopes, moderately eroded	1, 808	. 5
Monongahela silt loam, 2 to 5 percent slopes	1, 991	. 6	Titusville silt loam, 10 to 15 percent slopes	504	. 1
Monongahela silt loam, 5 to 10 percent slopes	2, 476	. 7	Titusville silt loam, 10 to 15 percent slopes, moderately eroded	1, 040	. 3
Monongahela silt loam, 5 to 10 percent slopes, moderately eroded	1, 366	. 4	Tyler silt loam, 0 to 2 percent slopes	145	(1)
Monongahela silt loam, 10 to 15 percent slopes	168	. 1	Tyler silt loam, 2 to 5 percent slopes	753	. 2
Monongahela silt loam, 10 to 15 percent slopes, moderately eroded	396	. 1	Upshur-Muskingum complex, 2 to 5 percent slopes, moderately eroded	164	. 1
Negley gravelly loam, 2 to 5 percent slopes	302	. 1	Upshur-Muskingum complex, 5 to 10 percent slopes, moderately eroded	878	. 3
Negley gravelly loam, 5 to 10 percent slopes, moderately eroded	562	. 2	Upshur-Muskingum complex, 10 to 15 percent slopes, moderately eroded	575	. 2
Negley gravelly loam, 10 to 15 percent slopes, moderately eroded	305	. 1	Upshur-Muskingum complex, 15 to 20 percent slopes, moderately eroded	429	. 1
Negley loam, 2 to 5 percent slopes	764	. 2	Upshur-Muskingum complex, 20 to 50 percent slopes, moderately eroded	785	. 2
Negley loam, 5 to 10 percent slopes	215	. 1	Upshur-Muskingum complex, 20 to 35 percent slopes, severely eroded	183	. 1
Negley loam, 5 to 10 percent slopes, moderately eroded	914	. 3	Wadsworth silt loam, 0 to 2 percent slopes	121	(1)
Negley loam, 10 to 15 percent slopes, moderately eroded	677	. 2	Wadsworth silt loam, 2 to 5 percent slopes	1, 172	. 3
Negley silt loam, 2 to 5 percent slopes	157	. 1	Wayland silt loam	10, 037	2. 9
Negley silt loam, 5 to 10 percent slopes, moderately eroded	195	. 1	Wayland silty clay loam	832	. 2
Negley silt loam, 10 to 15 percent slopes, moderately eroded	341	. 1	Weikert and Muskingum soils, 2 to 5 percent slopes	2, 379	. 7
Negley soils, 15 to 20 percent slopes, moderately eroded	443	. 1	Weikert and Muskingum soils, 2 to 5 percent slopes, moderately eroded	2, 350	. 7
Negley soils, 10 to 20 percent slopes, severely eroded	124	(1)	Weikert and Muskingum soils, 5 to 10 percent slopes	963	. 3
Olmsted silt loam	310	. 1	Weikert and Muskingum soils, 5 to 10 percent slopes, moderately eroded	11, 994	3. 4
Olmsted silty clay loam	448	. 1	Weikert and Muskingum soils, 5 to 10 percent slopes, severely eroded	333	. 1
Orrville loam	800	. 2	Weikert and Muskingum soils, 10 to 15 percent slopes	653	. 2
Orrville silt loam	3, 910	1. 1	Weikert and Muskingum soils, 10 to 15 percent slopes, moderately eroded	8, 770	2. 5
Papakating silt loam	709	. 2	Weikert and Muskingum soils, 10 to 15 percent slopes, severely eroded	435	. 1
Papakating silty clay loam	2, 144	. 6	Weikert and Muskingum soils, 15 to 20 percent slopes, moderately eroded	9, 646	2. 7
Parke silt loam, 2 to 5 percent slopes	1, 161	. 3	Weikert and Muskingum soils, 15 to 20 percent slopes, severely eroded	907	. 3
Parke silt loam, 5 to 10 percent slopes	334	. 1	Weikert and Muskingum soils, 20 to 35 percent slopes	19, 956	5. 8
Parke silt loam, 5 to 10 percent slopes, moderately eroded	1, 059	. 3	Weikert and Muskingum soils, 20 to 35 percent slopes, severely eroded	3, 348	1. 0
Purdy silt loam	119	(1)	Weikert and Muskingum soils, 35 to 50 percent slopes	5, 797	1. 6
Rainsboro silt loam, 2 to 5 percent slopes	1, 008	. 3	Weikert and Muskingum soils, 35 to 50 percent slopes, severely eroded	1, 855	. 5
Rainsboro silt loam, 5 to 10 percent slopes	556	. 2	Wellston silt loam, 2 to 5 percent slopes	1, 469	. 4
Rainsboro silt loam, 5 to 10 percent slopes, moderately eroded	144	(1)	Wellston silt loam, 5 to 10 percent slopes	574	. 2
Ravenna silt loam, 0 to 2 percent slopes	556	. 2	Wellston silt loam, 5 to 10 percent slopes, moderately eroded	2, 107	. 6
Ravenna silt loam, 2 to 5 percent slopes	6, 504	1. 8	Wellston silt loam, 10 to 15 percent slopes, moderately eroded	1, 278	. 4
Rittman silt loam, 2 to 5 percent slopes	3, 356	1. 0	Wellston silt loam, 15 to 20 percent slopes, moderately eroded	106	(1)
Rittman silt loam, 5 to 10 percent slopes, moderately eroded	2, 304	. 7	Wharton silt loam, 2 to 5 percent slopes	492	. 1
Rittman silt loam, 10 to 15 percent slopes, moderately eroded	296	. 1	Wharton silt loam, 5 to 10 percent slopes	813	. 2
Rittman silt loam, 15 to 20 percent slopes, moderately eroded	194	. 1	Wharton silt loam, 5 to 10 percent slopes, moderately eroded	1, 194	. 3
Rittman soils, 10 to 15 percent slopes, severely eroded	64	(1)	Wharton silt loam, 10 to 15 percent slopes, moderately eroded	476	. 1
Rittman soils, 15 to 20 percent slopes, severely eroded	132	(1)			
Sebring silt loam	1, 262	. 4			
Sebring silty clay loam	126	(1)			
Strip mine spoil, glacial materials, rolling	1, 842	. 5			
Strip mine spoil, sandstone and shale materials, rolling	3, 200	. 9			
Strip mine spoil, steep	7, 341	2. 1			
Strip mine spoil, very acid	216	. 1			
Summitville silt loam, 2 to 5 percent slopes	825	. 2			
Summitville silt loam, 5 to 10 percent slopes	436	. 1			

See footnote at end of table.

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

Soil	Acres	Percent	Soil	Acres	Percent
Willette muck	180	0. 1	Wooster soils, 15 to 20 percent slopes, moderately eroded	1, 613	0. 5
Wooster loam, 5 to 10 percent slopes, moderately eroded	3, 340	1. 0	Wooster soils, 15 to 20 percent slopes, severely eroded	200	. 1
Wooster silt loam, 2 to 5 percent slopes	5, 108	1. 5	Wooster soils, 20 to 35 percent slopes, moderately eroded	809	. 2
Wooster silt loam, 2 to 5 percent slopes, moderately eroded	2, 766	. 8	Wooster soils, 20 to 35 percent slopes, severely eroded	101	(1)
Wooster silt loam, 5 to 10 percent slopes	1, 985	. 6	Wooster soils, 35 to 50 percent slopes, moderately eroded	283	. 1
Wooster silt loam, 5 to 10 percent slopes, moderately eroded	17, 637	5. 1	Water areas	2, 181	. 6
Wooster soils, 10 to 15 percent slopes	367	. 1	Total	342, 400	100. 0
Wooster soils, 10 to 15 percent slopes, moderately eroded	6, 576	1. 9			
Wooster soils, 10 to 15 percent slopes, severely eroded	400	. 1			

[1] Less than 0.05 percent.

are needed to control erosion. (Capability unit IIIe-1; woodland suitability group 4)

Allegheny silt loam, 10 to 15 percent slopes (AhD).—This soil occupies strongly sloping terraces. It has a thinner surface layer than the soil described as typical for the series. This soil is suitable for cropping but is moderately susceptible to erosion and should be contour stripcropped and kept in hay 50 percent or more of the time. (Capability unit IIIe-1; woodland suitability group 4)

Allegheny silt loam, 10 to 15 percent slopes, moderately eroded (AhD2).—The plow layer of this strongly sloping soil contains a considerable amount of subsoil material. Included in mapping are small areas of Allegheny silt loam, sandstone substratum; small areas that have a loam surface layer; and small areas on slopes exceeding 15 percent. Because runoff is medium to rapid on this soil, the hazard of erosion is moderate to severe. Erosion can be controlled by stripcropping on the contour and by using a rotation that includes an equal number of years of hay and grain. (Capability unit IIIe-1; woodland suitability group 4)

Allegheny silt loam, sandstone substratum, 5 to 10 percent slopes (AlC).—This soil is on sloping terraces and benches. Following is a typical profile in a cultivated area:

0 to 8 inches, dark-brown, friable silt loam; acid unless limed.
8 to 13 inches, brown, friable silt loam; very strongly acid.
13 to 29 inches, brown to dark-brown fine silt loam; friable in upper part, firm in lower part; very strongly acid.
29 to 35 inches, strong-brown, firm clay loam that is about 20 percent sandstone fragments and small pebbles; very strongly acid.
35 to 40 inches, brown channery sandy loam that is about 40 percent sandstone fragments and a few small pebbles; firm to friable; very strongly acid.
40 inches +, rotted sandstone bedrock that grades to hard, gray sandstone bedrock at a depth of 4 to 6 feet.

The alluvium is 24 to 42 inches thick over bedrock; it contains a variable amount of pebbles and other fragments. Permeability is moderate, the root zone is moderately thick, and the available moisture capacity is moderate.

On this soil runoff is medium to rapid, and the erosion hazard is moderate. Erosion can be controlled if fields are contour stripcropped and if hay and grain both are grown an equal number of years in the rotation. (Capability unit IIIe-1; woodland suitability group 4)

Allegheny and Monongahela silt loams, 2 to 5 percent slopes (AmB).—The soils in this undifferentiated group are deep and friable. They have moderate available moisture capacity, are moderately high in productivity, are easily managed, and are only slightly susceptible to erosion. Included in mapping are small areas of nearly level Monongahela soils; areas that have a loam surface layer; and small areas that are moderately eroded. (Capability unit IIe-1; woodland suitability group 4)

Allegheny and Monongahela silt loams, 2 to 5 percent slopes, moderately eroded (AmB2).—The present surface layer of these eroded soils consists of the remaining part of the original surface soil mixed with subsoil material. Small areas of nearly level Monongahela soils are included. Runoff is medium, and the hazard of further erosion is slight. (Capability unit IIe-1; woodland suitability group 4)

Bogart Series

In the Bogart series are moderately well drained soils on terraces. These soils formed from sandy and gravelly, slightly limy glacial outwash that consists mostly of material from sandstone and shale but contains material from limestone and crystalline rock. The surface layer and subsoil range from 30 to 48 inches in total thickness and are gravelly sandy clay loam, loam, or sandy loam in texture. The substratum is made up of poorly sorted outwash and layers of till, or layers of lacustrine material, that retard movement of water in the subsoil. Bogart soils occur in nearly level to sloping areas on terraces in the northern part of the county.

Typical profile of a Bogart loam in a cultivated field:

0 to 8 inches, very dark grayish-brown loam; friable; pebbles make up 8 percent of horizon; strongly acid unless limed.
8 to 16 inches, yellowish-brown loam; friable; pebbles make up 10 to 15 percent of horizon; strongly acid.
16 to 26 inches, dark-brown gravelly sandy clay loam with many, coarse to fine, grayish mottles; firm in position but friable when disturbed; pebbles make up 20 percent of horizon; strongly acid.

26 to 42 inches, dark-brown gravelly sandy loam; strongly acid.
42 to 47 inches, brown sandy loam that is about 5 percent pebbles; loose; medium acid.
47 to 70 inches, layers of dark grayish-brown loam or loamy sand; neutral.

The solum is strongly acid, but the substratum is medium acid at a depth of about 50 inches and is mildly alkaline at a depth of 70 to 80 inches.

The Bogart soils have a thick root zone, are moderately rapid in permeability, and have moderate available moisture capacity. They are easily managed and are moderately productive of general farm crops and special crops. In dry years they are more productive than nearby well-drained soils because they retain moisture better. Crops on the Bogart soils respond well to applications of lime and fertilizer.

Bogart loam, 0 to 2 percent slopes (BgA).—This nearly level soil occupies terraces. At a depth of 4 to 8 feet, it has layers of material that are less permeable than the layers above them. In some places the lower subsoil includes layers of firm but porous outwash that is weakly cemented by iron. Runoff is very slow or slow, and there is little or no erosion hazard. (Capability unit I–2; woodland suitability group 2)

Bogart loam, 2 to 5 percent slopes (BgB).—This gently sloping soil is slightly susceptible to erosion. (Capability unit IIe–1; woodland suitability group 2)

Bogart silt loam, 0 to 2 percent slopes (BoA).—On this soil there is slow runoff but no appreciable hazard of erosion. (Capability unit I–2; woodland suitability group 2)

Bogart silt loam, 2 to 5 percent slopes (BoB).—The hazard of erosion is slight on this gently sloping soil. (Capability unit IIe–1; woodland suitability group 2)

Bogart soils, 5 to 10 percent slopes (BsC).—These sloping soils have a surface layer of loam or silt loam. Included in mapping are small areas of somewhat poorly drained soils. Runoff is medium, and the hazard of erosion is moderate. Erosion in cultivated fields can be controlled by contour stripcropping. (Capability unit IIIe–1; woodland suitability group 2)

Bogart soils, 5 to 10 percent slopes, moderately eroded (BsC2).—The surface layer of these sloping soils is loam or silt loam. Cultivated areas have a plow layer that is a mixture of the original surface layer and material from the subsoil. Runoff is slow to medium. Erosion is a moderate hazard but can be controlled by stripcropping on the contour. (Capability unit IIIe–1; woodland suitability group 2)

Canfield Series

The Canfield series consists of moderately well drained soils of the uplands that developed from medium-textured, slightly limy glacial till. These soils are in the northern half of the county.

Typical profile of a Canfield silt loam:

0 to 7 inches, dark grayish-brown, friable silt loam; neutral.
7 to 14 inches, yellowish-brown, friable loam; strongly acid.
14 to 30 inches, yellowish-brown loam mottled with gray; friable in upper part but firm in lower part; very strongly acid.
30 to 47 inches, brown, firm, dense loam mottled with gray; strongly acid.
47 inches +, brown loam glacial till; strongly acid in upper part, alkaline below a depth of 70 inches.

Canfield soils have moderate available moisture capacity, are moderately slowly permeable, and have a moderately thick root zone. In the subsoil there are firm, dense layers that retard the movement of water and the growth of roots. Productivity is only moderate, but crops respond well to added lime and fertilizer. The native vegetation is a mixed stand of oak, maple, beech, and other hardwoods.

Canfield silt loam, 2 to 5 percent slopes (CaB).—This soil is easily managed, is subject to only slight erosion, and is suited to a wide variety of crops. Included with it in mapping are areas that have a loam surface layer and a small acreage that has slopes of 0 to 2 percent. (Capability unit IIe–1; woodland suitability group 2)

Canfield silt loam, 2 to 5 percent slopes, moderately eroded (CaB2).—Although runoff is slow on this soil, it has removed part of the original surface layer, and the present surface layer contains some of the subsoil. Included is a small acreage that has a surface layer of loam. (Capability unit IIe–1; woodland suitability group 2)

Canfield silt loam, 5 to 10 percent slopes (CaC).—In this soil the total thickness of the surface layer and the subsoil is a little less than that of nearly level or gently sloping Canfield soils. Included in mapping is a small acreage with a loam surface layer. Runoff is medium and causes a moderate hazard of erosion. (Capability unit IIIe–1; woodland suitability group 2)

Canfield silt loam, 5 to 10 percent slopes, moderately eroded (CaC2).—The surface layer of this sloping soil includes some of the upper subsoil brought up in plowing. Runoff is medium, and the hazard of erosion is moderate. (Capability unit IIIe–1; woodland suitability group 2)

Carlisle Series

The Carlisle series consists of deep, very poorly drained organic soils that developed from woody and grassy or sedgy materials. These soils are in flat to depressed bogs in the glaciated part of the county.

Typical profile of Carlisle muck:

0 to 10 inches, black, friable muck; slightly acid.
10 to 22 inches, black muck that contains much partly decomposed, dark-brown woody material; compact, but very friable when disturbed; medium acid.
22 to 32 inches, very dark gray peat; loose; medium acid; decomposed woody material.
32 to 60 inches +, dark-brown, partly decomposed woody peat; loose; medium acid to neutral.

Unless drained, the Carlisle soils are very low in productivity. They have high available moisture capacity, are slowly permeable, and have a thin root zone. If properly drained, they are moderately productive of truck crops. The native vegetation is swamp grasses and sedges.

Carlisle muck (Cc).—This is the only Carlisle soil in Columbiana County. Most areas are covered with grasses or trees, but a few are used for crops. Although erosion is not a hazard on this soil, the surface layer in cultivated areas contains a small amount of mineral soil material that washed from higher slopes. Poor drainage is a severe limitation, and undrained areas are commonly ponded. Included in mapping are small areas of Willette muck and

Kerston muck. (Capability unit IIIw-4; woodland suitability group 14)

Cavode Series

The Cavode series consists of somewhat poorly drained soils of the uplands that overlie black carbonaceous shale. These soils are on gently sloping to sloping benches in the southern part of the county.

Typical profile of a Cavode silt loam:

- 0 to 9 inches, dark grayish-brown, friable silt loam; strongly acid.
- 9 to 17 inches, mottled grayish-brown and brown, firm silt loam; very strongly acid.
- 17 to 40 inches, mottled gray and strong-brown, firm silty clay loam; very strongly acid.
- 40 to 60 inches, mottled gray and strong-brown, very firm shaly silty clay loam; strongly acid; shale fragments are rotted.
- 60 inches +, black clay shale bedrock; neutral.

The depth to bedrock ranges from 4 to 6 feet.

The Cavode soils are less permeable than the Tyler soils, which developed from silty materials laid down by water, though they are similar to Tyler soils in other respects.

Cavode soils have high available moisture capacity, but they are slowly permeable and have a limited root zone unless drained. They are difficult to manage and are low in productivity. They can be used for crops, however, if excess water is removed by surface drainage and if runoff from adjacent slopes is intercepted by diversion terraces. The response of crops to liming and fertilization is moderate. Random tiling is effective in many areas, but systematic tiling is not commonly used, because the clayey subsoil retards the movement of water. The native vegetation is elm, maple, oak, and other hardwoods.

Cavode silt loam, 2 to 5 percent slopes (CdB).—This soil generally occupies the upper part of gently sloping benches in the unglaciated area of the county. Included in mapping are small areas that are moderately eroded and a few areas that have slopes of 0 to 2 percent. This soil is relatively difficult to manage because it has a clayey subsoil and is slowly permeable and wet. Improved drainage is needed if crops are grown. Runoff is medium, and erosion is a moderate hazard. (Capability unit IIIw-2; woodland suitability group 12)

Cavode silt loam, 5 to 10 percent slopes (CdC).—Runoff is medium to rapid on this sloping soil, and erosion is a moderate to severe hazard. Diversion terraces are needed in cultivated areas to divert excess water from adjacent slopes. Included in mapping are small areas that are strongly sloping. (Capability unit IIIe-2; woodland suitability group 12)

Cavode silt loam, 5 to 10 percent slopes, moderately eroded (CdC2).—This sloping, moderately eroded soil has a plow layer that is a mixture of material from the original surface layer and the subsoil. Areas having a silty clay loam surface layer are included. Runoff is medium to rapid, and the erosion hazard is moderate to severe. Erosion in cultivated fields can be controlled by using a system of stripcropping that keeps the soil covered with hay at least half the time. Diversion terraces generally are needed to divert excess water. (Capability unit IIIe-2; woodland suitability group 12)

Chagrin Series

In the Chagrin series are well-drained soils that developed in medium acid or slightly acid alluvium on flood plains.

Typical profile of Chagrin silt loam in a cultivated field:

- 0 to 12 inches, dark yellowish-brown, friable silt loam; medium acid.
- 12 to 27 inches, dark-brown, friable silt loam; medium to slightly acid.
- 27 to 35 inches +, dark-brown, slightly firm silt loam; medium acid.

In many places the Chagrin soils are adjacent to the moderately well drained Lobdell soils. Chagrin soils are highly productive. They have high available moisture capacity, are moderately permeable, have a thick root zone, and are suitable for continuous row cropping if they are well managed. They are occasionally flooded, but crop damage generally is only slight. Oak, maple, sycamore, and other hardwoods make up the native vegetation.

Chagrin loam (Ce).—In some areas this soil is likely to be flooded so frequently that it should be kept covered with plants. Runoff is very slow, however, and there is no erosion hazard. Included in areas mapped as this soil are areas that have a gravelly loam or a sandy loam surface layer. (Capability unit I-1, woodland suitability group 1)

Chagrin silt loam (Cg).—This soil generally is highly productive of row crops, though in small areas it is subject to frequent flooding and should be kept in permanent vegetation. Some areas having a reddish surface layer are included. Runoff is very slow, and there is no risk of erosion. (Capability unit I-1; woodland suitability group 1)

Chili Series

In the Chili series are well-drained soils that developed from sandy and gravelly glacial outwash. Most of the outwash is material from sandstone and shale, but about 20 percent is material from limestone and granite. These soils occur on terraces and kames in the glacial drift area of Wisconsin Age and on terraces along streams draining that area. Slopes range from gentle to steep.

Typical profile of a Chili loam:

- 0 to 8 inches, dark-brown, friable gravelly loam with a medium content of organic matter; very strongly acid.
- 8 to 18 inches, brown, very friable gravelly sandy loam; very strongly acid.
- 18 to 45 inches, dark-brown, very friable gravelly sandy clay loam; strongly acid.
- 45 inches +, dark-brown, noncoherent gravelly sandy loam; medium acid in upper part to calcareous at various depths below 60 inches.

Chili soils are less gravelly and have a thicker subsoil than Conotton soils. They have a thinner subsoil and are less deeply leached of lime than the Negley soils.

The Chili soils have moderately rapid permeability, low available moisture capacity, and a thick root zone. Their inherent fertility is moderate but is quickly depleted by continuous cultivation. Crops respond well to applications of lime and fertilizer. The native vegetation is forest, mainly oak and hickory.

Chili gravelly loam, 2 to 5 percent slopes (ChB).—This gently sloping soil occupies terraces. Included with it are small areas that have slopes of 0 to 2 percent and small areas that are moderately eroded.

This soil is almost all cultivated. It is friable throughout, is easily managed, and is well suited to all the common crops. If special crops are grown, however, irrigation is needed for the most favorable yields. Crops respond to applications of lime and fertilizer. Although runoff is very slow and the erosion hazard is only slight, the soil will wash if it is continuously cropped and is depleted of organic matter. (Capability unit IIe-4; woodland suitability group 3)

Chili gravelly loam, 5 to 10 percent slopes, moderately eroded (ChC2).—This sloping soil has a plow layer that contains material brought up from the subsoil. Much of it occurs on irregular, hummocky slopes in gravelly areas on uplands and on terrace escarpments. Included with it in upland areas are small areas of Wooster soils. Also included are a few areas that are only slightly eroded and a few that are severely eroded.

This soil is more droughty and, as a consequence, is less productive of truck crops than similar soils on milder slopes. If cropped, it should be protected by practices that control erosion and by a rotation that includes hay at least half the time. Although runoff is slow, the hazard of erosion is moderate. (Capability unit IIIe-4; woodland suitability group 3)

Chili gravelly loam, 10 to 15 percent slopes, moderately eroded (ChD2).—This strongly sloping soil occurs on terrace escarpments and in irregular, hummocky, gravelly areas on uplands. Included in mapping are small slightly eroded areas and, on uplands, small areas of Wooster soils.

This soil is suitable for occasional cultivation but is more suitable for hay and pasture. The hazard of erosion is moderate to severe. (Capability unit IVe-4; woodland suitability group 3)

Chili loam, 0 to 2 percent slopes (ClA).—This nearly level soil is slightly droughty but is not susceptible to erosion. Runoff is very slow. Included in mapping are small areas that have a gravelly loam or a silt loam surface layer. (Capability unit IIs-1; woodland suitability group 3)

Chili loam, 2 to 5 percent slopes (ClB).—This gently sloping soil is on terraces, or second bottoms, in stream valleys. Included in mapping are areas that have a silt loam surface layer and small areas that are moderately eroded.

Except for small areas in pasture and woodlots, all of this soil is cultivated. It warms up early in spring and is one of the most productive, most easily managed soils in the county. Although it dries out quickly after rain and tends to be droughty in dry years, it generally receives enough rain for satisfactory yields of general farm crops. Truck crops and special crops are well suited to this soil. All crops respond well to additions of lime and fertilizer. Runoff is very slow, but erosion is a slight hazard in fields that are continuously cultivated. Practices are needed to control erosion in areas used for crops. (Capability unit IIe-4; woodland suitability group 3)

Chili loam, 2 to 5 percent slopes, moderately eroded (ClB2).—This soil has subsoil material mixed into the surface layer, which contains less organic matter and a little more gravel than that of uneroded Chili soils. If the soil is used for crops, it requires practices that control erosion. In addition, it is slightly droughty. Included in mapping are some areas that have a silt loam surface layer. (Capability unit IIe-4; woodland suitability group 3)

Chili loam, 5 to 10 percent slopes (ClC).—This sloping soil has slow runoff but is moderately susceptible to erosion. If it is cultivated, it needs the protection of erosion control practices and should be kept in hay at least half the time. Included in mapping are small gravelly areas and areas that have a silt loam surface layer. (Capability unit IIIe-4; woodland suitability group 3)

Chili loam, 5 to 10 percent slopes, moderately eroded (ClC2).—The plow layer of this sloping soil is a mixture of the original surface layer and a small amount of subsoil material. Included in mapping are some areas in which the present surface layer is silt loam or gravelly loam.

Erosion in cultivated areas can be controlled by use of adequate practices and by keeping the soil in hay at least half the time. Although runoff is slow, the hazard of erosion is moderate. (Capability unit IIIe-4; woodland suitability group 3)

Chili loam, 10 to 15 percent slopes (ClD).—This strongly sloping soil occurs in irregular, hummocky areas and on terrace escarpments. Its layers tend to be thinner than those of Chili soils on milder slopes. Small areas of Chili gravelly loam are included.

Although runoff is slow on this soil, the erosion hazard is moderate to severe. Pasture plants are well suited, and tilled crops can be grown if erosion is controlled. (Capability unit IVe-4; woodland suitability group 3)

Chili loam, 10 to 15 percent slopes, moderately eroded (ClD2).—This strongly sloping soil occupies irregular, hummocky areas and terrace escarpments. Its horizons tend to be thinner than those described as typical for the series. Small areas of Chili silt loam are included.

This soil is well suited to hay and pasture, but it can be cropped if practices for controlling erosion are adequate. Runoff is slow, and the erosion hazard is moderate or severe. (Capability unit IVe-4; woodland suitability group 3)

Chili loam, 15 to 20 percent slopes, moderately eroded (ClE2).—This moderately steep soil occurs on irregular, hummocky slopes and terrace escarpments. It has thinner horizons than those described for the series. Included in mapping are small areas of Chili gravelly loam.

This soil is well suited to plants grown for pasture. It can be cultivated occasionally, but it is highly erodible if cropped and not protected. Runoff is slow to medium. (Capability unit IVe-4; woodland suitability group 3)

Chili soils, 5 to 10 percent slopes, severely eroded (CmC3).—The plow layer of these sloping soils consists mainly of subsoil material, and in most places shallow gullies have formed. Included are small areas of Chili gravelly loam.

These soils should be kept in hay or pasture, but they can be included in fields used for crops if sufficient amounts of manure and fertilizer are applied. Runoff is slow to medium, but erosion is a severe hazard in cultivated areas. (Capability unit IVe-4; woodland suitability group 5)

Chili soils, 10 to 15 percent slopes, severely eroded (CmD3).—These strongly sloping soils are in irregular, hummocky areas and on terrace escarpments. Their horizons tend to be thinner than those described as typical for the series. Included in mapping are small areas of Chili silt loam and Chili gravelly loam.

Because the soils of this mapping unit are highly susceptible to erosion, they are more suitable for hay and pasture than for cultivated crops. Runoff is slow to medium. (Capability unit VIe–2; woodland suitability group 5)

Chili soils, 15 to 20 percent slopes, severely eroded (CmE3).—These moderately steep, severely eroded soils occupy terrace escarpments and irregular, hummocky slopes. They have thinner horizons than the soil described for the series. Small areas of Chili gravelly loam are included.

Because these soils are subject to severe erosion, they are more suitable for pasture than for crops. Runoff is slow to medium. (Capability unit VIe–2; woodland suitability group 5)

Chili, Conotton, and Negley soils, 20 to 50 percent slopes (CnF).—These soils are mapped together in an undifferentiated group because they are suited to similar uses and require similar management. Although the soils are too steep and too droughty for crops, they are well suited to trees and to plants used in developing habitat for wildlife. Some of the milder slopes can be used for improved pasture, but the very steep slopes are better suited to unimproved pasture. Where planting is feasible, alfalfa and birdsfoot trefoil grow well and persist for several years. Surface runoff on these soils is medium to rapid. (Capability unit VIIe–1; woodland suitability group 3)

Chili, Conotton, and Negley soils, 20 to 50 percent slopes, severely eroded (CnF3).—The soils in this undifferentiated group are suitable as woodland or for wildlife. They are too steep, too severely eroded, and too droughty for other agricultural uses. (Capability unit VIIe–2; woodland suitability group 5)

Chilo Series

The Chilo series consists of dark-colored, very poorly drained soils on terraces. These soils developed from alluvium that is mainly silty but has layers of sand and fine gravel at various depths. The alluvium was derived from local sandstone, siltstone, and shale bedrock. Chilo soils are in nearly level, depressional areas that lie along shallow and poorly defined waterways on high terraces in the southern part of the county.

Typical profile of Chilo silty clay loam:

- 0 to 8 inches, very dark brown, friable silty clay loam; medium acid.
- 8 to 38 inches, dark-gray to gray, firm silty clay loam with many distinct mottles of strong brown; strongly acid.
- 38 inches +, stratified loam and gravelly loam soil material.

Although these soils have high available moisture capacity, they are slowly permeable, have a thin root zone, and, unless drained, are moderately low in productivity. If drainage is improved by use of tile, however, productivity is moderately high. The response of crops to lime and fertilizer is medium. The native vegetation is swamp grasses and sedges or a swamp forest consisting mainly of white oak and pin oak.

Chilo silty clay loam (Co).—This is the only Chilo soil mapped in the county. Drainage is a limitation on this soil, but erosion is not a hazard, for runoff is very slow. Included in mapping are a few small areas of dark-colored, very poorly drained soils that contain fragments of red clay shale, siltstone, and sandstone and that occur in large seep spots and near drainageways. (Capability unit IIIw–1; woodland suitability group 13)

Conotton Series

Soils of the Conotton series are well drained and steep. They developed from glacial outwash consisting of gravelly material that has a high content of sandstone pebbles and is about 20 percent limestone and granite pebbles. The outwash was deposited in kames and on terrace escarpments. The escarpments are mostly along Sandy and Little Beaver Creeks and the Ohio River.

Typical profile of a Conotton gravelly loam:

- 0 to 5 inches, black, very friable gravelly loam; strongly acid.
- 5 to 13 inches, dark-brown, very friable gravelly sandy loam; strongly acid.
- 13 to 30 inches, dark-brown, loose gravelly sandy loam; strongly acid.
- 30 to 60 inches, brown, loose gravelly loamy sand; slightly acid.

In some places the Conotton soils are weakly calcareous below a depth of 60 inches. The texture of the surface layer is gravelly loam, gravelly sandy loam, loam, or sandy loam, but in most areas it is gravelly loam. These soils are rapidly permeable and have low available moisture capacity. If moisture is adequate, roots penetrate deeply.

In this county the Conotton soils occur closely with the Chili and Negley soils, and they are mapped only in undifferentiated groups of Chili, Conotton, and Negley soils. These mapping units are described under the heading "Chili Series."

Damascus Series

The Damascus series is made up of poorly drained soils on terraces. These soils developed from gravelly and sandy glacial outwash of Wisconsin age that is more than 30 inches thick and is slightly limy. Some areas have a silty upper horizon less than 18 inches thick. The outwash consists of materials mostly from sandstone and shale but partly from limestone and crystalline rock. The substratum is poorly sorted outwash, till, or lacustrine material. Damascus soils occur on nearly level or gently sloping terraces in the northern part of the county.

Typical profile of Damascus silt loam:

- 0 to 8 inches, dark grayish-brown, friable silt loam with reddish-brown mottles; medium acid.
- 8 to 15 inches, mottled grayish-brown, friable loam; strongly acid.
- 15 to 33 inches, mottled yellowish-brown and gray, friable loam ranging to gravelly sandy clay loam in the lower part; medium acid to slightly acid.
- 33 inches +, dark grayish-brown, friable gravelly sandy loam glacial outwash with layers of glacial till and lacustrine material; neutral.

In these soils the root zone is thin because the water table is seasonally high. The subsoil is moderately permeable. The soils have moderate available moisture capacity and are moderately productive. Elm, sugar maple, beech, and other hardwoods make up the native vegetation.

Damascus silt loam (Da).—This is the only Damascus soil in the county. It occupies nearly level to depressional areas on the Wisconsin glacial outwash plain.

Included in mapping are areas where the surface layer is loam and small areas where it is gravelly loam.

Drainage is the major limitation on this soil. Because of the gravelly layers, however, wetness generally is a problem only early in spring. If drainage is improved, crops respond well to lime and fertilizer, and productivity is moderate. Runoff is very slow, and there is no erosion hazard. (Capability unit IIIw-2; woodland suitability group 13)

Dekalb Series

Soils of the Dekalb series developed from sandstone and are moderately deep and well drained. They are on strongly sloping to very steep hillsides and on a few ridgetops in the unglaciated part of the county.

Typical profile of a Dekalb loam:

0 to 8 inches, dark-brown, friable loam containing a few sandstone fragments; extremely acid.

8 to 19 inches, yellowish-brown channery loam that is 15 to 25 percent sandstone fragments; friable but less so than surface layer; extremely acid.

19 to 29 inches, yellowish-brown, friable channery sandy loam that is about 60 percent sandstone fragments; strongly acid.

29 inches +, yellowish-brown, weathered, weakly cemented sandstone that grades to hard, gray sandstone at a depth of 10 to 15 feet.

The Dekalb soils take in water readily, are moderately rapidly permeable, and have low available moisture capacity. Productivity is low, but crops respond well to lime and fertilizer. The native vegetation is oak-hickory forest.

Dekalb loam, 2 to 5 percent slopes (DeB).—This soil occupies gently sloping ridgetops that are scattered throughout the southern half of the county. In spite of its limited depth and low available moisture capacity, both of which reduce yields in dry years, the soil is suited to crops because it is permeable and in good tilth. Crops respond well to applications of lime, fertilizer, and manure. Hay grown in the rotation helps to supply organic matter to the soil. Erosion is a slight hazard and should be controlled by suitable practices. (Capability unit IIe-3; woodland suitability group 7)

Dekalb loam, 5 to 10 percent slopes (DeC).—This soil occupies sloping ridgetops and knobs. These areas favor use of the soil as cropland in the hilly region where it occurs, but erosion is a moderate hazard and needs to be controlled. Runoff is medium. (Capability unit IIIe-3; woodland suitability group 7)

Dekalb loam, 5 to 10 percent slopes, moderately eroded (DeC2).—This soil occurs on sloping ridgetops and knobs; it has a plow layer that consists of the original surface layer mixed with some of the subsoil. Included in mapping are severely eroded areas.

This soil can be used for crops in the hilly region where it occurs, but it is moderately erodible if not protected. (Capability unit IIIe-3; woodland suitability group 7)

Dekalb loam, 10 to 15 percent slopes, moderately eroded (DeD2).—This soil, which occupies strongly sloping hillsides, has a plow layer that is a mixture of surface soil and the upper part of the subsoil. Included in mapping are small areas that are slightly eroded or severely eroded.

In controlling erosion, more care is needed on this soil than on less strongly sloping Dekalb loams, and hay or pasture should be grown in areas not used for tilled crops in the rotation. The hazard of erosion is moderate or severe. (Capability unit IIIe-3; woodland suitability group 7)

Dekalb loam, 15 to 20 percent slopes, moderately eroded (DeE2).—This soil lies on moderately steep hillsides. It is well suited to hay and pasture but can be used occasionally for a row crop and a small grain in order to reestablish long-term meadow. Slightly eroded areas and severely eroded areas are included. Runoff is rapid, and the hazard of erosion is severe in cropped fields. (Capability unit IVe-3; woodland suitability group 7)

Dekalb loam, 20 to 35 percent slopes (DeF).—This soil occupies steep hillsides and is thinner than the soil described as typical for the series. It is well suited to grass or trees. Runoff is rapid, and the erosion hazard is severe. (Capability unit VIe-1; woodland suitability group 8)

Dekalb loam, 20 to 35 percent slopes, moderately eroded (DeF2).—This soil is thinner than the soil described for the series. It occupies steep hillsides and has lost part or all of its dark-colored surface layer through erosion. In some places the plow layer is a mixture of subsoil material and surface soil, and in other places it consists entirely of subsoil.

This soil is well suited to grass or trees, but it has rapid runoff and is subject to severe erosion. (Capability unit VIe-1; woodland suitability group 8)

Dekalb soils, 20 to 35 percent slopes, severely eroded (DkF3).—These soils occur on steep hillsides, where runoff is very rapid and the erosion hazard is severe. The plow layer consists mostly of subsoil material, and the remaining part of the subsoil is thin. These soils are suited to trees and are of limited use for unimproved pasture. (Capability unit VIIe-2; woodland suitability group 9)

Dekalb stony loam, 5 to 20 percent slopes (DsD).—This soil is on sloping hillsides in the southern part of the county. Sandstone rocks make up 60 to 70 percent of the soil, by volume. The soil can be used for pasture or trees, but surface stones and small areas of outcropping rock are hazards to the use of machinery. (Capability unit VIe-1, woodland suitability group 9)

Dekalb stony loam, 20 to 50 percent slopes (DsF).—This soil occurs on very steep slopes. From 60 to 70 percent of the soil, by volume, is rock fragments of sandstone. Included in mapping are small areas that are moderately or severely eroded. This soil is better suited to trees than to other crops, but it can be used to a limited extent for pasture. (Capability unit VIIe-1; woodland suitability group 9)

Ernest Series

The Ernest series consists of moderately well drained soils that developed in thick colluvium derived from siltstone, shale, and sandstone. In places the substratum contains some waterlaid material. These soils occur in sloping to steep areas along the base of valley walls and hillsides in the unglaciated part of the county.

Typical profile of an Ernest silt loam:

0 to 9 inches, very dark grayish-brown, friable silt loam with about 5 percent rock fragments; very strongly acid.

9 to 23 inches, yellowish-brown, firm channery coarse silty clay loam; very strongly acid.
23 to 34 inches, finely mottled, strong-brown and gray, firm, compact channery silty clay loam; strongly acid.
34 to 48 inches, mottled dark-brown and gray, very firm silty clay with about 5 percent rock fragments: strongly acid.
48 to 62 inches, dark-brown, friable silty clay loam with many, coarse, gray mottles; medium acid.
62 to 108 inches, olive-brown channery silty clay loam; neutral.

The Ernest soils commonly occur with the Laidig soils. They are less well drained than the Laidig soils and developed in colluvium that is not so coarse.

The Ernest soils are slowly permeable and, because they receive seepage from higher slopes, are moist most of the year. They are subject to runoff from higher areas and are somewhat difficult to manage when used for crops. The root zone is only moderately thick because of the firm, compact layer in the subsoil. Productivity is moderate, and the available moisture capacity is moderate. The native vegetation is a forest of mixed hardwoods, chiefly oak and maple.

Ernest silt loam, 5 to 10 percent slopes (ErC).—This sloping soil has medium runoff and is subject to severe erosion. If crops are grown, diversion terraces or contour strips are needed to control soil losses. Included in mapping are areas that are moderately eroded and areas that are somewhat poorly drained. (Capability unit IIIe–1; woodland suitability group 2)

Ernest silt loam, 10 to 15 percent slopes, moderately eroded (ErD2).—The plow layer of this strongly sloping soil contains a considerable amount of material from the subsoil. Small included areas are slightly eroded or severely eroded. Runoff is medium to rapid on this soil, and the erosion hazard is moderate to severe. Erosion in cultivated areas can be controlled by diversion terraces or stripcropping and by a rotation that provides an equal number of years in hay and in grain. (Capability unit IIIe–1; woodland suitability group 2)

Ernest silt loam, 15 to 20 percent slopes, moderately eroded (ErE2).—Tillage has brought a considerable amount of subsoil material into the plow layer of this moderately steep soil. Included in mapping are small areas that are slightly eroded or severely eroded.

This soil is suitable for limited cultivation, but it is more suitable for pasture. Because runoff is rapid, erosion is a severe hazard if crops are grown or if pasture is overgrazed. (Capability unit IVe–2; woodland suitability group 2)

Ernest silt loam, 20 to 35 percent slopes, moderately eroded (ErF2).—This steep soil has a much thinner surface layer and subsoil than less strongly sloping Ernest soils. Small included areas are severely eroded. This soil is well suited as woodland but can be used for pasture. It has very rapid runoff, however, and is highly susceptible to erosion. (Capability unit VIe–1; woodland suitability group 2)

Fitchville Series

In the Fitchville series are somewhat poorly drained soils on terraces that developed from silt and some fine sand deposited in ponded water. These deposits occur over glacial till or outwash and, within short distances, range from 2 to 5 feet in thickness. Fitchville soils are in nearly level and gently sloping areas on broad outwash plains and in swamps and areas of former swamps on the uplands.

Typical profile of a Fitchville silt loam:

0 to 9 inches, grayish-brown, friable silt loam; very strongly acid.
9 to 22 inches, strong-brown, friable silty clay loam with many, medium, gray and reddish-brown mottles; very strongly acid.
22 to 42 inches, dark yellowish-brown, firm silty clay loam with common, medium, gray mottles; strongly acid.
42 to 54 inches, yellowish-brown, firm silty clay loam; medium acid in the upper part and slightly acid in the lower part.

The Fitchville soils are less gravelly and sandy than the Jimtown soils. Fitchville soils are moderately productive if they are drained and are properly managed. Tiling and surface drainage both may be needed for satisfactory yields. The soils are moderately slow in permeability and have high moisture-holding capacity, but all the moisture in the soil may not be available to plants because the subsoil has a dense, firm layer at a depth of 22 to 42 inches. Also because of this layer, the root zone is only moderately thick. The native vegetation is a forest of beech and maple.

Fitchville silt loam, 0 to 2 percent slopes (FcA).—Runoff is slow on this nearly level soil, and there is no erosion hazard. Tile lines and surface drainage are needed if yields are to be adequate. (Capability unit IIw–2; woodland suitability group 12)

Fitchville silt loam, 2 to 5 percent slopes (FcB).—Except for its gentle slopes, this soil is like Fitchville silt loam, 0 to 2 percent slopes. The soil is seasonally wet because of a firm, dense layer in the subsoil. Drainage can be improved by use of tile and practices that remove excess surface water. Runoff is slow to medium. (Capability unit IIw–2; woodland suitability group 12)

Frenchtown Series

The Frenchtown series consists of poorly drained soils of the uplands that have a dense, firm layer in the subsoil. These soils formed from moderately fine textured, slightly limy glacial till. They occur in nearly level and depressional areas in the northern part of the county.

Typical profile of Frenchtown silt loam:

0 to 10 inches, grayish-brown, friable silt loam with common, medium, strong-brown and dark-gray mottles; content of pebbles 10 percent; strongly acid.
10 to 21 inches, mottled yellowish-brown and gray, friable silt loam or loam; content of pebbles about 10 percent; strongly acid.
21 to 34 inches, olive-brown, dense, firm loam with many, medium, gray and dark reddish-brown mottles and about 15 percent pebbles; strongly acid.
34 to 58 inches, dark-brown, friable loam; content of pebbles 15 percent; neutral in upper part but ranging to calcareous below a depth of 42 inches.

The Frenchtown soils are similar to the Sebring and Damascus soils. They have a coarser textured subsoil than the Sebring soils, and they are less gravelly and sandy than the Damascus soils, which do not have a dense, firm subsoil layer.

The root zone is thin in the Frenchtown soils because of the dense layer in the subsoil. Permeability is slow, and the available moisture capacity is moderate. Productivity is low unless drainage is improved, and the response of crops to lime and fertilizer is only fair. The native vegetation is chiefly pin oak, swamp white oak, elm, and red maple.

Frenchtown silt loam (Fr).—This nearly level soil is moderately productive if it is tile drained. Surface drainage also is beneficial. Runoff is very slow, and erosion is not likely. Included in mapping are areas that have slopes of 2 to 5 percent. (Capability unit IIIw-2; woodland suitability group 13)

Glenford Series

The Glenford series consists of gently sloping to sloping, moderately well drained soils on terraces. These soils developed from silt, clay, and some fine sand that were deposited in ponded water over glacial till and outwash. Within short distances these materials range from 2 to 5 feet in thickness. Glenford soils occur in the northern part of the county.

Typical profile of a Glenford silt loam:

0 to 9 inches, dark grayish-brown, friable silt loam; strongly acid.
9 to 23 inches, yellowish-brown, friable silt loam with many, medium, brown mottles in lower part; strongly acid.
23 to 36 inches, strong-brown silty clay loam with grayish mottles; friable in upper part, firm in lower part; strongly acid.
36 to 43 inches, layers of strong-brown loam and gray silty clay loam; less firm than layer above; acid.
43 inches +, stratified layers of silty, sandy, and clayey materials; sandy layers, if present, are discontinuous; neutral or alkaline.

The Glenford soils occur with and are similar to the Bogart soils, which have a gravelly and sandy subsoil.

Glenford soils are moderately productive, have moderate available moisture capacity, and are moderately slow in permeability. Because the subsoil has a firm, dense layer, the root zone is only moderately thick. Crops respond well to lime and fertilizer. The native vegetation is a forest of beech and sugar maple.

Glenford silt loam, 2 to 5 percent slopes (GfB).—This deep soil is gently sloping, but small nearly level areas are included with it. Also included are small moderately eroded areas. The soil has moderate available moisture capacity and is moderately productive. Although runoff is medium, the erosion hazard is only slight. (Capability unit IIe-1; woodland suitability group 2)

Glenford silt loam, 5 to 10 percent slopes (GfC).—This sloping soil is moderately to highly erodible if not protected. Erosion in cultivated fields can be controlled by contour stripcropping and a rotation that keeps the soil in hay at least half the time. Runoff is medium. Small included areas are well drained or somewhat poorly drained. (Capability unit IIIe-1; woodland suitability group 2)

Glenford silt loam, 5 to 10 percent slopes, moderately eroded (GfC2).—The plow layer of this sloping soil consists partly of material that formerly was subsoil. Included in mapping are small areas of Fitchville soils. Runoff is medium, and the hazard of erosion is moderate to severe. Needed in cultivated areas to control erosion are contour stripcropping and a rotation that keeps the soil in hay at least half the time. (Capability unit IIIe-1; woodland suitability group 2)

Gravel Pits

Gravel pits (Gp) generally occur on kames, eskers, and outwash terraces. These pits are normally 15 to 30 feet deep and, in many places, are in areas of Chili, Conotton, and Negley soils. The gravel is generally in layers that vary in thickness and change in composition within short distances. Between the gravelly layers are sandy ones that contain variable amounts of silty and clayey materials. The gravel consists mainly of quartz and granite minerals, but there is a smaller amount of shale. Only a few pits in the county are active.

Because the soil has been disturbed during excavation, erosion is active in and around areas of Gravel pits. Uncontrolled runoff has washed the unstable soil material and has deposited silt in nearby drainageways. Since the soil material contains little organic matter and has low available moisture capacity, establishing a plant cover is difficult. In areas where acidity is no more than slight, sweetclover commonly establishes itself naturally if it is not disturbed by mining operations. (Capability unit not assigned; woodland suitability group 15)

Gresham Series

The Gresham series consists of gently sloping to strongly sloping, somewhat poorly drained soils that developed from medium-textured, slightly limy glacial till on uplands. These soils have a dense, firm layer in the subsoil. They occupy benches at the base of steep slopes and lie in an east-west band across the center of the county.

Typical profile of a Gresham silt loam:

0 to 12 inches, dark grayish-brown, friable silt loam; very strongly acid.
12 to 60 inches, yellowish-brown, friable light silty clay loam with many, medium, gray mottles; very strongly acid.
60 to 126 inches, olive-brown, slightly firm silt loam with common, coarse, gray and strong-brown mottles; strongly acid in the upper part to neutral in the lower part.
126 inches +, light-olive to olive loam glacial till; weakly calcareous.

From 5 to 10 percent of the soil, by volume, is rock fragments.

The Gresham soils are similar to the Ravenna soils but are more weathered. Gresham soils are subject to seepage from higher slopes. They have slow permeability, moderate available moisture capacity, and a moderately thick to thin root zone. If well managed, they are moderately productive. Crops respond well to lime and fertilizer. Wet areas can be adequately drained by random tiling. The native vegetation consists of hardwood trees, mainly maple, beech, elm, and oak.

Gresham silt loam, 2 to 5 percent slopes (GrB).—This soil occupies gently sloping benches. Included with it are moderately eroded areas. Permeability and runoff are slow; wetness and erosion are slight limitations. If the soil is adequately drained, crops respond well to applications of lime and fertilizer. (Capability unit IIIw-2; woodland suitability group 12)

Gresham silt loam, 5 to 10 percent slopes (GrC).—Runoff is medium on this soil, and erosion is a moderate to severe hazard. Some moderately eroded areas are included. (Capability unit IIIe-2; woodland suitability group 12)

Guernsey Series

The Guernsey series consists of deep, moderately well drained soils of the uplands that developed from mixed materials derived from limestone, sandstone, siltstone, and shale. The underlying bedrock is 36 to 50 inches below the surface. These soils occupy gently sloping to strongly sloping benches and foot slopes along valley walls. They occur chiefly in the drainage basin of West Fork Little Beaver Creek.

Typical profile of a Guernsey silt loam:

0 to 11 inches, very dark grayish-brown, friable silt loam; strongly acid.
11 to 26 inches, dark yellowish-brown, friable silty clay loam with gray and dark-brown mottles in lower part; very strongly acid.
26 to 38 inches, yellowish-brown, plastic clay with common, coarse, gray and strong-brown mottles; strongly acid.
38 to 50 inches, brown, plastic silty clay with common, coarse, olive and gray mottles and a few sandstone and limestone fragments; calcareous.

The Guernsey soils are similar to the Wharton soils, which developed in material derived from black clay shale, and to the Summitville soils, which developed in mixed materials derived from several kinds of rock, including red clay shale.

Guernsey soils have slow permeability, moderate available moisture capacity, and a moderately thick to thick root zone. They are erodible but easily managed and are some of the most productive soils on the unglaciated uplands. Their fertility is higher than that of nearby soils. The native vegetation is a forest of oak, tulip-poplar, black walnut, and other hardwoods.

Guernsey silt loam, 2 to 5 percent slopes (GuB).—Contour cultivation and diversion terraces are needed on this gently sloping soil to control erosion and to dispose of excess water from higher slopes. Runoff is medium, and the erosion hazard is slight. Small included areas are moderately eroded. (Capability unit IIe–2; woodland suitability group 2)

Guernsey silt loam, 5 to 10 percent slopes (GuC).—This soil occupies sloping areas at the base of steeper slopes. It is moderately to highly erodible if not protected. Runoff is medium. (Capability unit IIIe–2; woodland suitability group 2)

Guernsey silt loam, 5 to 10 percent slopes, moderately eroded (GuC2).—This sloping soil lies at the base of higher slopes. Its plow layer is a mixture of the original surface layer and the subsoil. Because runoff is medium and the erosion hazard is moderate to severe, contour stripcropping and diversion terraces are needed to control soil losses. (Capability unit IIIe–2; woodland suitability group 2)

Guernsey silt loam, 10 to 15 percent slopes, moderately eroded (GuD2).—This strongly sloping soil lies at the base of steeper slopes. Its plow layer contains material brought up from the subsoil in tillage, and its subsoil is thinner than that described as typical for the series. Runoff is medium to rapid, and the hazard of erosion is severe. Included in mapping are small slightly eroded areas. (Capability unit IVe–2; woodland suitability group 2)

Guernsey silty clay loam, thin solum variant, 10 to 15 percent slopes, moderately eroded (GvD2).—This soil is similar to the one described for the series, but it is shallower to bedrock and contains many fragments of sandstone and siltstone. Following is a typical profile:

0 to 8 inches, dark grayish-brown silty clay loam with common sandstone fragments; neutral.
8 to 12 inches, yellowish-brown channery silty clay; strongly acid.
12 to 20 inches, dark grayish-brown to dark-brown, firm channery silty clay; strongly acid.
20 to 26 inches, dark grayish-brown and light olive-brown channery silty clay; neutral.
26 inches +, limestone bedrock.

Most of this soil is on strongly sloping hillsides in the drainage basin of West Fork Little Beaver Creek. Included in mapping are some areas that are sloping and some that are moderately eroded.

This soil is moderately productive but is somewhat difficult to manage because of the moderately fine textured surface layer. It has moderate available moisture capacity and is more fertile than the Muskingum soils, with which it occurs. The root zone is moderately thick, and permeability is moderately slow. The native vegetation is a forest of mixed hardwoods, chiefly maple, oak, and black walnut.

This soil is better suited to hay and pasture than to other crops. Runoff is medium, and the erosion hazard is severe. (Capability unit IVe–2; woodland suitability group 7)

Guernsey silty clay loam, thin solum variant, 15 to 20 percent slopes, moderately eroded (GvE2).—Except for its moderately steep slopes, this soil is similar to Guernsey silty clay loam, thin solum variant, 10 to 15 percent slopes, moderately eroded. This soil has medium to rapid runoff and is highly erodible if cultivated and not protected. It is better suited to hay and pasture than to tilled crops. (Capability unit VIe–1; woodland suitability group 7)

Hanover Series

Soils of the Hanover series are deep and well drained. They developed on uplands from medium-textured, slightly limy glacial till. They occur on gently sloping to moderately steep benches and ridgetops.

Typical profile of a Hanover silt loam:

0 to 10 inches, dark yellowish-brown, friable silt loam; very strongly acid.
10 to 20 inches, dark-brown, friable silt loam; very strongly acid.
20 to 50 inches, dark-brown, firm loam that contains more clay than the surface layer; extremely acid.
50 to 62 inches, dark yellowish-brown loam with many, fine, grayish-brown mottles; extremely acid.
62 inches +, dark yellowish-brown loam glacial till that grades to olive gray at a depth of 15 to 20 feet; very strongly acid in upper part but ranges to alkaline at depth of 14 feet.

The Hanover soils are similar to the Wooster soils but are more weathered and leached and have a slightly finer textured subsoil. In some respects they are similar to the Loudonville soils, which are moderately deep to bedrock.

Hanover soils have a thick root zone, are moderately permeable, have high available moisture capacity, and are moderately productive. Their fertility is quickly depleted under cultivation, but crops respond well to applications of lime and fertilizer. The native vegetation is oak, hickory, maple, and other hardwoods.

Hanover silt loam, 2 to 5 percent slopes (HaB).—This gently sloping soil occupies ridgetops and the outer edge of benches. Small included areas are moderately well drained.

This soil has high available moisture capacity. It is friable and easily managed and, under good management, is productive. Crops respond well to lime and fertilizer. Although runoff is medium, the erosion hazard is only slight. (Capability unit IIe-1; woodland suitability group 4)

Hanover silt loam, 2 to 5 percent slopes, moderately eroded (HaB2).—This soil has a plow layer that is a mixture of surface soil and subsoil, but in other respects it is similar to Hanover silt loam, 2 to 5 percent slopes. It is slightly less productive because it is moderately eroded. Runoff is medium. (Capability unit IIe-1; woodland suitability group 4)

Hanover silt loam, 5 to 10 percent slopes (HaC).—This sloping soil has medium to rapid runoff and is moderately susceptible to erosion. In cultivated areas erosion can be controlled by contour stripcropping and a rotation that provides an equal number of years in hay and in grain. (Capability unit IIIe-1; woodland suitability group 4)

Hanover silt loam, 5 to 10 percent slopes, moderately eroded (HaC2).—The plow layer of this sloping soil contains material brought up from the subsoil during tillage. Included in mapping are a few severely eroded areas.

On this soil runoff is medium to rapid, and the hazard of erosion is moderate. Erosion in cultivated fields can be controlled by contour stripcropping and a rotation that provides an equal number of years in hay and in grain. (Capability unit IIIe-1; woodland suitability group 4)

Hanover silt loam, 10 to 15 percent slopes, moderately eroded (HaD2).—The plow layer of this strongly sloping soil consists of the remaining part of the original surface layer mixed with subsoil material. The present subsoil is thinner than that described as typical for the series. Small included areas are moderately eroded or severely eroded.

Runoff is medium to rapid on this soil, and the erosion hazard is moderate to severe. Contour stripcropping and a rotation that keeps the soil in hay at least half the time will control erosion in cultivated areas. (Capability unit IIIe-1; woodland suitability group 4)

Hanover silt loam, 15 to 20 percent slopes, moderately eroded (HaE2).—This moderately steep soil has a plow layer that contains a considerable amount of subsoil material. The subsoil is thinner than that described for the series. Small severely eroded areas are included.

This soil is suitable for occasional row cropping, but it is more suitable for hay. Runoff is rapid, and erosion is a severe hazard. (Capability unit IVe-1; woodland suitability group 4)

Jimtown Series

In the Jimtown series are nearly level to sloping, very strongly acid to slightly acid, somewhat poorly drained soils on terraces. These soils developed from gravelly and sandy, slightly limy glacial outwash more than 3 feet thick. The outwash consists mostly of materials from sandstone and shale but partly of materials from limestone and crystalline rock. All or part of the subsoil is gravelly. The substratum is made up of poorly sorted outwash, till, or lacustrine material.

Typical profile of a Jimtown silt loam:

0 to 9 inches, very dark grayish-brown silt loam with common pebbles; neutral (limed).
9 to 15 inches, dark grayish-brown silt loam with few pebbles; friable; neutral (limed).
15 to 21 inches, brown fine loam with many, medium, grayish-brown and reddish-brown mottles and iron concretions; friable; common pebbles; medium acid.
21 to 25 inches, dark grayish-brown gravelly sandy loam with many, medium, brown and dark-red mottles; weakly cemented by iron; medium acid.
25 to 31 inches, brown gravelly loamy sand; very friable; medium acid.
31 to 58 inches, dark grayish-brown gravelly sandy loam; slightly acid or neutral.

The Jimtown soils are similar to the Fitchville soils but developed in coarser textured material. Because of a high water table, Jimtown soils have a thin to moderately thick root zone. They are moderately permeable and have high available moisture capacity. If the soils are tile drained, they are easily managed and, under good management, are moderately productive. The native vegetation is forest consisting mainly of beech, sugar maple, and elm.

Jimtown loam, 0 to 2 percent slopes (JtA).—Wetness is a moderate limitation that affects the use of this soil. Crop yields can be increased by draining the soil with tile. Runoff is very slow. (Capability unit IIw-2; woodland suitability group 12)

Jimtown loam, 2 to 5 percent slopes (JtB).—Wetness is a moderate limitation to the use of this gently sloping soil for crops. In addition, erosion is a slight hazard in cultivated fields. Runoff is slow. The water table can be lowered and runoff reduced by using tile drains. (Capability unit IIw-2; woodland suitability group 12)

Jimtown silt loam, 0 to 2 percent slopes (JwA).—This nearly level soil occurs on the glacial outwash plain. It is moderately permeable and is productive if tile drained and otherwise properly managed. Runoff is very slow, and there is no erosion hazard. (Capability unit IIw-2; woodland suitability group 12)

Jimtown silt loam, 2 to 5 percent slopes (JwB).—The use of this soil is moderately limited by wetness. Runoff is slow, and the hazard of erosion is slight. (Capability unit IIw-2; woodland suitability group 12)

Kerston Series

In the Kerston series are very poorly drained soils that consist of alternate layers of organic material and alluvial soil material. These soils occur in bogs along flood plains in the northern part of the county.

Typical profile of Kerston muck:

0 to 2 inches, black silty muck; friable; slightly acid.
2 to 5 inches, very dark grayish-brown, friable silt loam; neutral.
5 to 9 inches, black, friable muck; neutral.
9 to 12 inches, very dark grayish-brown, friable silt loam; neutral.
12 to 20 inches, black, granular muck with much undecomposed fibrous peat; neutral.
20 inches +, layers of very dark brown fibrous peat, black muck, and very dark grayish-brown silt loam; neutral.

The Kerston soils are thicker than the Willette soils, which consist of less than 42 inches of muck or peat over mineral soil. The silty layers of the Kerston soils are lacking in the Carlisle soils.

Under natural conditions the Kerston soils are waterlogged. If they are drained, however, they are highly productive of truck crops and general farm crops. Although the root zone is thin, the available moisture capacity is high. Permeability is moderate in the muck but is very slow in the underlying mineral material. The native vegetation is made up of sedges and swamp grasses or a forest consisting chiefly of swamp white oak.

Kerston muck (Km).—This is the only Kerston soil mapped in the county. In some places the substratum contains marl. Included in mapping are small areas of Willette muck and of Carlisle muck.

Runoff is ponded on this soil, and undrained areas are suitable only for native vegetation and as areas for wildlife. If the soil is drained, however, it is suitable for cropping. (Capability unit IIIw–4; woodland suitability group 14)

Laidig Series

The Laidig series consists of deep, well-drained soils that formed from thick, acid colluvium in benchlike areas along the valley walls of the Ohio River and Little Beaver Creek. These soils occur on concave sloping benches to very steep slopes.

Typical profile of a Laidig stony loam:

0 to 3 inches, very dark grayish-brown, friable stony loam; very strongly acid.
3 to 26 inches, yellowish-brown, friable stony loam; very strongly acid.
26 to 38 inches, mottled yellowish-brown and dark grayish-brown, firm heavy sandy loam; very strongly acid.
38 inches +, dark grayish-brown, firm loam weathered mostly from sandstone but also from shale; very strongly acid.

These soils receive adequate moisture from higher slopes. They have high available moisture capacity, moderately slow permeability, and a thick root zone. Almost all their acreage is covered by forest, of which they are productive. The principal trees in forested areas are sugar maple, cucumbertree, tulip-poplar, and beech. In addition, hemlock, black and yellow birch, oak, basswood, ash, and black cherry are common.

Laidig stony loam, 5 to 10 percent slopes (LaC).—Because this soil contains stones of all sizes, it is better suited to trees than to other crops. If needed, however, it can be used for unimproved pasture. (Capability unit VIe–1; woodland suitability group 6)

Laidig stony loam, 10 to 15 percent slopes (LaD).—Because of stoniness, this strongly sloping soil is better suited to trees than to other crops. Cleared areas are suited to pasture. (Capability unit VIe–1; woodland suitability group 6)

Laidig stony loam, 15 to 20 percent slopes (LaE).—This moderately steep soil can be used for unimproved pasture, but it is better suited to trees because of slope and stoniness. (Capability unit VIe–1; woodland suitability group 6)

Laidig stony loam, 20 to 35 percent slopes (LaF).—This soil is too steep and too stony for pasture, but it can be used as woodland. (Capability unit VIIe–1; woodland suitability group 6)

Lobdell Series

In the Lobdell series are moderately well drained soils that developed in recent, medium acid or slightly acid alluvium on flood plains.

Typical profile of Lobdell silt loam:

0 to 14 inches, very dark grayish-brown, friable silt loam; slightly acid.
14 to 22 inches, dark-brown, friable silt loam; medium to slightly acid.
22 to 33 inches, mottled dark-gray, dark reddish-brown, and dark yellowish-brown, friable silt loam; medium acid.
33 to 42 inches, mottled gray and pale-brown, friable sandy loam; medium to slightly acid.

Lobdell soils have a moderately thick root zone, are moderately permeable, and have high available moisture capacity. They are highly productive and are suited to row crops and to special crops. The soils occur in areas on flood plains that commonly are subject to flooding, but crops are little damaged by floodwater. The native vegetation consists of sycamore, elm, oak, maple, and other hardwoods.

Lobdell loam (Lb).—Some areas of this nearly level soil are likely to be flooded so frequently that they should be protected by a permanent cover of plants. Erosion is not a hazard, however, for runoff is very slow. Included in mapping are small areas that have a sandy loam surface layer. (Capability unit I–1; woodland suitability group 2)

Lobdell silt loam (Ld).—Some areas of this soil are so likely to be flooded that they should be protected by permanent vegetation. Runoff is very slow, and there is no erosion hazard. (Capability unit I–1; woodland suitability group 2)

Lorain Series

The Lorain series consists of dark-colored, very poorly drained soils that developed from clay and silty clay material deposited in former lakebeds, in swamps, and in potholes on the glacial till plain in the northern part of the county.

Typical profile of Lorain clay:

0 to 10 inches, black, friable clay with a few, medium, yellowish-red mottles; slightly acid.
10 to 15 inches, black, firm clay with dark reddish-brown mottles; slightly acid.
15 to 29 inches, firm, dark-gray clay with many, fine, dark reddish-brown and very dark grayish-brown mottles; strongly acid.
29 inches +, very dark gray silty clay; slightly acid.

Pebbles are lacking throughout the profile.

The Lorain soils are similar to the Luray soils but developed from fine-textured instead of medium-textured materials. Lorain soils are very slowly permeable, have high available moisture capacity, and, if drained, have a moderately thick root zone. Drained areas are highly productive but are difficult to manage because of their fine-textured surface layer and subsoil. Lorain soils commonly occur in low areas where suitable outlets for drains are difficult to locate. These low areas are excellent for wildlife. The native vegetation on Lorain soils is swamp grasses and sedges or a forest of swamp white oak and pin oak.

Lorain clay (Ln).—This is the only Lorain soil in the county. Included with it are areas that have a silty clay surface layer. Poor drainage is a severe limitation on this soil, but runoff is ponded or very slow, and there is no erosion hazard. (Capability unit IIIw-1; woodland suitability group 13)

Loudonville Series

In the Loudonville series are well-drained soils of the uplands that developed from medium-textured glacial till 20 to 42 inches thick over bedrock. These soils occupy gently sloping or sloping ridgetops and strongly sloping or moderately steep hillsides. Most of the acreage is on the Illinoian till plain, but some is on the Wisconsin till plain.

Typical profile of a Loudonville silt loam:

0 to 8 inches, dark-brown, friable silt loam with a few glacial pebbles and fragments of underlying bedrock; very strongly acid.

8 to 25 inches, brown to dark-brown, friable loam; content of rock fragments increases with depth; very strongly acid.

25 to 38 inches, brown and dark yellowish-brown loam with many glacial pebbles and fragments of bedrock; very strongly acid.

38 inches +, fractured, olive-colored siltstone bedrock.

The Loudonville soils are moderately productive and easily managed. They have a moderately thick root zone, moderate to moderately rapid permeability, and moderate available moisture capacity. Crops respond well to lime and fertilizer. The native vegetation is oak-hickory forest.

Loudonville silt loam, 2 to 5 percent slopes (LoB).—This soil occupies gently sloping ridgetops. It is easily managed, though it is subject to slight erosion and dries out quickly after a rain. Erosion can be controlled in tilled fields by cultivating on the contour and by using a rotation that provides 2 years of hay. (Capability unit IIe-1; woodland suitability group 7)

Loudonville silt loam, 2 to 5 percent slopes, moderately eroded (LoB2).—The plow layer of this gently sloping soil is a mixture of the original surface layer and material from the subsoil. The soil has slow runoff and is slightly susceptible to erosion. (Capability unit IIe-1; woodland suitability group 7)

Loudonville silt loam, 5 to 10 percent slopes (LoC).—This soil occurs on sloping ridgetops, where runoff is slow but the erosion hazard is moderate. Included in mapping are small areas that have a loam surface layer. In cultivated fields erosion can be controlled by contour stripcropping and a rotation that keeps the soil in hay at least half the time. (Capability unit IIIe-1; woodland suitability group 7)

Loudonville silt loam, 5 to 10 percent slopes, moderately eroded (LoC2).—This soil, which occupies sloping ridgetops, has a plow layer that is a mixture of subsoil and the original surface layer. Some included areas are only slightly eroded. Runoff is slow, and the hazard of erosion is moderate. Contour stripcropping and a rotation that keeps the soil in hay at least half the time will control erosion in cultivated areas. (Capability unit IIIe-1; woodland suitability group 7)

Loudonville silt loam, 10 to 15 percent slopes, moderately eroded (LoD2).—The plow layer of this strongly sloping soil consists of the remaining part of the original surface layer mixed with subsoil material. The present subsoil is thinner than that described as typical for the series. Small included areas are slightly eroded, and small areas are severely eroded.

Runoff is slow to medium, and erosion is a moderate to severe hazard. Practices needed to control erosion are contour stripcropping and a rotation that provides the protection of hay at least half the time. (Capability unit IIIe-1; woodland suitability group 7)

Loudonville silt loam, 15 to 20 percent slopes, moderately eroded (LoE2).—This moderately steep soil has a plow layer that is about half subsoil material. The subsoil is thinner than the one described as typical for the series. Small severely eroded areas are included.

This soil is well suited to pasture. If cultivated, however, it is highly erodible unless protected. Needed for controlling erosion in cultivated areas are contour stripcropping and a long rotation that keeps the soil in meadow most of the time. (Capability unit IVe-1; woodland suitability group 7)

Loudonville and Muskingum soils, 2 to 5 percent slopes (LuB).—The soils of this undifferentiated group occur in an intricate pattern on gently sloping ridgetops and hillsides in the area of the Illinoian glacial till plain. These soils have slow runoff and are slightly susceptible to erosion. Contour cultivation should be used to control soil losses in fields used for crops. (Capability unit IIe-3; woodland suitability group 7)

Loudonville and Muskingum soils, 2 to 5 percent slopes, moderately eroded (LuB2).—These soils have lost about half of their original surface layer through erosion. Consequently, they are slightly less productive than Loudonville and Muskingum soils, 2 to 5 percent slopes. The soils in this group are well suited to crops and pasture, but manure and other forms of organic matter should be returned regularly. Runoff is slow, and the erosion hazard is slight. Small included areas are severely eroded. (Capability unit IIe-3; woodland suitability group 7)

Loudonville and Muskingum soils, 5 to 10 percent slopes, moderately eroded (LuC2).—Erosion has removed about half of the original surface layer from these sloping soils, which occupy ridgetops. Runoff is slow to medium, and the hazard of erosion is moderate. Crops can be grown on these soils, but regular additions of lime, fertilizer, and manure are required. In addition, practices are needed for controlling erosion. (Capability unit IIIe-3; woodland suitability group 7)

Loudonville and Muskingum soils, 5 to 15 percent slopes, severely eroded (LuC3).—These severely eroded soils occur on sloping ridgetops. They have lost most of their original surface layer and are highly susceptible to erosion. Runoff is medium to rapid. The soils are well suited to pasture and to meadow grown in long rotations, but practices are needed to control erosion. Also needed are regular applications of lime, fertilizer, and manure. (Capability unit IVe-3; woodland suitability group 7)

Loudonville and Muskingum soils, 10 to 15 percent slopes, moderately eroded (LuD2).—These strongly sloping soils have a plow layer that contains some of the subsoil. They can be used for crops if they are well protected from erosion, which is a moderate to severe hazard. Runoff is medium to rapid. (Capability unit IIIe-3; woodland suitability group 7)

Loudonville and Muskingum soils, 15 to 20 percent slopes (LuE).—These moderately steep soils have a subsoil that is thinner than the one described for the series.

Included in mapping are areas that have been cleared of trees and are moderately eroded. These included areas have lost all or part of their original dark-colored surface layer.

In areas that have been cleared, the soils of this group are well suited to pasture. (Capability unit IVe–3; woodland suitability group 7)

Loudonville and Muskingum soils, 15 to 20 percent slopes, severely eroded (LuE3).—These moderately steep, severely eroded soils have a plow layer that consists mostly of subsoil material. Their subsoil is thinner than the one described as typical for the series.

These soils are well suited to hay or pasture, but they can be cropped occasionally if suitable practices are used controlling soil losses. Runoff is rapid, and the erosion hazard is severe. (Capability unit VIe–2; woodland suitability group 7)

Luray Series

The Luray series consists of dark-colored, very poorly drained soils on terraces. These soils developed in deposits of silt, silty clay loam, and loam that were laid down in ponded water over glacial drift.

Typical profile of Luray silty clay loam:

0 to 8 inches, very dark brown, friable silty clay loam with many, fine, dark reddish-brown mottles; neutral.
8 to 20 inches, grayish-brown, friable silt loam with many, medium, strong-brown mottles; neutral.
20 to 30 inches, mottled dark reddish-brown, gray, and strong-brown, firm loam; slightly acid.
30 to 56 inches, dark yellowish-brown coarse silty clay loam; neutral.

There are few or no fragments in the profile.

The Luray soils are similar to the Lorain soils but are coarser textured. They are finer textured than the Olmsted soils.

Luray soils are moderately slowly to very slowly permeable and have high available moisture capacity. The water table is high but can be lowered and kept at a safe level by use of tile. In addition, surface drainage is feasible in many places. After the soils are drained, they have a thick root zone and are highly productive. To help control erosion, diversion terraces can be used for diverting excess surface water. The native vegetation is swamp grasses and sedges or a forest consisting mainly of pin oak and swamp white oak.

In Columbiana County the Luray soils occur closely with the Marengo soils, and they are mapped only in undifferentiated groups with those soils. The Marengo soils are described under the heading "Marengo Series."

Luray and Marengo silty clay loams (Lv).—The soils in this undifferentiated group are nearly level and gently sloping. Because they have a moderately fine textured surface layer, they are somewhat difficult to manage. Drainage is a severe limitation, but cultivated crops can be grown if drainage is improved. Erosion is not likely. (Capability unit IIIw–1; woodland suitability group 13)

Luray and Marengo silt loams (Lw).—These nearly level and gently sloping soils are more easily managed than Luray and Marengo silty clay loams. Drainage is a moderately severe limitation, but there is no erosion hazard. If drained, the soils are suitable for cultivation. (Capability unit IIIw–1; woodland suitability group 13)

Made Land

Made land (Ma) generally occurs in and around towns and suburbs. It consists of filled areas, trash dumps, areas adjoining sewage disposal plants, and other artificially made land. It does not include Gravel pits and Strip mine spoil. A large part of Made land is used for building sites, parking lots, and other urban uses. All of it is in locations that likely will be similarly used as urban areas expand. (Capability unit not assigned; woodland suitability group 15)

Marengo Series

In the Marengo series are dark-colored, very poorly drained soils that formed on glacial drift. These soils occur in depressional areas on the glaciated upland, wherever seepage is calcareous.

Typical profile of a Marengo soil:

0 to 11 inches, black, friable silty clay loam with many, fine, dark reddish-brown mottles; medium acid.
11 to 20 inches, grayish-brown, friable loam with many, fine, yellowish-brown mottles and small concretions of iron; slightly acid.
20 to 40 inches, dark grayish-brown to dark-brown, firm clay loam with many, medium, distinct, gray mottles and thick clay films; slightly acid.
40 inches +, olive-brown, friable loam glacial till; mildly alkaline.

The Marengo soils are similar to the Luray and Lorain soils. They are coarser textured than the Lorain soils. Marengo soils are finer textured than Olmsted soils.

The Marengo soils are slowly to very slowly permeable, have high available moisture capacity, and, if they are drained, have a thick root zone. Although the water table is seasonally high, it can be lowered to a safe level by use of tile. In addition, excess water on the surface readily passes downward and is removed through the tile, though surface drainage also can be improved in many places. Drained areas are highly productive, but diversion terraces should be used to take care of runoff from adjacent slopes. The native vegetation is swamp grasses and sedges or a forest of pin oak and swamp white oak.

In this county the Marengo soils occur with the Luray soils and are mapped only in undifferentiated groups with those soils. The Luray soils are described under the heading "Luray Series."

Monongahela Series

The Monongahela series consists of moderately well drained soils that developed in silty alluvium containing thin layers of sand and gravel at various depths. The alluvium washed from soils derived from acid shale, siltstone, and sandstone. Monongahela soils have a dense, firm layer in their subsoil. They occupy concave to convex, gently sloping to sloping areas on high terraces and on benches that are 150 to 250 feet higher than the terraces. They occur in the southern part of the county.

Typical profile of a Monongahela silt loam:

0 to 8 inches, dark-brown, friable silt loam; very strongly acid.
8 to 15 inches, yellowish-brown, friable silt loam; extremely acid.

15 to 25 inches, strong-brown, friable silty clay loam with common brown and reddish-brown mottles; extremely acid.
25 to 56 inches, yellowish-brown, very firm silty clay loam with common, fine, gray mottles; extremely acid.
56 to 71 inches, brown, firm, dense gravelly silty clay loam; pebbles common; medium acid.

These soils have high available moisture capacity, but their permeability is moderately slow, and their zone for rooting is limited by the dense layer in the subsoil. The soils are well suited to general crops and are moderately productive. The native vegetation is a forest of oak, maple, and other hardwoods.

Monongahela silt loam, 2 to 5 percent slopes (MoB).—This soil occurs on gently sloping terraces and benches. Small included areas are moderately eroded, and small areas are nearly level.

This soil has slow runoff but is moderately susceptible to erosion. If cropped continuously, it puddles and washes. Nevertheless, it is easily managed and is well suited to general farm crops, for it has gentle slopes and moderately good drainage, is in good tilth, and has high available moisture capacity. Because of the dense layer in the subsoil, however, all the moisture available in the soil may not be reached by roots. Crops respond well to lime, fertilizer, and manure. To maintain soil structure, hay should be included in the rotation. (Capability unit IIe-1; woodland suitability group 2)

Monongahela silt loam, 5 to 10 percent slopes (MoC).—This sloping soil lies on benches and terraces. It has slow to medium runoff and is moderately erodible if not protected. It is suitable for cropping but requires diversion terraces, contour stripcropping, and other practices that control erosion and safely divert runoff from higher slopes. (Capability unit IIIe-1; woodland suitability group 2)

Monongahela silt loam, 5 to 10 percent slopes, moderately eroded (MoC2).—This moderately eroded soil occupies sloping terraces and benches. Its plow layer is a mixture of the original surface layer and material from the subsoil.

On this soil runoff is slow to medium, and the erosion hazard is moderate. Crops can be safely grown, but diversion terraces, contour stripcropping, and other practices are needed to control erosion and to intercept runoff from higher slopes. (Capability unit IIIe-1; woodland suitability group 2)

Monongahela silt loam, 10 to 15 percent slopes (MoD).—Runoff is medium on this strongly sloping soil, and erosion is a moderate to severe hazard. Erosion in cultivated areas can be controlled by contour stripcropping and a rotation that provides an equal number of years in meadow and in row crops. (Capability unit IIIe-1; woodland suitability group 2)

Monongahela silt loam, 10 to 15 percent slopes, moderately eroded (MoD2).—The plow layer of this strongly sloping soil contains material brought up from the subsoil during tillage. Runoff is medium, and the hazard of erosion is moderate to severe. In fields used for crops, erosion can be controlled by contour stripcropping and a rotation that provides 1 year of hay for each year of grain. (Capability unit IIIe-1; woodland suitability group 2)

Muskingum Series

The Muskingum series consists of moderately deep, well-drained soils that developed over acid siltstone and thin layers of shale and fine-grained sandstone. The shale is gray but weathers to olive and brown.

Typical profile of a Muskingum soil:

0 to 7 inches, brown, friable channery silt loam; very strongly acid.
7 to 16 inches, yellowish-brown channery silt loam; very strongly acid.
16 to 20 inches, yellowish-brown silt loam that is about 50 percent channery fragments of siltstone and sandstone; very strongly acid.
20 inches +, olive siltstone bedrock; extremely acid.

These soils are mainly on the middle and lower parts of steep slopes. Because of the movement of soil materials downhill, Muskingum soils are relatively thicker than soils on the upper slopes. The Muskingum soils have low available moisture capacity and a thin to moderately thick root zone. Their productivity is low, although crops are grown in some areas where slopes do not exceed 18 to 20 percent. Lime, fertilizer, and good management are necessary for satisfactory yields. The native vegetation is a forest of oak, hickory, and other hardwoods.

In this county the Muskingum soils occur closely with the Loudonville, Upshur, and Weikert soils. They are mapped only in complexes with the Upshur soils and only in undifferentiated groups with the Loudonville soils and the Weikert soils. These mapping units are described under the headings "Loudonville Series," "Upshur Series," and "Weikert Series."

Negley Series

In the Negley series are deep, well-drained soils that developed from weakly calcareous glacial outwash consisting of gravel and sand. About 65 percent of the gravelly material came from local sedimentary rocks, 10 percent from cherty limestone, and 25 percent from crystalline rocks. The Negley soils are on kames, terrace escarpments, and gravelly terraces that lie about 100 feet above Little Beaver Creek, Sandy Creek, and the Ohio River.

Typical profile of a Negley gravelly loam:

0 to 9 inches, yellowish-brown gravelly loam; extremely acid.
9 to 39 inches, brown to dark-brown gravelly sandy clay loam with reddish-brown clay films; extremely acid.
39 to 99 inches, dark-brown to dark yellowish-brown gravelly sandy loam; very strongly acid.
99 inches +, brown to dark grayish-brown gravelly sandy loam to loamy sand; slightly acid.

Although the root zone of these soils is thick, rooting is limited by the low to moderate available moisture capacity in the material below the subsoil. Permeability is moderately rapid. Because drought is a hazard in dry years, large amounts of organic matter should be returned. The native vegetation is a forest of oak, hickory, and other hardwoods.

Negley gravelly loam, 2 to 5 percent slopes (NeB).—This gently sloping soil is droughty, but it is only slightly susceptible to erosion because runoff is very slow. Included in mapping are some moderately eroded areas. (Capability unit IIe-4; woodland suitability group 3)

Negley gravelly loam, 5 to 10 percent slopes, moderately eroded (NeC2).—This sloping soil, which occupies kames and terraces, contains a large amount of gravel and tends to be droughty. Nevertheless, it is suited to truck crops because it warms up early in spring, dries out quickly after rain, and can be profitably irrigated. Small included areas are only slightly eroded. Runoff is slow, and the erosion hazard is moderate. (Capability unit IIIe-4; woodland suitability group 3)

Negley gravelly loam, 10 to 15 percent slopes, moderately eroded (NeD2).—This strongly sloping soil occupies terrace escarpments and kames. It is well suited to hay and pasture but can be used for tilled crops occasionally if erosion is controlled. Although runoff is slow, the erosion hazard is moderate to severe. Included in mapping are small slightly eroded areas. (Capability unit IVe-4; woodland suitability group 3)

Negley loam, 2 to 5 percent slopes (NgB) —This soil occupies gentle, convex slopes on broad terraces. It is friable throughout, has moderate available moisture capacity, and is well suited to truck crops and general farm crops. Runoff is slow, and the erosion hazard is slight. (Capability unit IIe-4; woodland suitability group 3)

Negley loam, 5 to 10 percent slopes (NgC).—This sloping soil lies on terraces, where runoff is slow and the erosion hazard is moderate. In cultivated fields erosion can be controlled by contour stripcropping and a rotation that provides 1 year in hay for each year in cultivated crops. (Capability unit IIIe-4; woodland suitability group 3)

Negley loam, 5 to 10 percent slopes, moderately eroded (NgC2).—Tillage has mixed some of the subsoil into the plow layer of this sloping soil. Because erosion has been moderate, productivity is slightly lower than that of uneroded Negley loams. Runoff is slow. Needed in cultivated areas are contour stripcropping, applications of lime, fertilizer, and manure, and a rotation that provides 1 year in hay for each year in cultivated crops. (Capability unit IIIe-4; woodland suitability group 3)

Negley loam, 10 to 15 percent slopes, moderately eroded (NgD2).—This strongly sloping soil occurs on kames and terrace escarpments. It is well suited to hay and pasture but is moderately to highly erodible in fields that are cropped and not protected. Nevertheless, cultivated crops can be grown occasionally if soil losses are controlled. Small included areas are severely eroded. (Capability unit IVe-4; woodland suitability group 3)

Negley silt loam, 2 to 5 percent slopes (NlB).—This gently sloping soil has very slow runoff and is subject to only slight erosion. It is well suited to truck crops and to general farm crops. (Capability unit IIe-4; woodland suitability group 3)

Negley silt loam, 5 to 10 percent slopes, moderately eroded (NlC2).—This soil occurs on sloping terraces. Small included areas have a surface layer of loam or gravelly loam.

This soil is well suited to truck crops and general farm crops. It warms up early in spring and dries out quickly after rain, though it is droughty during prolonged dry periods. Crops respond well to lime and fertilizer. Runoff is slow, and erosion is a moderate hazard. (Capability unit IIIe-4; woodland suitability group 3)

Negley silt loam, 10 to 15 percent slopes, moderately eroded (NlD2).—This strongly sloping soil occurs near terrace escarpments and on kames. It can be used occasionally for cultivated crops but is better suited to pasture or meadow. Although runoff is slow, the erosion hazard is moderate to severe. (Capability unit IVe-4; woodland suitability group 3)

Negley soils, 15 to 20 percent slopes, moderately eroded (NsE2).—The soils in this undifferentiated group occupy kames and terrace escarpments. These soils are moderately steep and are highly susceptible to erosion. They are well suited to pasture and hay but are not suited to tilled crops, except for an occasional crop of grain that is grown in preparing a seedbed for hay. Included in mapping are small areas with a surface layer of loam. (Capability unit IVe-4; woodland suitability group 3)

Negley soils, 10 to 20 percent slopes, severely eroded (NsE3).—These strongly sloping soils have lost all of their original surface layer through erosion and are marked by shallow gullies. Their present surface layer varies in texture. The soils are highly erodible if left bare, but they can be used for pasture or hay if they are protected from uncontrolled runoff. (Capability unit VIe-2; woodland suitability group 5)

Olmsted Series

The Olmsted series consists of dark-colored, very poorly drained soils that developed from slightly limy glacial outwash. These soils occur in nearly level and depressional areas on terraces in the northern part of the county.

Typical profile of Olmsted silt loam:

0 to 10 inches, very dark brown, friable silt loam with common pebbles; medium acid.

10 to 19 inches, grayish-brown, friable loam with common pebbles and grayish mottles; slightly acid.

19 to 25 inches, grayish-brown, friable loam with thin, grayish clay films; neutral.

25 to 32 inches, dark grayish-brown, friable loam with grayish clay films; neutral.

32 to 44 inches, gray and brown, friable gravelly loam with many, medium, brown mottles; neutral.

44 inches +, mottled gray and brown clay loam with layers of gravelly loam and thin or discontinuous layers of finer textured material.

The Olmsted soils are coarser textured in the subsoil and the substratum than the Luray and Chilo soils. Olmsted soils have moderately slow permeability and moderate available moisture capacity. If drained, they have a thick root zone and, compared to lighter colored soils nearby, are highly productive because they contain more organic matter. Tile drainage works well in the dark-colored Olmsted soils. The native vegetation is swamp grasses and sedges or a swamp forest of white oak and pin oak.

Olmsted silt loam (Od).—This soil has a high water table, but it is highly productive and is easily managed if drained. Runoff is slow, and there is no erosion hazard. (Capability unit IIw-1; woodland suitability group 13)

Olmsted silty clay loam (Om).—Although this soil has a high water table, it is highly productive if drained. It is more difficult to manage than Olmsted silt loam because it has a finer textured, more clayey surface layer. Runoff is very slow, and there is no erosion hazard. (Capability unit IIw-1; woodland suitability group 13)

Orrville Series

The Orrville series consists of somewhat poorly drained soils that developed in alluvium on flood plains.

Typical profile of Orrville silt loam:

0 to 12 inches, dark-brown, friable silt loam; medium acid.
12 to 23 inches, mottled dark grayish-brown, friable silt loam; medium acid.
23 to 32 inches, dark reddish-brown, friable loam with many mottles and black manganese stains; medium acid.
32 to 45 inches, gray silt loam with many mottles; medium acid.

The Orrville soils produce favorable yields of row crops if they are not flooded during the growing season and if wet areas are drained. Permeability is moderately slow, the available moisture capacity is moderate to high, and the root zone is thick in areas where drainage is adequate. The native vegetation is forest consisting mainly of sycamore and elm.

Orrville loam (Or).—This soil has very slow runoff and is not subject to erosion, but it has an intermittently high water table. Some areas are so likely to be flooded that they should be kept in permanent vegetation. Included in mapping are areas that have a sandy loam surface layer. (Capability unit IIw–3; woodland suitability group 12)

Orrville silt loam (Ov).—Erosion is not a hazard on this soil, but drainage is a limitation and is slower than in Orrville loam. Runoff is very slow. Some areas of this soil are so likely to be flooded that they should be kept in permanent vegetation. (Capability unit IIw–3; woodland suitability group 12)

Papakating Series

In the Papakating series are very poorly drained, dark-colored soils on low-lying flood plains.

Typical profile of Papakating silty clay loam:

0 to 5 inches, very dark brown, friable silty clay loam with common, fine, faint mottles of dark brown; slightly acid.
5 to 13 inches, black, friable clay loam; slightly acid.
13 to 16 inches, black, firm clay loam with common, medium, distinct mottles of dark grayish brown; slightly acid.
16 to 21 inches, dark grayish-brown, firm loam with many, coarse, distinct mottles of yellowish brown; slightly acid.
21 to 26 inches, dark grayish-brown, friable gravelly loam with brown mottles; slightly acid.

The Papakating soils are moderately slowly permeable and have high available moisture capacity. They can be drained by use of tile and, if drained, have a thick root zone. Because of wetness and generally frequent flooding, these soils are used mainly for pasture, but they are highly productive of crops in areas where drainage is adequate and flooding is infrequent. In some places the native vegetation is forest of pin oak and swamp white oak, and in others it is swamp grasses and sedges.

Papakating silt loam (Pa).—Included in areas mapped as this soil are some areas that have a loam surface layer. Runoff is ponded on this soil, and there is no erosion hazard. Wetness is a limitation, however, and artificial drainage is needed. Flooding is likely in some areas, which should be protected by permanent vegetation. (Capability unit IIIw–1; woodland suitability group 13)

Papakating silty clay loam (Pc).—This soil occurs in swampy areas on flood plains, nearest the sides of valleys. It is suited to crops if it is drained, but some areas are likely to be flooded and should be kept in permanent vegetation. Erosion is not a hazard. (Capability unit IIIw–1; woodland suitability group 13)

Parke Series

In the Parke series are deep, well-drained soils that developed from weakly calcareous glacial outwash consisting of silt, sand, and gravel. The upper part of these soils, to a depth of 10 to 25 inches, is made up chiefly of silt. Underlying this material is glacial outwash that consists mainly of sand and gravel from sandstone and shale but partly of material from limestone and crystalline rock. The Parke soils occupy gently sloping and sloping terraces in the central and southern parts of the county. They occur in areas that range from 50 to 100 feet above smaller drainageways and are as much as 400 feet above the Ohio River and larger tributary streams.

Typical profile of a Parke silt loam:

0 to 10 inches, dark-brown, friable silt loam; strongly acid unless it has been limed.
10 to 23 inches, dark-brown, friable silt loam with a few pebbles in the lower part; very strongly acid.
23 to 44 inches, yellowish-red, firm sandy clay loam with common pebbles and cobbles; very strongly acid.
44 to 92 inches, yellowish-red gravelly sandy clay loam with many pebbles and cobbles; very strongly acid.
92 inches +, strong-brown, friable gravelly loamy sand; strongly acid.

These soils have moderate permeability and moderate available moisture capacity. Although they are very strongly acid or extremely acid, they are moderately productive, are easily managed, and have a thick root zone. Truck crops and general farm crops are suited and respond well to lime and fertilizer. The native vegetation is a forest of oak, hickory, and other hardwoods.

Parke silt loam, 2 to 5 percent slopes (PkB).—This gently sloping soil occupies convex areas on terraces. Because it is permeable and friable, and because its available moisture capacity is favorable, it is well suited to truck crops and to general farm crops. Erosion is a slight hazard. (Capability unit IIe–1; woodland suitability group 1)

Parke silt loam, 5 to 10 percent slopes (PkC).—This sloping soil has slow runoff but is moderately susceptible to erosion. Practices that control erosion are contour cultivation and a rotation that provides an equal number of years in hay and in cultivated crops. (Capability unit IIIe–1; woodland suitability group 1)

Parke silt loam, 5 to 10 percent slopes, moderately eroded (PkC2).—This soil is similar to Parke silt loam, 2 to 5 percent slopes, but it is more sloping, and its surface layer is lighter colored because some of the subsoil has been plowed into it. Although runoff is slow, erosion is a moderate hazard. Among the practices needed to control erosion and to maintain productivity are contour stripcropping; applications of lime, fertilizer, and manure; and a rotation that provides 1 year in hay for each year in cultivated crops. (Capability unit IIIe–1; woodland suitability group 1)

Purdy Series

The Purdy series consists of poorly drained soils on terraces in the unglaciated part of the county. These soils developed in silty alluvium with thin layers of sand and gravel at various depths. This material washed from soils derived from local siltstone, sandstone, and shale. Purdy soils are nearly level or depressional and occupy areas of high terraces that are adjacent to the uplands.

Typical profile of Purdy silt loam:

0 to 9 inches, gray, friable silt loam; very strongly acid.
9 to 17 inches, mottled brown and grayish-brown, friable to firm silty clay loam; very strongly acid.
17 to 22 inches, strong-brown, very firm light silty clay loam with many, medium, grayish-brown mottles; fragipan; very strongly acid.
22 to 39 inches, strong-brown, firm light silty clay loam with medium, distinct, grayish-brown mottles; very strongly acid.
39 inches +, mottled yellowish-brown, friable silty clay loam stratified with layers of grayish-brown gravelly clay loam; strongly acid to medium acid.

Because these soils are slowly permeable and have a high water table, they are cold and wet in spring. They have moderate available moisture capacity and, unless drained, a thin root zone. Artificial drainage is needed before cultivated crops can be grown. The response of crops to lime and fertilizer is moderate. Elm, red maple, and pin oak make up the native vegetation.

Purdy silt loam (Pu).—This is the only Purdy soil mapped in the county. It occurs in nearly level areas along shallow, poorly defined drainageways. This poorly drained soil has a high water table that hinders root growth. Crop yields can be greatly increased by tiling and by removing excess water from the surface. Runoff is very slow, and there is no erosion hazard. (Capability unit IVw-1; woodland suitability group 13)

Rainsboro Series

In the Rainsboro series are moderately well drained soils that developed from glacial outwash and have a firm, dense layer in the subsoil. The upper part of these soils, to a depth of 10 to 25 inches, consists mostly of silt. Layers of gravel, sand, and silt make up the lower part. Rainsboro soils occur on high terraces of the Illinoian till plain and on terraces, ranging from 100 to 400 feet above stream level, along Little Beaver Creek, Sandy Creek, and the Ohio River.

Typical profile of a Rainsboro silt loam:

0 to 10 inches, dark grayish-brown silt loam; medium acid.
10 to 19 inches, yellowish-brown silt loam; strongly acid.
19 to 43 inches, dark-brown fine silt loam with grayish-brown mottles in lower part; friable in upper part but firm below a depth of 24 inches; strongly acid.
43 to 71 inches, dark-brown gravelly sandy loam; strongly acid.

Bedrock or glacial till is at a variable depth below 72 inches.

The Rainsboro soils are similar to the Bogart soils but are more deeply leached and weathered. Rainsboro soils are moderately permeable and have moderate available moisture capacity. Their root zone generally is thick, though it may be limited by a seasonally high water table. The soils are easily managed, are well suited to general crops, and are moderately productive. Crops respond well to applications of lime and fertilizer. The native vegetation is a forest of mixed hardwoods, chiefly oak and maple.

Rainsboro silt loam, 2 to 5 percent slopes (RaB).—This gently sloping soil is well suited to general crops. Because it is easily managed, it also is used for potatoes and other special crops in some places. Runoff is slow, and the erosion hazard is only slight. Included in mapping are some areas that have a loam surface layer, a few areas that are nearly level, and a few that are moderately eroded. (Capability unit IIe-1; woodland suitability group 2)

Rainsboro silt loam, 5 to 10 percent slopes (RaC).—This sloping soil is suited to general crops, but it has medium runoff and is moderately susceptible to erosion. (Capability unit IIIe-1; woodland suitability group 2)

Rainsboro silt loam, 5 to 10 percent slopes, moderately eroded (RaC2).—The plow layer of this sloping soil consists of the original surface layer mixed with some of the upper subsoil. If the soil is cultivated, it should be carefully managed and needs large additions of organic matter. Runoff is medium, and the hazard of erosion is moderate. (Capability unit IIIe-1; woodland suitability group 2)

Ravenna Series

The Ravenna series consists of nearly level to sloping, somewhat poorly drained soils that developed from medium-textured, slightly limy glacial till on uplands. These soils have a dense, firm layer in the subsoil. They lie in slightly depressional areas in the northern half of the county.

Typical profile of a Ravenna silt loam:

0 to 11 inches, brown, friable silt loam; very strongly acid.
11 to 15 inches, yellowish-brown, friable loam with many, medium, pale-brown mottles; very strongly acid.
15 to 32 inches, strong-brown, firm loam with many, medium, pale-brown and gray mottles; very strongly acid.
32 to 70 inches, brown, friable loam with gray mottles; very strongly acid to slightly acid.
70 inches +, dark yellowish-brown, friable loam till; mildly alkaline to weakly calcareous.

These soils have high available moisture capacity, but their permeability is slow to moderately slow, and their root zone is only moderately thick because of the dense layer in the subsoil. Productivity is moderate. The response of crops to liming and fertilization is good. The native vegetation is a forest of sugar maple and beech.

Ravenna silt loam, 0 to 2 percent slopes (RnA).—This soil occupies depressional or nearly level areas. Its surface layer is thicker than the one described in the typical profile. Runoff is slow, and erosion is not a hazard, but wetness is a moderate limitation. If the soil is drained, it is suited to general crops. (Capability unit IIw-2; woodland suitability group 12)

Ravenna silt loam, 2 to 5 percent slopes (RnB).—This soil occupies lower areas on the landscape of the Wisconsin till plain. In these areas it generally lies at the base of sloping, better drained Canfield and Wooster soils. Because of somewhat poor drainage, it is less productive than those soils. Some included areas are moderately eroded.

On this soil runoff is slow, erosion is a slight hazard, and wetness is a slight limitation. Permeability is slow in the subsoil. The soil can be made moderately productive by tiling or by removing excess water from the surface. Crops respond to lime and fertilizer. (Capability unit IIw-2; woodland suitability group 12)

Rittman Series

The Rittman series consists of gently sloping to strongly sloping soils that have a fragipan and are moderately well drained. These soils developed from slightly limy, clay loam glacial till on uplands. They occur in the northwestern part of the county.

Typical profile of a Rittman silt loam:

0 to 7 inches, very dark grayish-brown, friable silt loam; slightly acid unless limed.
7 to 14 inches, yellowish-brown, friable clay loam with gray clay films in the lower part; strongly acid.
14 to 22 inches, dark yellowish-brown, very firm clay loam with dark grayish-brown mottles; very strongly acid.
22 to 34 inches, dark-brown, very firm clay loam; strongly acid.
34 to 49 inches, dark-brown, firm clay loam; neutral.
49 inches, olive-brown, firm clay loam till; mildly alkaline.

These soils are slowly permeable and have moderate available moisture capacity. Because of the dense layer in the subsoil, their root zone is only moderately thick. Productivity is moderate, but the surface layer tends to puddle if worked when wet. Crops respond well to lime and fertilizer. The native vegetation is forest consisting mainly of sugar maple, beech, and oak.

Rittman silt loam, 2 to 5 percent slopes (RsB).—This soil occupies high areas of the glacial till plain. Included in mapping are some moderately eroded areas. Runoff is slow to medium, and the hazard of erosion is slight to moderate. (Capability unit IIe–2; woodland suitability group 11)

Rittman silt loam, 5 to 10 percent slopes, moderately eroded (RsC2).—In this soil the surface layer and subsoil together are thinner than in the soil described as typical for the series. The plow layer consists partly of material that formerly was subsoil. Slightly eroded areas are included.

Runoff is medium to rapid on this soil, and erosion is a moderate to severe hazard. Erosion in cultivated fields can be controlled by contour stripcropping and a rotation that includes hay at least half the time. (Capability unit IIIe–2; woodland suitability group 11)

Rittman silt loam, 10 to 15 percent slopes, moderately eroded (RsD2).—The original surface layer of this strongly sloping soil is thinner than that of the typical soil, and the plow layer is a mixture of the surface layer and the upper part of the subsoil.

Because this soil has medium to rapid runoff, it is highly erodible in cultivated areas. Needed to control erosion are contour stripcropping and a rotation that keeps the soil in hay at least half the time. (Capability unit IVe–2; woodland suitability group 11)

Rittman silt loam, 15 to 20 percent slopes, moderately eroded (RsE2).—This moderately deep soil has a plow layer that consists of the original surface layer mixed with subsoil material. The subsoil is thinner than that of the soil described as typical for the series.

This soil can be used occasionally for row crops, but it is better suited to pasture. It has rapid runoff and, if not protected, is highly erodible. (Capability unit IVe–2; woodland suitability group 11)

Rittman soils, 10 to 15 percent slopes, severely eroded (RtD3).—Because the plow layer of these strongly sloping soils is mostly subsoil material, the remaining part of the subsoil is not so thick as the subsoil described as typical. Included in mapping are small areas that have slopes of 5 to 10 percent.

These soils are better suited to pasture or trees than to other crops. If the soils are cultivated for reseeding, however, they are highly erodible, for runoff is rapid. (Capability unit VIe–2; woodland suitability group 5)

Rittman soils, 15 to 20 percent slopes, severely eroded (RtE3).—The plow layer of these moderately steep soils consists mostly of material brought from the subsoil in tillage. The subsoil is thinner than that described for the series.

These soils can be used for tilled crops but are better suited to trees or to pasture used for controlled grazing. Runoff is rapid, and erosion is a severe hazard if the soils are cultivated and not protected. (Capability unit VIe–2; woodland suitability group 5)

Sebring Series

The Sebring series consists of nearly level, poorly drained soils on terraces. These soils developed in deposits of silt, silty clay loam, and loam laid down in ponded water. They occur on the broad outwash plains in the Wisconsin till area and in former swamps in areas of kettle relief on the glacial till plain.

Typical profile of Sebring silt loam:

0 to 8 inches, grayish-brown, friable silt loam; very strongly acid.
8 to 17 inches, mottled strong-brown, gray, and grayish-brown, friable silty clay loam; very strongly acid.
17 to 28 inches, mottled brown and gray, very firm silty clay loam; slightly acid.
28 to 43 inches, brown, firm silty clay loam with many, coarse, distinct mottles of gray; neutral.
43 inches +, brown loamy sand with stratified layers of silty, sandy, and clayey material; slightly acid.

These poorly drained soils have a thin root zone. They are slowly permeable but have high available moisture capacity. Productivity is moderate if drainage is improved. Crops respond well to lime and fertilizer.

Sebring silt loam (Sb).—This level or nearly level soil occupies outwash terraces and depressional areas of the Wisconsin till plain. Some included areas are gently sloping.

If drained, this soil can be cropped and is moderately productive. Runoff is very slow, and there is no erosion hazard. (Capability unit IIIw–2; woodland suitability group 13)

Sebring silty clay loam (Sc).—This soil is moderately productive if it is drained. Runoff is slow, and erosion is not likely. (Capability unit IIIw–2; woodland suitability group 13)

Strip Mine Spoil

Most of Columbiana County is underlain by coal and clay, and the strip mining of these materials is extensive. By 1960, coal had been removed from about 13,000 acres, and 750 additional acres are now being stripped each year. The amount of strip mining is increasing on the more productive farmland in the northern part of the county.

In strip mining, the overburden of soil and rock is moved to the downhill side in order to expose the coal, which is then removed. The spoil banks are graded on the upper part, but the last cut or pit generally is left open. On the uphill side there is a high wall or rock escarpment, and on the outer or downhill side, a very steep spoil bank. The spoil is seeded to grass or planted to trees, with varying success. An attempt commonly is made to impound water in the pit and over the exposed coal. Many pits contain water that is suitable for fishing and other recreational uses.

The spoil from strip mining consists of rock or glacial till material over deeply buried soil material. Generally, it is a mixture of gray shale, fragments of black shale and sandstone, and fine material. In some places, however, slightly limy glacial till makes up most of the spoil, but this is mixed with some black shale. Except in a few spots where pyritic material occurs, none of the spoil is toxic.

Strip mine spoil is used for wildlife, for the limited production of hay and pasture and of black locust for fence posts, and as building sites. Perhaps in the future some areas can be used for recreation and community developments.

Strip mine spoil, glacial materials, rolling (SgD).—This miscellaneous land type consists of loam glacial till mixed with a small amount of material from shale, siltstone, and sandstone. The spoil banks have been graded and now are level to sloping, and there are only a few stones on the surface that hinder operation of farm machinery. Much of the land is so rough, however, that further grading is needed before machinery can be operated without risk of damage.

The spoil is moderately permeable, has moderate available moisture capacity, and is friable and limy. But it lacks organic matter and is very low in fertility. Surface runoff is medium to rapid, and erosion is a moderate to severe hazard, even in areas covered by pasture plants or other permanent vegetation. Where a suitable mixture has been planted in a prepared and fertilized seedbed, the yield of forage is low. A mixture suitable for pasture consists of birdsfoot trefoil, alsike clover, and orchardgrass or Kentucky 31 fescue. To maintain the stand, pasture must be grazed carefully. In areas to be used for meadow, alfalfa can be substituted for birdsfoot trefoil in the mixture.

Spoil banks also can be vegetated by planting forest trees. Black locust grows well but, after about the eighth year, is susceptible to damage by the locust borer. The natural growth of trees is still poor on some spoil banks that are more than 50 years old.

Wildlife is rather sparse in spoil areas but can be increased by planting shrubs and other vegetation that provide food and cover. (Capability unit VIs–1; woodland suitability group 5)

Strip mine spoil, sandstone and shale materials, rolling (SmD).—The material in this land type consists of gray and black shale and siltstone fragments and a small amount of sandstone. The spoil has been graded and is level to sloping, and it has enough fine material at the surface to support some vegetation, though plants grow better in some places than in others. Only a few large stones lie on the surface, and there is little or no toxic material. Despite some grading, however, the surface generally is so rough that the operation of machinery used in cultivating and harvesting is not feasible.

This spoil has medium to rapid runoff, rapid permeability, and low available moisture capacity. If limed and fertilized, it produces only a little forage. Grazing is the best way to harvest the forage, but it must be limited to a few days at a time so that overgrazing is avoided. Erosion is a moderate hazard, and a good stand of pasture or meadow is needed to control soil losses. Suitable mixtures for seeding are birdsfoot trefoil, alsike clover, and orchardgrass or Kentucky 31 fescue for pasture; and alfalfa, alsike clover, and orchardgrass for meadow.

Planting forest trees is another means of revegetating spoil banks. Black locust provides the quickest cover, but it may be damaged by the locust borer after it is about 8 years old. Natural seeding cannot be relied on, for the growth of native trees is still poor on some spoil banks that are more than 50 years old.

Wildlife is rather sparse in areas of this land type, but it can be increased by planting vegetation that provides food and cover. (Capability unit VIs–1; woodland suitability group 9)

Strip mine spoil, steep (SpF).—This land type either consists of excavated glacial till or is a mixture of siltstone, shale, and sandstone materials. Most areas are stony. Runoff is very rapid, and the erosion hazard is severe.

This spoil is of little use except as woodland or wildlife areas. It can be planted to suitable trees or to vegetation that provides food and cover. It is not suitable for housing or industrial uses unless it is graded to a more gentle slope. (Capability unit VIIe–3; woodland suitability group 15)

Strip mine spoil, very acid (Ss)—.This land type consists of toxic black shale, rock material that contains some coal, and very acid rocks that liberate acids when exposed. These materials do not support a plant cover, and they can be a source of stream pollution. Because they contain pyritic minerals that expand on contact with air, they are likely to cause heaving if covered by concrete or other hard-surfaced material. The best way to handle this kind of spoil is to bury it with nontoxic materials. (Capability unit VIIIs–1; woodland suitability group 15)

Summitville Series

In the Summitville series are moderately well drained soils of the uplands that developed from mixed materials derived from red clay shale, sandstone, and siltstone. These materials were mixed by colluvial action. The soils lie on gently sloping to strongly sloping benches and ridgetops in the southern, or unglaciated, part of the county.

Typical profile of a Summitville silt loam:

0 to 7 inches, dark grayish-brown, friable silt loam containing a few channery fragments of siltstone; very strongly acid.

7 to 14 inches, strong-brown, friable silty clay loam; very strongly acid; channery fragments of brown siltstone are common.

14 to 25 inches, reddish-brown to yellowish-red silty clay loam ranging to silty clay in lower part; friable in upper part, firm in lower part; many, medium, reddish-gray mottles; sticky; many channery fragments of brown siltstone; very strongly acid.

25 to 30 inches, weak-red, firm, sticky clay; channery fragments of brown siltstone make up 25 percent of soil mass; very strongly acid.

30 to 34 inches, yellowish-brown, plastic silty clay; about 5 percent of soil mass is channery fragments of brown siltstone; very strongly acid.

34 to 50 inches, weak-red clay; massive; neutral.

These soils have slow permeability and moderate available moisture capacity. They are moderately productive and are inherently more fertile than adjacent soils derived from more acid rocks. Summitville soils are somewhat difficult to manage, however, for excessive cultivation is likely to damage structure and to cause the soil to puddle when wet. Crops respond well to lime and fertilizer.

Summitville silt loam, 2 to 5 percent slopes (SuB).—This soil occurs on gently sloping benches and ridgetops. Included in mapping are small moderately eroded areas and small areas of somewhat poorly drained soils.

This soil is moderately productive and has a moderately thick root zone, but it tends to puddle easily and requires management that maintains structure and provides for the return of organic matter. Runoff is medium, and erosion is a slight to moderate hazard in cultivated fields. (Capability unit IIe–2; woodland suitability group 11)

Summitville silt loam, 5 to 10 percent slopes (SuC).—This sloping soil has medium to rapid runoff and is moderately to highly erodible if not protected. Erosion can be controlled by contour stripcropping and a rotation that keeps the soil in hay at least half the time. In addition, diversion terraces are needed to divert excess water from areas on benches. (Capability unit IIIe–2; woodland suitability group 11)

Summitville silt loam, 5 to 10 percent slopes, moderately eroded (SuC2).—The plow layer of this sloping soil is a mixture of the original surface layer and some of the subsoil. Runoff is medium to rapid, and the erosion hazard is moderate to severe. Erosion in cultivated areas can be controlled by stripcropping and a rotation that includes hay at least half the time. In addition, areas of this soil on benches should be protected by diversion terraces. (Capability unit IIIe–2; woodland suitability group 11)

Summitville silt loam, 10 to 15 percent slopes, moderately eroded (SuD2).—The plow layer of this strongly sloping soil contains material brought from the subsoil in cultivation, and the remaining part of the subsoil is thinner than the subsoil in the typical soil. Included in mapping are slightly eroded areas.

Erosion is a severe hazard on this soil. Soil losses in cultivated fields can be controlled by stripcropping, a rotation that keeps the soil in hay at least half the time, and diversion terraces that protect areas on benches from excess runoff. (Capability unit IVe–2; woodland suitability group 11)

Titusville Series

The Titusville series consists of deep, moderately well drained, dominantly sloping soils that occupy uplands and have a compact layer in the subsoil. These soils formed from medium-textured, slightly limy glacial till. They occur on glaciated benches at the foot of steeper slopes.

Typical profile of a Titusville silt loam:

0 to 1 inch, black silt loam; very strongly acid.
1 to 10 inches, dark grayish-brown to yellowish-brown, friable silt loam; common pebbles; very strongly acid.
10 to 14 inches, yellowish-brown, friable silt loam; common pebbles; very strongly acid.
14 to 19 inches, brown, friable fine loam; common pebbles; very strongly acid.
19 to 30 inches, mottled brown and gray, firm clay loam; a few dark-red layers and blotches; 5 percent pebbles; strongly acid.
30 to 42 inches, yellowish-brown, firm loam with many, medium, distinct mottles of gray and grayish brown; moderate fragipan with weak, medium, prismatic structure; strongly acid.
42 to 70 inches, dark yellowish-brown, firm loam with common, coarse, distinct mottles of gray; weak, very coarse, angular blocky structure and weak platy structure; medium acid.
70 to 168 inches, olive-brown loam; weak, thick, platy structure to massive (structureless); neutral.
168 to 230 inches, dark grayish-brown loam till ranging to very dark gray, calcareous loam till at a depth of 216 inches.

These soils are moderately permeable, are moderately productive, and have high available moisture capacity and a moderately thick root zone. Crops respond well to lime and fertilizer and to good management, though root growth is limited by the compact layer in the subsoil. Runoff from adjacent slopes should be carried away safely by use of diversion terraces.

Titusville silt loam, 2 to 5 percent slopes (TuB).—This soil occupies benches at the base of steep slopes. It is easily managed but needs the protection of diversion terraces that take care of excess water from higher slopes. Runoff is slow, and the erosion hazard is slight. (Capability unit IIe–1; woodland suitability group 2)

Titusville silt loam, 5 to 10 percent slopes (TuC).—This sloping soil has medium runoff. If cultivated, it is subject to moderate erosion. (Capability unit IIIe–1; woodland suitability group 2)

Titusville silt loam, 5 to 10 percent slopes, moderately eroded (TuC2).—Tillage has mixed some of the subsoil into the plow layer of this soil. Runoff is medium. Erosion is a moderate hazard in cultivated areas but can be controlled by use of adequate practices. (Capability unit IIIe–1; woodland suitability group 2)

Titusville silt loam, 10 to 15 percent slopes (TuD).—This strongly sloping soil has rapid runoff and, if cultivated, is highly susceptible to erosion. (Capability unit IIIe–1; woodland suitability group 2)

Titusville silt loam, 10 to 15 percent slopes, moderately eroded (TuD2).—This strongly sloping soil has a plow layer that is about one-third material from the subsoil. Runoff is rapid, and erosion is a severe hazard in fields used for crops. (Capability unit IIIe–1; woodland suitability group 2)

Tyler Series

The Tyler series consists of somewhat poorly drained soils that developed from medium-textured alluvium derived from acid shale, siltstone, and sandstone. These soils have a dense layer in the subsoil. They are in nearly level to sloping, concave areas that lie on high terraces and on benches in the central and southern parts of the county.

Typical profile of a Tyler silt loam:

0 to 7 inches, dark grayish-brown, friable silt loam; weak, thin, platy structure; slightly acid unless limed.
7 to 16 inches, dark yellowish-brown, friable silt loam with distinct, grayish-brown mottles; strongly acid to extremely acid.
16 to 73 inches, yellowish-brown, firm silty clay loam to gravelly clay loam with thick, gray clay films; strongly acid.

73 to 126 inches, strong-brown, firm gravelly loam to silty clay; medium acid or slightly acid.

Permeability is slow, and the available moisture capacity is high to moderate. The root zone is thin or only moderately thick, because penetration of roots is retarded by the dense layer in the subsoil. Productivity is moderate if drainage is improved, but undrained areas are better suited to pasture than to tilled crops.

Tyler silt loam, 0 to 2 percent slopes (TyA).—This nearly level or depressional soil is on terraces. It is well suited to crops if adequate drainage is provided. A rotation that includes hay crops will supply organic matter and help to maintain tilth. Applications of lime and fertilizer are helpful in maintaining productivity. Runoff is slow, and erosion is not a problem. (Capability unit IIIw-2; woodland suitability group 12)

Tyler silt loam, 2 to 5 percent slopes (TyB).—This soil occurs on gently concave slopes and in areas near the sides of valleys that receive runoff and seepage from higher slopes. Drainage is the major limitation, for runoff is slow, and the erosion hazard is only slight. The soil can be used for crops if it is drained and is protected from erosion and runoff from adjacent slopes. (Capability unit IIIw-2; woodland suitability group 12)

Upshur Series

Soils of the Upshur series are moderately deep or deep and well drained. They developed in material derived from red clay shale and lie in hilly areas where this shale crops out. Upshur soils occur in the southern part of the county.

Typical profile of an Upshur clay:

0 to 7 inches, dark reddish-brown, firm, very plastic clay; common fragments of siltstone; strongly acid.

7 to 14 inches, dark reddish-brown, firm, very plastic clay; common fragments of rotted siltstone; strongly acid.

14 to 20 inches, yellowish-red, firm, plastic clay; few fragments of rotted siltstone; strongly acid.

20 to 30 inches, reddish-brown, firm, sticky clay; few fragments of rotted siltstone; medium acid ranging to neutral in lower part.

30 inches +, weak-red clay shale; mildly alkaline.

The combined thickness of the surface layer and the subsoil ranges from 24 to 48 inches.

Upshur soils have moderate available moisture capacity and a moderately thick root zone. They gully severely if poorly managed, and they are difficult to manage because of their poor tilth. Generally, the soils are strongly acid or medium acid in the upper part and range to neutral in the lower part.

In this county the Upshur soils occur with the Muskingum soils and are mapped only in complexes with those soils. The Muskingum soils are described under the heading "Muskingum Series."

Upshur-Muskingum complex, 2 to 5 percent slopes, moderately eroded (UmB2).—The gently sloping soils in this complex have slow runoff and are slightly to moderately susceptible to erosion. They are suitable for cultivation. (Capability unit IIe-2; woodland suitability groups 10 and 7)

Upshur-Muskingum complex, 5 to 10 percent slopes, moderately eroded (UmC2).—In this complex are sloping soils that have medium runoff and are moderately or highly erodible if not protected. Still, these soils are suitable for cultivation. Small included areas are severely eroded. (Capability unit IIIe-2; woodland suitability groups 10 and 7)

Upshur-Muskingum complex, 10 to 15 percent slopes, moderately eroded (UmD2).—The soils in this complex occupy strongly sloping hillsides. Upshur clay is moderately deep and occurs in areas where red clay shale crops out on the upper part of slopes. The Muskingum soils are shallow and lie near the base of slopes where the only parent material is weathered siltstone. In addition, Muskingum soils occur in areas of siltstone outcrops on the upper part of slopes.

Included with the Upshur and Muskingum soils are moderately deep to shallow soils that lie downslope from the Upshur soils and developed in red shale material, which moved downhill by soil creep, mixed with olive siltstone material from the underlying bedrock. The moderately deep areas are inclusions of Summitville soils. Also included are small areas that are slightly eroded or severely eroded.

The soils in this complex have moderate available moisture capacity and a thin or moderately thick root zone. They are difficult to manage because of variations in soil tilth and in crop response to fertilizer. Runoff is rapid, and the erosion hazard is moderate to severe. The Muskingum soils are strongly acid, whereas Upshur clay ranges from strongly acid in the upper part to neutral in the lower part. Muskingum soils tend to be droughty in dry periods. (Capability unit IVe-2; woodland suitability groups 10 and 7)

Upshur-Muskingum complex, 15 to 20 percent slopes, moderately eroded (UmE2).—Except for their moderately steep slopes, the soils in this complex are similar to those in the Upshur-Muskingum complex, 10 to 15 percent slopes, moderately eroded. Moreover, this complex has similar inclusions of Summitville soils and other soils.

The soils in this complex are difficult to manage and generally are not suited to cultivated crops. They have rapid runoff and are highly erodible unless protected. If the Upshur soil is poorly managed, gullying is a severe hazard. (Capability unit VIe-1; woodland suitability groups 10 and 7)

Upshur-Muskingum complex, 20 to 50 percent slopes, moderately eroded (UmF2).—The soils in this complex are steep but in other respects are similar to the soils in the Upshur-Muskingum complex, 10 to 15 percent slopes, moderately eroded. In addition, there are similar inclusions of Summitville soils, other soils, and small slightly eroded areas.

On these soils runoff is very rapid, and the erosion hazard is severe. The soils generally are not suited to cultivated crops, but under careful management they can safely be used for permanent pasture or forest. Gullying is a severe hazard on the Upshur soil if management is poor, and droughtiness is a limitation on the Muskingum soils. (Capability unit VIe-1; woodland suitability groups 10 and 7)

Upshur-Muskingum complex, 20 to 35 percent slopes, severely eroded (UmF3).—The soils in this complex are steeper and more severely eroded than those in the Upshur-Muskingum complex, 10 to 15 percent slopes, moderately eroded. Their surface layer consists of material that formerly was subsoil, and shallow gullies are common. Runoff is very rapid; erosion is a severe hazard. (Capability unit VIIe-2; woodland suitability groups 10 and 7)

Wadsworth Series

The Wadsworth series consists of nearly level and gently sloping soils that have a firm, dense layer in the subsoil and are somewhat poorly drained. These soils developed from slightly limy clay loam glacial till. They occur in the northwestern part of the county.

Typical profile of a Wadsworth silt loam:

0 to 9 inches, very dark grayish-brown, friable silt loam; acid unless limed.
9 to 14 inches, olive-brown, friable fine silty clay loam with yellowish-red and dark grayish-brown mottles; medium acid.
14 to 23 inches, mottled strong-brown and grayish-brown, friable clay loam; about 5 percent pebbles; strongly acid.
23 to 41 inches, brown, firm clay loam with very thick, gray clay films on peds and many, coarse, black stains of manganese; about 10 percent pebbles; strongly acid ranging to neutral in lower part.
41 to 60 inches, olive-brown, friable clay loam with few, coarse, yellowish-brown mottles and gray, vertical clay seams; 10 percent pebbles; neutral.
60 to 72 inches, dark grayish-brown clay loam till; 10 percent pebbles; mildly alkaline to calcareous.

These soils are slowly permeable and have high to moderate available moisture capacity. Although their root zone is thin or only moderately thick because of the firm layer in the subsoil, the soils are moderately productive if they are drained, limed, and fertilized.

Wadsworth silt loam, 0 to 2 percent slopes (WaA).—Wetness is the main limitation affecting use of this nearly level soil. If drainage is improved, however, and if lime and fertilizer are applied, the soil is moderately productive. Runoff is slow. (Capability unit IIIw–2; woodland suitability group 12)

Wadsworth silt loam, 2 to 5 percent slopes (WaB).—This soil occupies lower areas along broad drainageways and at the foot of sloping, better drained Rittman soils. It has a thinner surface layer than Wadsworth silt loam, 0 to 2 percent slopes. Wetness is a major limitation, but this soil is moderately productive if it is drained, limed, and fertilized. The erosion hazard is only slight. (Capability unit IIIw–2; woodland suitability group 12)

Wayland Series

The Wayland series consists of poorly drained soils that developed in alluvium on flood plains.

Typical profile of Wayland silt loam:

0 to 4 inches, very dark gray, friable silt loam; slightly acid.
4 to 10 inches, dark-gray silt loam with dark-brown mottles; slightly acid.
10 to 22 inches, dark grayish-brown, friable silt loam with dark reddish-brown mottles; slightly acid; many concretions (buckshot) in lower part.
22 to 37 inches +, mottled dark-brown and light olive-brown, friable loam and sandy loam; neutral.

These soils have slow or moderately slow permeability and high available moisture capacity. Unless drained, they have a thin root zone.

Wayland silt loam (Wc).—This soil occurs on flood plains, where flooding and a seasonally high water table limit productivity. The soil is well suited to grass and trees, and it generally can be cultivated if drained. Some areas, however, are subject to flooding that commonly damages crops, and these areas should be kept in permanent vegetation. Runoff is very slow. (Capability unit IIIw–3; woodland suitability group 13)

Wayland silty clay loam (Wd).—This poorly drained soil has a high water table. Because of its finer textured surface layer, it is more difficult to drain and to manage than Wayland silt loam. Some areas should be kept in permanent vegetation because they are subject to flooding that is likely to damage crops. Runoff is very slow. (Capability unit IIIw–3; woodland suitability group 13)

Weikert Series

The Weikert series consists of shallow, well-drained soils that developed from acid siltstone and thin layers of shale and fine-grained sandstone. The shale is gray but weathers to olive and brown.

Typical profile of a Weikert soil:

0 to 4 inches, brown, friable shaly silt loam that is about 15 percent siltstone fragments; extremely acid unless limed.
4 to 12 inches, brown to yellowish-brown, friable channery silt loam that is about 70 percent siltstone fragments, which crush easily; very strongly acid.
12 to 18 inches, rotted, olive siltstone bedrock with layers of soil, 1 millimeter thick, in horizontal cracks; very strongly acid.
18 inches +, hard, olive siltstone bedrock; very strongly acid.

These soils have low available moisture capacity and a thin to moderately thick root zone that extends into thin layers of soil material between the layers of bedrock. The native vegetation is a forest of oak, hickory, and other hardwoods.

In this county the Weikert soils occur closely with the Muskingum soils and are mapped only in undifferentiated groups with those soils. The Muskingum soils are described under the heading "Muskingum Series."

Weikert and Muskingum soils, 2 to 5 percent slopes (WmB).—The soils in this undifferentiated group occupy ridgetops that range from a few hundred feet to one-half mile in width. Included in mapping are small areas of Wellston silt loam.

Because of their gentle slopes, rapid permeability, and good tilth, these soils are well suited to crops. In dry years, however, yields are limited by the thin root zone and low available moisture capacity. Crops respond well to applications of lime, fertilizer, and manure. Erosion is a moderate hazard but can be controlled by use of suitable practices, including a rotation that keeps the soils in hay part of the time. (Capability unit IIIe–3; woodland suitability group 7)

Weikert and Muskingum soils, 2 to 5 percent slopes, moderately eroded (WmB2).—The plow layer of these soils is light colored because it contains channery fragments and consists partly of material that formerly was subsoil. Included in mapping are small severely eroded areas.

These moderately eroded soils are slightly less productive than Weikert and Muskingum soils, 2 to 5 percent slopes. Needed for favorable yields are lime, fertilizer, and manure or other organic material. Erosion is a moderate hazard, and the available moisture capacity is low. (Capability unit IIIe–3; woodland suitability group 7)

Weikert and Muskingum soils, 5 to 10 percent slopes (WmC).—These soils occur on sloping hillsides, where intensive practices are needed for erosion control. Runoff is medium. (Capability unit IIIe–3; woodland suitability group 7)

Weikert and Muskingum soils, 5 to 10 percent slopes, moderately eroded (WmC2).—These soils lie on sloping hillsides. The surface layer of the Weikert soil contains channery material brought up from the upper subsoil in cultivation. Runoff is medium on these soils, and erosion is a moderate hazard in unprotected fields. (Capability unit IIIe-3; woodland suitability group 7)

Weikert and Muskingum soils, 5 to 10 percent slopes, severely eroded (WmC3).—These soils lie on sloping hillsides where erosion has been so severe that all of the original surface layer is missing. Included in mapping are small severely eroded areas of Wellston soils. Runoff is medium to rapid. (Capability unit IVe-3; woodland suitability group 7)

Weikert and Muskingum soils, 10 to 15 percent slopes (WmD).—These soils occupy strongly sloping hillsides that are moderately or highly susceptible to erosion if cultivated and not protected. They are fairly well suited to meadow or pasture and, if needed, can be used for crops. Runoff is medium to rapid. (Capability unit IIIe-3; woodland suitability group 7)

Weikert and Muskingum soils, 10 to 15 percent slopes, moderately eroded (WmD2).—These strongly sloping soils occur on hillsides that have medium to rapid runoff and are moderately or highly susceptible to erosion if used for cultivated crops. The soils are fairly well suited to meadow or pasture. Among the practices needed to control erosion is a rotation that includes hay crops part of the time. (Capability unit IIIe-3; woodland suitability group 7)

Weikert and Muskingum soils, 10 to 15 percent slopes, severely eroded (WmD3).—The original surface layer of these strongly sloping soils has been lost through erosion. The soils are better suited to meadow or pasture than they are to row crops. Runoff is medium to rapid, and erosion is a severe hazard in cultivated fields. Included in mapping are small areas of severely eroded Wellston soils. (Capability unit IVe-3; woodland suitability group 7)

Weikert and Muskingum soils, 15 to 20 percent slopes, moderately eroded (WmE2).—These soils, which occupy moderately steep hillsides, generally formed in a mixture of material derived from siltstone, sandstone, and shale. Some of this material accumulated as a result of soil creep downslope. The soils have rapid runoff, are highly erodible if not protected, and are better suited to pasture than to row crops. (Capability unit IVe-3; woodland suitability group 7)

Weikert and Muskingum soils, 15 to 20 percent slopes, severely eroded (WmE3).—These soils formed on moderately steep hillsides, generally in a mixture of material derived from siltstone, shale, and a little sandstone. Some of this material was moved downslope by soil creep. The original surface layer of these soils has been lost through erosion, and permanent vegetation is needed to control further soil losses. Runoff is rapid. (Capability unit VIe-2; woodland suitability group 7)

Weikert and Muskingum soils, 20 to 35 percent slopes (WmF).—These soils occur on steep hillsides and generally formed in a mixture of material derived from siltstone, sandstone, and shale. Some of this material accumulated as the result of soil creep downslope. The soils are thicker on the lower part of slopes than they are on the upper part. Trees are well suited to these soils, but pasture can be maintained if it is carefully managed. Runoff is very rapid, and the erosion hazard is severe. (Capability unit VIe-1; woodland suitability group 8)

Weikert and Muskingum soils, 20 to 35 percent slopes, severely eroded (WmF3).—Erosion has removed most of the original surface layer from these steep soils, and a few shallow gullies have formed. The soils developed in a mixture of material weathered from siltstone, shale, and sandstone.

These soils have very rapid runoff and are highly erodible if not protected. They are too steep for farm machinery and are poorly suited to grass. Their best use likely is woodland. (Capability unit VIIe-2; woodland suitability group 8)

Weikert and Muskingum soils, 35 to 50 percent slopes (WmG).—These soils are shallow and occur on very steep hillsides, where they formed in a mixture of material derived from siltstone, sandstone, and shale. Some of this material accumulated as a result of soil creep. Included in mapping are small areas that have been cleared of forest and are moderately eroded, and small areas of very steep Dekalb loam.

The soils of this unit have very rapid runoff and are subject to severe erosion. They are better suited to trees than to grass. (Capability unit VIIe-1; woodland suitability group 8)

Weikert and Muskingum soils, 35 to 50 percent slopes, severely eroded (WmG3).—These shallow, very steep soils have lost all of their original surface layer through erosion. They formed in materials that were derived from siltstone, sandstone, and shale and that were mixed as a result of soil creep downhill. Small areas of very steep Dekalb loam are included.

On these soils runoff is very rapid, and the erosion hazard is severe. Trees are better suited than grass. (Capability unit VIIe-2; woodland suitability group 8)

Wellston Series

Soils of the Wellston series are deep or moderately deep and well drained. These soils developed in material weathered from acid, olive siltstone and fine-grained sandstone. They occur on gently sloping to strongly sloping ridgetops and benches in the southern half of the county.

Typical profile of a Wellston silt loam:

0 to 6 inches, brown, friable silt loam; about 10 percent channery fragments of siltstone; extremely acid unless limed.
6 to 25 inches, brown to strong-brown, friable channery silt loam ranging to clay loam in the lower part; about 25 percent channery fragments of siltstone; extremely acid.
25 to 31 inches, dark-brown, friable channery light clay loam that is about 40 percent weathered channery fragments lying in thin horizontal layers; extremely acid.
31 to 37 inches, yellowish-brown, friable channery loam; 50 percent siltstone fragments; extremely acid.
37 to 49 inches, dark yellowish-brown, weathered siltstone to fine-grained sandstone with thin layers of soil between thin strata of rock; extremely acid.

Wellston soils are moderately permeable and have moderate available moisture capacity. They have a moderately thick or thick root zone and are moderately productive.

Wellston silt loam, 2 to 5 percent slopes (WnB).—This gently soping soil occupies ridgetops and broad benches. Included in mapping are small areas that have a loam surface layer; small areas that are moderately eroded; and small areas of Weikert and Muskingum soils. This Wellston soil is deeper than the Weikert and Muskingum soils but is not so deep as the Allegheny soils.

Wellston silt loam, 2 to 5 percent slopes, is well suited to crops because of its favorable position, good drainage, and good tilth. Crops respond well to lime and fertilizer, and erosion is only a slight hazard. In fields used for crops, erosion can be controlled by cultivating on the contour and by following a rotation that keeps the soil in hay part of the time. (Capability unit IIe–1; woodland suitability group 7)

Wellston silt loam, 5 to 10 percent slopes (WnC).—Erosion is a moderate hazard on this sloping soil. It can be controlled in cultivated areas by contour stripcropping and a rotation that provides an equal number of years in hay and in grain. (Capability unit IIIe–1; woodland suitability group 7)

Wellston silt loam, 5 to 10 percent slopes, moderately eroded (WnC2).—The plow layer of this sloping soil consists of original surface soil mixed with material from the subsoil. Small included areas are severely eroded.

Erosion is a moderate hazard on this soil, but it can be controlled by contour stripcropping and a rotation that provides an equal number of years in hay and in grain. (Capability unit IIIe–1; woodland suitability group 7)

Wellston silt loam, 10 to 15 percent slopes, moderately eroded (WnD2).—This strongly sloping soil has a plow layer that consists of original surface soil mixed with subsoil material. Erosion is a moderate to severe hazard in cultivated fields. Small included areas are only slightly eroded. (Capability unit IIIe–1; woodland suitability group 7)

Wellston silt loam, 15 to 20 percent slopes, moderately eroded (WnE2).—This steep soil has a plow layer consisting partly of material that formerly was subsoil. It is not so deep to bedrock as the soil described as typical for the series. Included in mapping are slightly eroded areas. This soil is highly erodible if it is cultivated and not protected. (Capability unit IVe–1; woodland suitability group 7)

Wharton Series

The Wharton series consists of moderately well drained soils of the uplands that are underlain by acid, black, carbonaceous clay shale. These soils lie on gently sloping to strongly sloping benches in the southern part of the county.

Typical profile of a Wharton silt loam:

0 to 8 inches, dark grayish-brown, friable silt loam; very strongly acid.
8 to 13 inches, yellowish-brown, slightly firm silt loam; very strongly acid.
13 to 25 inches, brown, firm silty clay loam, with a few small fragments of black shale; very strongly acid.
25 to 28 inches, mottled yellowish-brown and grayish-brown, firm silty clay loam with common small fragments of black shale; very strongly acid.
28 to 38 inches, dark-brown silty clay loam with many weathered fragments of black shale; strongly acid.
38 to 45 inches, dark-brown, weathered fragments of black shale; strongly acid.
45 inches +, black carbonaceous shale.

These soils have moderate available moisture capacity and a moderately thick to thick root zone. Because they have a fine-textured subsoil, however, they are slowly permeable and generally are difficult to manage. In spring they tend to dry out and to warm up more slowly than other soils. Productivity is moderate; crops respond well to lime and fertilizer. In cultivated areas diversion terraces and contour stripcropping are needed to reduce runoff and to control erosion. The native vegetation is a forest of maple, beech, and oak.

Wharton silt loam, 2 to 5 percent slopes (WoB).—This soil occupies gently sloping benches in the unglaciated part of the county. It has a fine-textured subsoil and is kept wet most of the year by runoff from higher slopes. For this reason, and because runoff is medium to rapid, the soil is not easily managed, though it is moderately productive if management is good. Erosion is a slight to moderate hazard. Small included areas are moderately eroded. (Capability unit IIe–2; woodland suitability group 11)

Wharton silt loam, 5 to 10 percent slopes (WoC) —This sloping soil has rapid runoff and is moderately to highly erodible if cultivated and not protected. Erosion in tilled fields can be controlled by contour stripcropping and a rotation that includes hay at least half the time. In addition, diversion terraces are needed to carry away excess water in some places. (Capability unit IIIe–2; woodland suitability group 11)

Wharton silt loam, 5 to 10 percent slopes, moderately eroded (WoC2).—The plow layer of this sloping soil is a mixture of original surface soil and subsoil. Small included areas are severely eroded.

On this soil runoff is rapid, and erosion is a moderate to severe hazard in cultivated fields. Here, erosion can be controlled by contour stripcropping and a rotation that keeps the soil in hay at least half the time. Diversion ditches are needed to divert excess water in some places. (Capability unit IIIe–2; woodland suitability group 11)

Wharton silt loam, 10 to 15 percent slopes, moderately eroded (WoD2).—The plow layer of this strongly sloping soil consists of original surface soil mixed with material from the subsoil. Included in mapping are small areas that are somewhat poorly drained and areas that are only slightly eroded.

This soil is well suited to pasture, and it can be used for crops if erosion is controlled by contour stripcropping and a rotation that keeps meadow on the soil most of the time. Runoff is rapid, and the hazard of erosion is severe. (Capability unit IVe–2; woodland suitability group 11)

Willette Series

In the Willette series are shallow, very poorly drained organic soils that developed from decomposed plants in flat to depressional bogs in the unglaciated areas of the county.

Typical profile of Willette muck:

0 to 26 inches, black, friable muck; medium acid.
26 inches +, very dark grayish-brown silty clay; neutral.

The Willette soils are moderately permeable above the clayey material but are slowly permeable in it. They have high available moisture capacity. Unless drained, however, they are low in productivity and have a thin root zone. Drained areas are moderately productive of general crops. The native vegetation consists either of grasses and sedges or of swamp white oak, pin oak, and other hardwoods.

Willette muck (Wp).—This is the only Willette soil mapped in the county, and almost all of it is covered with grass or trees. It has a high water table and is very poorly drained. Runoff is ponded. Cultivation compacts this soil and causes it to shrink. Areas subject to crop-damaging floods are better suited to permanent vegetation than to crops. (Capability unit IIIw-4; woodland suitability group 14)

Wooster Series

In the Wooster series are well-drained soils of the uplands that developed from medium-textured, slightly limy glacial till. These soils are gently sloping to very steep and occur in the northern half of the county.

Typical profile of a Wooster silt loam:

0 to 5 inches, dark grayish-brown, friable silt loam with a few pebbles; slightly acid.

5 to 19 inches, yellowish-brown, friable loam with a few pebbles; strongly acid.

19 to 25 inches, dark yellowish-brown, firm loam with common pebbles; strongly acid.

25 to 56 inches, dark yellowish-brown and olive-brown, firm loam with common pebbles; weak, coarse, angular blocky structure; slightly acid or neutral.

56 inches +, olive-brown, friable coarse loam till; calcareous.

The Wooster soils are moderately permeable and have moderate to high available moisture capacity. Their root zone is thick or moderately thick, and their productivity is moderate. Crops respond well to lime and fertilizer.

Wooster loam, 5 to 10 percent slopes, moderately eroded (WrC2).—This sloping soil has slow to medium runoff and is moderately susceptible to erosion. Some of the practices that control erosion are contour stripcropping and a rotation that provides 1 year in hay for each year in grain. Small areas included with this soil are severely eroded. (Capability unit IIIe-1; woodland suitability group 1)

Wooster silt loam, 2 to 5 percent slopes (WsB).—This gently sloping soil occupies relatively high areas. Included in mapping are small areas that have a loam surface layer.

This soil is productive because it is well drained, has high available moisture capacity, and has a thick root zone. It is easily managed and is suited to many kinds of crops. The response to lime and fertilizer is good. Runoff is slow, and the erosion hazard is only slight. (Capability unit IIe-1; woodland suitability group 1)

Wooster silt loam, 2 to 5 percent slopes, moderately eroded (WsB2).—The plow layer of this soil consists mostly of the original surface layer but contains some of the upper subsoil. A few included areas have a surface layer of loam.

This soil is slightly less productive than uneroded Wooster soils. If crops are grown, organic matter should be returned regularly. Runoff is slow, and the erosion hazard is slight. (Capability unit IIe-1; woodland suitability group 1)

Wooster silt loam, 5 to 10 percent slopes (WsC).—This sloping soil has slow to medium runoff and is moderately erodible if not protected. Erosion in cultivated fields can be controlled by stripcropping on the contour and using hay in the rotation. Included in mapping are a few areas that have a loam surface layer. (Capability unit IIIe-1; woodland suitability group 1)

Wooster silt loam, 5 to 10 percent slopes, moderately eroded (WsC2).—Tillage has mixed some of the subsoil into the plow layer of this sloping soil. Runoff is slow to medium, and the erosion hazard is moderate. In cultivated areas erosion can be controlled by contour stripcropping and a rotation that provides 1 year in hay for each year in grain. (Capability unit IIIe-1; woodland suitability group 1)

Wooster soils, 10 to 15 percent slopes (WtD).—The surface layer of these strongly sloping soils is loam or silt loam. The subsoil is thinner than that of the typical Wooster soil. Small areas of Canfield loam are included.

On these soils runoff is medium, and the hazard of erosion is moderate to severe. Soil losses in cultivated fields can be controlled by contour stripcropping and a rotation that keeps the soils in hay at least half the time. (Capability unit IIIe-1; woodland suitability group 1)

Wooster soils, 10 to 15 percent slopes, moderately eroded (WtD2).—These strongly sloping soils have a plow layer of loam or silt loam that is a mixture of original surface soil and subsoil. The present subsoil is thinner than the one described as typical for the series. Included in mapping are small areas of Canfield soil.

Runoff is medium, and erosion is a moderate hazard in cultivated fields. These can be protected from erosion if they are contour stripcropped and are kept in hay at least half the time. (Capability unit IIIe-1; woodland suitability group 1)

Wooster soils, 10 to 15 percent slopes, severely eroded (WtD3).—The plow layer of these severely eroded soils consists partly of material that formerly was subsoil, and the present subsoil is thinner than that described for the series. Small areas of Canfield soil are included. Runoff is medium to rapid, and erosion is severe in unprotected fields. Rotations that include sod crops a large part of the time are needed for erosion control. (Capability unit IVe-3; woodland suitability group 5)

Wooster soils, 15 to 20 percent slopes, moderately eroded (WtE2).—These moderately steep soils have a surface layer of silt loam or loam, and their surface layer and subsoil are thinner than those of the typical Wooster soil. Small included areas are slightly eroded.

These soils have a moderately thick root zone, moderate available moisture capacity, and rapid runoff. If cultivated, they are highly susceptible to erosion. Soil losses can be checked by the growing of meadow in long rotations. (Capability unit IVe-1; woodland suitability group 1)

Wooster soils, 15 to 20 percent slopes, severely eroded (WtE3).—The plow layer of these severely eroded soils consists mostly of material brought up from the subsoil through tillage. Included in mapping are small areas of Canfield soil. Because runoff is rapid, erosion is a severe hazard in cultivated fields. To control erosion, meadow should be grown in long rotations. (Capability unit VIe-2; woodland suitability group 5)

Wooster soils, 20 to 35 percent slopes, moderately eroded (WtF2).—These steep soils have rapid runoff and are highly erodible if not protected, but they are suitable for pasture or as woodland. Included in mapping are small slightly eroded areas. (Capability unit VIe-1; woodland suitability group 1)

Wooster soils, 20 to 35 percent slopes, severely eroded (WtF3).—The plow layer of these steep soils consists mostly of subsoil material. The soils can be used for pasture but are more suitable as woodland. Runoff is very rapid, and the erosion hazard is severe. (Capability unit VIIe–2; woodland suitability group 1)

Wooster soils, 35 to 50 percent slopes, moderately eroded (WtG2).—These very steep soils are well suited to trees, and they can be used for pasture if grazing is limited. Runoff is very rapid, and the hazard of erosion is severe. Included in mapping are some areas that are only slightly eroded. (Capability unit VIIe–1; woodland suitability group 1)

Formation, Morphology, 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 Columbiana County. In the second part each soil series represented in the county is placed in its respective subgroup of the new system for classifying soils and also is placed in its respective great soil group of the old classification system. The great soil groups represented in the county are briefly defined. In the third part is a description of each soil series in Columbiana 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 process 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 upon 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 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. Little is known about the effects of the microorganisms, earthworms, ants, and other plants and animals living in the soil. 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 upon soil development are modified by the parent material and by the relief, which, in turn, influences drainage. The parent material and the relief influence the kind of soil profile that can be formed and in some cases 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 materials.

Parent material

Parent material is the unconsolidated mass of rock material from which a soil develops. Some kinds of parent material are derived from bedrock, and some have been transported into the area by glacial action or by wind or water.

In the southern part of the county, which is unglaciated, some of the soils formed in residual material and others in transported materials. The Upshur, Dekalb, Weikert, and Guernsey soils formed in beds of weathered shale, limestone, and sandstone. Upshur soils have inherited their red color and clayey texture from red, clayey parent material. The Dekalb soils, which formed in sandy parent material, are loamy to sandy and contain fragments of sandstone throughout. The Weikert soils have a variable content of coarse fragments they inherited from parent material and the underlying shale. Guernsey soils are high in natural fertility because they formed in material influenced by weathered limestone.

High benches in the southern part of the county have a thick mantle of silt that was deposited by water in a preglacial lake (*7*). The silty Allegheny and Monongahela soils formed in this silty mantle.

Soils on terraces in southern Columbiana County formed in transported material of complex origin. Most of the material consists of glacial outwash laid down in deposits that vary in texture (*6*). The Chili, Negley, and Parke soils are gravelly and formed in gravelly outwash. Rainsboro soils formed in silty, gravelly, and sandy outwash. The texture of these soils reflects the influence of parent material.

Colluvium, deposited at the base of slopes after the collapse of steep valley walls, is parent material for the Laidig and Ernest soils.

The parent material on the narrow flood plains is recently transported material of local origin. Formed in it are the Chagrin, Lobdell, Orrville, and Wayland soils.

The central part of Columbiana County is mantled by glacial drift of Illinoian age (*14*) that varies in thickness. Hanover soils formed in areas where the till is thick, and Loudonville soils formed in areas where it is thin. Parent material from glacial till, and the soils that formed in it, contain a variable amount of coarse fragments, mostly from local sedimentary rocks. Some of the till material was picked up and carried into the county from Canada and other areas to the north.

The northern part of the county is covered by thick glacial deposits of Wisconsin age that were laid down more recently than the till in some other areas. The texture of this material is mostly loam, but in northwestern areas of the county it is clay loam. Wooster soils, which formed in loam till, are less clayey than Rittman soils, which formed in clay loam till.

Climate

The climate under which the soil material has accumulated and existed since deposition is an active factor in soil formation. Columbiana County is located in an area that has a temperate, humid, continental climate. Climatic data for the county are given in the section "General Nature of the Area."

The climate has influenced the removal of material by leaching. Because soluble bases are removed as they are released from mineral material, the soils that formed are acid. In addition, clay and sesquioxides are carried from the surface horizon to lower horizons. Most soils of the county are acid, at least in the upper horizons, because the bases are continually leached downward.

The Canfield, Wooster, Rittman, Titusville, and other soils show evidence of clay movement from the A to the B horizon. Allegheny, Laidig, Negley, and Parke soils show evidence of more intensive weathering than other soils; they are more acid and have a lower content of weatherable minerals than most other soils.

The Purdy, Papakating, Luray, and Damascus soils, because of their position on the landscape, have formed under a wetter microclimate than normal soils of the county. This results in waterlogging, at least seasonally, and in gleying that is caused by the reduction and removal of iron.

A drier microclimate has prevailed on steep slopes, where surface runoff is rapid. This has influenced the development of the shallow Weikert and Dekalb soils.

Plant and animal life

Columbiana County was originally almost completely covered by a forest of mixed hardwoods. Most of the soils formed under forest, but the Carlisle, Kerston, and Willette soils formed in swampy areas under grasses and sedges.

Soils of the uplands that formed under hardwood forest have been affected by organic matter consisting of decayed leaves, stems, and other woody material. The decomposition of this material liberates organic acids that speed the weathering of mineral material. Deciduous forest helps to maintain a relatively uniform content of bases in the root zone. Although the bases are taken up by tree roots, they are returned to the soil surface in the leaves and stems. When the leaves decompose, the bases reenter the soil and are again used by plants.

Windthrow, or the blowdown of trees by wind, affects soil formation in small areas and can best be seen in areas of wet soils that are still forested. As a result of windthrow, the A horizon is thickened in the throw area.

Worms, ants, and burrowing animals mix a considerable amount of material in all the soils (*9*).

Man's use of the land has brought about significant changes in the soils of the county. Tillage has accelerated erosion in many areas; the construction of buildings and structures has partially or completely destroyed soils in many places; and drainage and irrigation practices have significantly altered conditions under which soils have formed. In addition, the use of lime and fertilizer has changed soil reaction and base status.

Relief

Relief influences the development of soils through its effect on runoff, erosion, ponding, depth of water table, internal drainage, accumulation and removal of organic matter, and other phenomena. Nearly level and depressional soils are frequently wet because of a fluctuating water table and seepage from surrounding soils. The base status of poorly drained soils tends to be higher than that of well-drained soils because bases accumulate in poorly drained soils.

Soils having complex, gentle slopes generally show the greatest degree of horizon development because the soil is neither waterlogged nor droughty. Among these soils in Columbiana County are ones in the Wooster, Canfield, Glenford, Chili, Rittman, and Ravenna series. Steep soils of the Weikert, Dekalb, Muskingum, and similar series tend to be shallow because the interrelationship between relief and parent material results in soil losses that nearly keep pace with soil development. Relief, by affecting microclimate, greatly influences the plant and animal life on and in the soil.

Time

Time accounts for many of the differences among soils. Generally, the longer the time that climate and plant and animal life have acted upon soil material, the more distinct are the horizons. In soils that formed in alluvium, such as the Chagrin, Lobdell, and Orrville soils, no strongly differentiated profile has developed because the soil material has not been in place long enough.

Soils on glacial till have formed since the glacial ice receded 15,000 to several hundred thousand years ago. The soils formed in older till generally are more weathered and more strongly leached of bases than those formed in the most recent till. The Allegheny, Laidig, Negley, and Parke soils are the most weathered soils in the county, as shown by low base status and strong acidity.

Classification of Soils

Soils are classified so that we may more easily remember their significant characteristics, assemble knowledge about them, see their relationships to one another and to the whole environment, and develop principles that help us understand their behavior and response to manipulation. First through classification, and then through use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

The system of classification described in this section of the report is the 1938 system (*2*) with later revisions (*15*). Effective January 1, 1965, however, a new system of classification was adopted as standard for all soil surveys in the United States (*13, 17*). In table 9 the soils of Columbiana County are classified according to the current and the 1938 systems.

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 of this report.

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 Sols Bruns Acides, Red-Yellow Podzolic soils, Gray-Brown Podzolic soils, Planosols, Low-Humic Gley soils, Humic Gley soils, Alluvial soils, Lithosols, and Bog (organic) soils. The miscellaneous land types are not classified by great soil groups.

In the highest category of classification, the great soil groups have been placed in three orders, zonal, intrazonal, and azonal. The zonal order is made up of soils with evident, genetically related horizons that reflect the predominant influence of climate and living organisms in their formation. The intrazonal order consists of soils with evident, genetically related horizons that reflect the dominant influence of a local factor, such as relief or parent material, over the effects of climate and living organisms. The azonal order is made up of soils that lack distinct, genetically related horizons, commonly because of youth, resistant parent material, or steep slopes.

Table 10 shows the relations among the 49 soil series of this county. The vertical columns in the table indicate the internal drainage of the various soils. The horizontal lines show the series in a way that indicates the general nature of the parent material.

In the following paragraphs each great soil group is discussed, and the soil series in each are listed. Some soils in some of the great soil groups intergrade toward other great soil groups. That is, they have characteristics of two groups.

TABLE 9.—*Soil series classified according to the present system of classification* [1] *and the 1938 system with its later revisions*

Series	Current classification	1938 classification
	Subgroup	Great soil group
Allegheny	Alfic Normudults	Red-Yellow Podzolic.
Bogart	Aquic Normudalfs	Gray-Brown Podzolic.
Canfield	Aquic Fragiudalfs	Gray-Brown Podzolic.
Carlisle	(2)	Bog.
Cavode	Aqualfic Normudults	Red-Yellow Podzolic (intergrading toward Planosol).
Chagrin	Typic Udifluvents	Alluvial.
Chili	Typic Normudalfs	Gray-Brown Podzolic.
Chilo	Mollic Ochraqualfs	Humic Gley.
Conotton	Typic Normudalfs	Gray-Brown Podzolic.
Damascus	Typic Ochraqualfs	Low-Humic Gley.
Dekalb	Typic Dystrochrepts	Sols Bruns Acides.
Ernest	Aquic Fragiudults	Gray-Brown Podzolic (intergrading toward Red-Yellow Podzolic).
Fitchville	Aeric Ochraqualfs	Gray-Brown Podzolic.
Frenchtown	Typic Fragiaqualfs	Low-Humic Gley.
Glenford	Aquic Normudalfs	Gray-Brown Podzolic.
Gresham	Aeric Fragiaqualfs	Gray-Brown Podzolic.
Guernsey	Aquic Normudalfs	Gray-Brown Podzolic (intergrading toward Red-Yellow Podzolic).
Hanover	Alfic Normudults	Gray-Brown Podzolic.
Jimtown	Aeric Ochraqualfs	Gray-Brown Podzolic.
Kerston	(2)	Bog.
Laidig	Typic Fragiudults	Red-Yellow Podzolic.
Lobdell	Typic Udifluvents	Alluvial.
Lorain	Typic Argiaquolls	Humic Gley.
Loudonville	Typic Normudalfs	Gray-Brown Podzolic.
Luray	Typic Argiaquolls	Humic Gley.
Marengo	Typic Argiaquolls	Humic Gley.
Monongahela	Typic Fragiudults	Red-Yellow Podzolic (intergrading toward Gray-Brown Podzolic).
Muskingum	Typic Dystrochrepts	Sols Bruns Acides (intergrading toward Lithosol).
Negley	Alfic Normudults	Gray-Brown Podzolic.
Olmsted	Mollic Ochraqualfs	Humic Gley.
Orrville	Aeric Fluventic Normaquepts	Alluvial.
Papakating	Typic Humaquepts	Humic Gley.
Parke	Alfic Normudults	Gray-Brown Podzolic.
Purdy	Typic Fragiaquults	Planosol.
Rainsboro	Typic Fragiudalfs	Gray-Brown Podzolic.
Ravenna	Aeric Fragiaqualfs	Gray-Brown Podzolic.
Rittman	Aquic Fragiudalfs	Gray-Brown Podzolic.
Sebring	Typic Ochraqualfs	Low-Humic Gley.
Summitville	Alfic Normudults	Gray-Brown Podzolic.
Titusville	Aquic Fragiudalfs	Gray-Brown Podzolic.
Tyler	Aquic Fragiudults	Planosol.
Upshur	Typic Normudalfs	Gray-Brown Podzolic.
Wadsworth	Aeric Fragiaqualfs	Gray-Brown Podzolic.
Wayland	Fluventic Mollic Normaquepts	Low-Humic Gley.
Weikert	Lithic Dystrochrepts	Lithosol (intergrading toward Sols Bruns Acides).
Wellston	Alfic Normudults	Gray-Brown Podzolic (intergrading toward Red-Yellow Podzolic).
Willette	(2)	Bog.
Wharton	Paraquic Normudults	Red-Yellow Podzolic (intergrading toward Gray-Brown Podzolic).
Wooster	Typic Fragiudalfs	Gray-Brown Podzolic.

[1] Placement of some soil series in the present system of classification may change as more precise information becomes available.
[2] Carlisle, Kerston, and Willette soils have not been placed in a subgroup.

TABLE 10.—*Soil series arranged to show the relationship*

Parent material	Sols Bruns Acides	Red-Yellow Podzolic soils			Gray-Brown Podzolic soils		
	Well drained	Well drained	Moderately well drained	Somewhat poorly drained	Well drained	Moderately well drained	Somewhat poorly drained
Material from sedimentary rocks:							
Siltstone	Muskingum[1].				Wellston[2]		
Sandstone	Dekalb						
Black clay shale			Wharton[4]	Cavode[5]			
Red clay shale					Upshur		
Colluvial material:							
Thin, mixed material from red clay shale, siltstone, and sandstone.						Summitville.	
Thin, mixed material from limestone, siltstone, shale, and sandstone.						Guernsey[2,3]	
Thick, mixed material from sandstone, siltstone, and shale.		Laidig				Ernest[2]	
Glacial till:							
Slightly limy loam of Wisconsin age.					Wooster	Canfield	Ravenna
Slightly limy clay loam of Wisconsin age.						Rittman	Wadsworth
Slightly limy till of Illinoian age.					Hanover	Titusville	Gresham
Shallow till					Loudonville.		
Material laid down by water:							
Slightly limy glacial outwash of Wisconsin age.					Conotton, Chili.	Bogart	Jimtown
Glacial outwash of Illinoian and pre-Illinoian ages.					Negley, Parke.	Rainsboro	
Glacial lacustrine material; medium texture.						Glenford	Fitchville
Glacial lacustrine material; fine texture.							
Alluvium from local rocks; on high terraces and benches.		Allegheny	Monongahela.[4]				
Alluvium recently deposited on flood plains.							
Organic material:							
Thick muck							
Thin muck							
Muck interstratified with alluvium.							

[1] Muskingum soils are Sols Bruns Acides that intergrade toward Lithosols.
[2] Wellston, Guernsey, and Ernest soils are Gray-Brown Podzolic soils that intergrade toward Red-Yellow Podzolic soils.
[3] Weikert soils are Lithosols that intergrade toward Sols Bruns Acides.

Sols Bruns Acides

Sols Bruns Acides are soils that have a thin A1 horizon; an A2 horizon that is poorly differentiated from the A1; and a B2 horizon showing uniform color, weak blocky structure, and little evidence, or only traces, of silicate clay accumulation. Soils of this great soil group formed under forest in a humid, temperate climate. In Columbiana County the only soils that are representative of the central concept of this group are the well-drained Dekalb soils, which occupy about 28 percent of the total acreage.

The Muskingum soils are Sols Bruns Acides that have some characteristics of Lithosols and are considered intergrades. They intergrade toward Lithosols because they are only moderately deep and have weak horizonation.

Red-Yellow Podzolic soils

Red-Yellow Podzolic soils have a thin surface layer of litter and acid humus; a thin organic-mineral A1 horizon; a thicker, light-colored, leached A2 horizon; a thick, red, yellowish-red, or yellowish-brown B horizon that shows some accumulation of clay and sesquioxides; and a relatively sandy C horizon. These soils formed under deciduous, coniferous, or mixed forest in a humid, warm-temperature climate. Soils representing the central concept of this group are the Allegheny and Laidig soils.

between parent material, great soil groups, and drainage

Planosols		Low-Humic Gley soils	Humic Gley soils	Alluvial soils				Lithosols	Bog (organic) soils
Somewhat poorly drained	Poorly drained	Poorly drained	Very poorly drained	Well drained	Moderately well drained	Somewhat poorly drained	Poorly drained	Well drained	Very poorly drained
								Weikert [3]	
		French-town.	Marengo						
		French-town.	Marengo						
		Damascus	Olmsted						
		Sebring	Luray						
			Lorain						
Tyler	Purdy		Chilo						
		Wayland	Papakating.	Chagrin	Lobdell	Orrville			
									Carlisle.
									Willette.
									Kerston.

[4] Wharton and Monongahela soils are Red-Yellow Podzolic soils that intergrade toward Gray-Brown Podzolic soils.
[5] Cavode soils are Red-Yellow Podzolic soils that intergrade toward Planosols.
[6] Guernsey silty clay loams, thin solum variants, are well drained.

The Monongahela and Wharton soils are Red-Yellow Podzolic soils that intergrade toward Gray-Brown Podzolic soils. They are not so acid or so strongly weathered as typical Red-Yellow Podzolic soils. They have an A1, A2, B2t, C sequence of horizons, though the A2 horizon may be destroyed by tillage in cultivated areas.

The Cavode soils are intergrades toward Planosols. They have many characteristics that are typical of Red-Yellow Podzolic soils, but their B horizon has a much higher content of clay than their A horizon. This strongly contrasting B horizon is typical of Planosols.

Gray-Brown Podzolic soils

Gray-Brown Podzolic soils formed under deciduous forest in a humid, temperate climate. In undisturbed areas they have an A1, A2, B2, C sequence of horizons. In cultivated areas the A1 and A2 horizons are mixed and an Ap horizon is formed. The B2 horizon is one of clay accumulation and contains more clay than the A1 and A2 horizons. Base saturation is 35 percent or more in the B horizon and increases with depth. Soils of the Bogart, Canfield, Chili, Conotton, Fitchville, Glenford, Gresham, Hanover, Jimtown, Loudonville, Negley, Parke, Rainsboro, Ravenna, Rittman, Summitville, Titusville, Upshur.

Wadsworth, and Wooster series represent the central concept of this great soil group.

The Gray-Brown Podzolic soils that intergrade toward the Red-Yellow Podzolic soils are the Ernest, Guernsey, and Wellston soils. They have the same sequence of horizons as typical Gray-Brown Podzolic soils, but they are more acid, have fewer weatherable primary minerals, and have lower base saturation. However, they are not so acid or so strongly weathered as Red-Yellow Podzolic soils.

Planosols

Planosols have an eluviated surface horizon underlain by a B horizon that is more strongly illuviated, compacted, or cemented than the B horizon of associated normal soils. The Tyler and Purdy soils are representative of this great soil group.

Low-Humic Gley soils

Low-Humic Gley soils are saturated with water seasonally and have characteristics associated with wetness. They are poorly drained soils having a thin, dark-colored surface horizon that is less than 6 inches thick and is moderately high in content of organic matter. In Columbiana County these soils have an eluviated A horizon over a mottled, gleylike B horizon that contains more clay and is more strongly developed than the A horizon. Base saturation in the B horizon is more than 35 percent and increases with depth. The Low-Humic Gley soils of this county are the Damascus, Frenchtown, Sebring, and Wayland soils. They account for only about 1 percent of the county.

Humic Gley soils

Humic Gley soils are poorly or very poorly drained. They have a thick, black A horizon, high in content of organic matter, over a gray or mottled B or C horizon. These soils formed under marsh plants or swamp forest in a subhumid, cool-temperate to warm-temperate climate. The soils of the Chilo, Lorain, Luray, Marengo, Olmsted, and Papakating series are the Humic Gley soils in Columbiana County. They occupy only about 2 percent of the total acreage.

Alluvial soils

Alluvial soils formed in transported material of relatively recent deposition. They are characterized by weak or no modification of the original material by soil-forming processes. These soils lie on bottom land where flooding is frequent and fresh material is periodically deposited. In Columbiana County they are medium textured and usually moist; they make up about 7 percent of the total area. Soils of the Chagrin, Lobdell, and Orrville series are the Alluvial soils in this county.

Lithosols

Lithosols are characterized by little or no horizon development. They are generally shallow to underlying consolidated material and, in many places, overlie freshly or imperfectly weathered masses of rock and rock fragments that commonly occur on steep slopes.

Strictly speaking, there are no Lithosols in Columbiana County. The Weikert soils are classified as Lithosols but have some characteristics of Sols Bruns Acides. They have a skeletal B horizon that shows some development and accumulation of clay in some places, but in other respects they are similar to Lithosols.

Bog (organic) soils

Bog soils consist of brown, dark-brown, or black 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, mostly in a humid or subhumid climate. The Carlisle, Kerston, and Willette soils are the Bog soils in this county.

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 CO plus a characterization number (example, CO-39). The symbol is listed in the paragraph just before the profile description and in table 11 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 (*16*), 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.

Allegheny series

The Allegheny series consists of well-drained soils that developed from medium-textured alluvium on high-level terraces and benches in the unglaciated area of the county. Associates in the same drainage sequence are the moderately well drained Monongahela soils, the somewhat poorly drained Tyler soils, the poorly drained Purdy soils, and the very poorly drained Chilo soils.

Representative profile of an Allegheny silt loam on a high terrace (St. Clair Township, NW. corner of SE¼SE¼ sec. 8, T. 6 N., R. 1 W.):

Ap—0 to 8 inches, brown (10YR 4/3) silt loam; weak, fine, granular structure; friable; strongly acid; abrupt, smooth boundary.

B1—8 to 14 inches, dark-brown (10YR 4/4) silt loam; weak, medium, subangular blocky structure; friable; plentiful roots; few fine pores; 2 percent channery fragments of sandstone; very strongly acid; gradual, smooth boundary.

B21t—14 to 24 inches, dark-brown (7.5YR 4/4) gritty silt loam; weak, medium, subangular blocky structure; friable; common roots; few fine pores; 2 percent channery fragments of sandstone; few, patchy, thin clay films; strongly acid; abrupt, smooth boundary.

IIB22t—24 to 41 inches, dark-brown (7.5YR 4/4) sandy clay loam; weak, medium, subangular blocky structure; friable; 15 percent channery fragments of sandstone; strongly acid; clear, smooth boundary.

IIC—41 to 60 inches +, dark-brown (7.5YR 4/4) sandy loam; weak, coarse, subangular blocky structure; friable; a few thin clay films on vertical surfaces and sand grains; 25 percent coarse fragments, mostly sandstone; strongly acid.

The A horizon ranges from black in undisturbed areas to dark grayish brown or brown in cultivated areas. The B horizon is strong brown or dark brown and ranges from loam to silty clay loam. Some areas of the Allegheny soils are underlain by weathered limestone at a depth of 24 to 42 inches.

Representative profile of an Allegheny silt loam in pasture on a high bench (CO–39; St. Clair Township, SE¼NE¼ sec. 26, T. 6 N., R. 1 W.):

A1—0 to 1½ inches, black (5YR 2/1) silt loam; moderate, fine, granular structure; friable; 2 percent pebbles from local rocks; strongly acid; abrupt, smooth boundary.

A2—1½ to 7 inches, brown (10YR 4/3) silt loam; moderate, thin, platy structure breaking to weak, fine, granular; friable; 2 percent pebbles; very strongly acid; abrupt, smooth boundary.

B1—7 to 13 inches, strong-brown (7.5YR 4/6) silt loam; weak, medium, angular blocky structure ranging to moderate, fine, angular blocky structure in lower part; very thin, discontinuous, dark yellowish-brown (10YR 4/4) clay films on ped faces; friable; 3 percent pebbles; extremely acid; abrupt, smooth boundary.

B21t—13 to 30 inches, strong-brown (7.5YR 4/6) fine silt loam; moderate to strong, medium, angular blocky structure; very thin, dark yellowish-brown (10YR 4/4) clay films on ped faces; friable; 5 percent pebbles; extremely acid; abrupt, smooth boundary.

B22t—30 to 43 inches, yellowish-brown (10YR 5/6) loam to clay loam with many, coarse, black manganese stains and common, medium, faint mottles of light brownish gray (10YR 6/2); strong, coarse, angular blocky structure; very thin, yellowish-brown (10YR 5/4) clay films on ped faces; very firm; black, manganese-stained, rotted channery fragments and 10 percent pebbles; very strongly acid; abrupt, smooth boundary; at lower boundary of this horizon, there is a dark-brown (7.5YR 3/4) sandy layer containing flat angular fragments of iron-cemented sand.

B23t—43 to 52 inches, yellowish-brown (10YR 5/4) silt loam with thin layers of silty clay and sandy loam; strong, coarse, angular blocky structure; peds break along horizontal laminae; light brownish-gray (10YR 6/2) and black, manganese-stained clay films 2 millimeters thick on ped faces; firm; 5 percent pebbles; very strongly acid; abrupt, smooth boundary.

B24t—52 to 68 inches, strong-brown (7.5YR 5/6) loam with irregular layers of yellowish-red (5YR 5/8) sandy clay loam and black manganese stains; strong, coarse, angular blocky structure; vertical pale-brown (10YR 6/3) and horizontal yellowish-brown (10YR 5/4) clay films 2 millimeters thick on ped faces; firm; 1 percent pebbles; very strongly acid; abrupt, smooth boundary.

B3t—68 to 80 inches, yellowish-red (5YR 5/8), 3-millimeters-thick laminae of silt loam, silty clay, and fine sandy loam and a thick layer of yellowish-brown (10YR 5/4) loam; strong, coarse, angular blocky structure grading to strong, medium, subangular blocky in lower part; 3-millimeters-thick, gray (10YR 6/1) clay films on faces of coarse peds and very thin, brown (7.5YR 5/4) clay films on faces of small peds; very firm; 5 percent pebbles; very strongly acid; abrupt, broken boundary; (this horizon is lower part of the water-laid material; all pebbles in profile are weathered).

IIR—80 to 84 inches, grayish-brown (10YR 5/2) channery fragments of siltstone coated by very thin, gray (10YR 6/1) clay and black manganese stains; underlain by siltstone bedrock.

This soil on high benches is similar in morphology to the Allegheny silt loam on lower terraces. Between the depths of 52 and 80 inches, however, it has yellowish-red colors and contains fragments of plinthite. In cultivated areas the A horizon generally is brown. In some places the B horizon is brown, and in places it is silty clay loam.

Bogart series

The Bogart series consists of moderately well drained soils that developed from glacial outwash on terraces. Associates in the same drainage sequence are the well-drained Chili soils, the somewhat poorly drained Jimtown soils, the poorly drained Damascus soils, and the very poorly drained Olmsted soils. The Bogart soils are similar to the Glenford soils, which developed from lacustrine material.

Representative profile of a Bogart loam in pasture (Perry Township, NW¼NE¼ sec. 35, T. 17 N., R. 4 W.)

A1—0 to 2 inches, very dark brown (10YR 2/2) loam; weak, fine, granular structure; very friable; 1 percent pebbles; abrupt, smooth boundary.

A21—2 to 8 inches, dark-brown (10YR 4/3) loam; weak, medium and fine, granular structure; friable; 5 percent pebbles; strongly acid; abrupt, smooth boundary.

A22—8 to 10 inches, brown (10YR 5/3) loam; weak, medium and thin, platy structure; friable; few roots; 5 percent pebbles; strongly acid; abrupt, smooth boundary.

B1—10 to 16 inches, yellowish-brown (10YR 5/4) loam; moderate, medium and fine, subangular blocky structure; a few, patchy, brown (10YR 5/3) and reddish-brown (5YR 4/4) clay films; friable; plentiful roots; 10 percent pebbles; strongly acid; abrupt, wavy boundary.

B21t—16 to 26 inches, dark-brown (7.5YR 4/3) gravelly sandy clay loam with common, coarse, prominent mottles of gray (10YR 5/1); weak, coarse, angular blocky structure; thin, dark-brown (10YR 4/3) clay films on ped faces and reddish-brown (5YR 4/4) clay films in pores and as bridges between sand grains; friable when disturbed but firm in place; few roots; 20 percent pebbles; strongly acid; gradual boundary.

B22t—26 to 42 inches, dark-brown (7.5YR 4/3) gravelly fine sandy loam with many, coarse, gray (10YR 5/1) mottles; more friable than the B21t horizon but otherwise with the same morphology; clear, wavy boundary.

B3—42 to 47 inches, brown (10YR 4/3) sandy loam; single grain; very friable; 5 percent pebbles; strongly acid to medium acid; gradual boundary.

C—47 to 70 inches +, dark grayish-brown (10YR 4/2) loam, silt loam, and loamy sand in layers; single grain; loose to very friable; 2 percent pebbles; neutral.

The A horizon generally is silt loam or loam but is gravelly loam in some areas. In places the B horizon ranges from silt loam to sandy loam. The depth to gray mottling ranges from 14 to 23 inches. The solum is 3 to 4 feet thick over outwash.

Canfield series

The Canfield series consists of moderately well drained soils that developed from slightly limy loam till. Associates in the same drainage sequence are the well-drained Wooster soils, the somewhat poorly drained Ravenna soils, the poorly drained Frenchtown soils, and the very poorly drained Marengo soils. The Canfield soils have a coarser textured solum than the Rittman soils, which developed from clay loam till.

Representative profile of a Canfield silt loam in a cultivated field (CO-67; Fairfield Township, SW¼NE¼ sec. 22, T. 12 N., R. 2 W):

Ap—0 to 7 inches, dark-brown (10YR 3/3) silt loam; moderate, fine, granular structure; friable; abundant roots; 7 percent pebbles; neutral; abrupt, smooth boundary.

B1t—7 to 14 inches, dark yellowish-brown (10YR 4/4) loam; weak, fine, subangular blocky structure; very thin clay films on ped faces, which are pitted and degraded; friable; plentiful roots; many medium pores; 10 percent pebbles; strongly acid; abrupt, wavy boundary.

B21t—14 to 19 inches, yellowish-brown (10YR 5/4) loam with many, coarse, distinct variegations of dark brown (7.5YR 3/3); weak, coarse, subangular blocky structure; brown (10YR 5/3) clay films on ped faces; friable when disturbed but slightly firm in place; plentiful roots; many fine pores; 25 percent pebbles; very strongly acid; abrupt, wavy boundary.

Bx1—19 to 30 inches, yellowish-brown (10YR 5/4) loam; many, coarse, distinct, dark-brown (7.5YR 3/3) variegations and black manganese stains in upper part; distinct gray (N 6/0) mottles in lower part; strong fragipan with weak, medium, angular blocky structure; yellowish-brown (10YR 5/4) degraded clay films on ped faces; firm; a few roots; many fine to medium pores; 30 percent pebbles; very strongly acid; gradual, wavy boundary.

Bx2—30 to 38 inches, dark-brown (7.5YR 4/4) heavy sandy loam with many, coarse, distinct mottles of light gray to gray (N 6/0) and brown (10YR 5/3); moderate fragipan with weak, coarse, angular blocky structure; brown to dark-brown (10YR 4/3) clay films on ped faces and in pores; few roots; many fine pores; 25 percent pebbles; very strongly acid; gradual, wavy boundary.

C1—38 to 47 inches, brown (10YR 4/3) loam with common, coarse, faint mottles of gray (10YR 6/1); weak, very coarse, angular blocky structure; dark-brown (7.5YR 4/3) films on ped faces; friable; no roots; many fine pores with clay films; 30 percent pebbles; strongly acid; clear, wavy boundary.

C2—47 to 70 inches +, brown (10YR 4/3) loam with very thin, dark grayish-brown (10YR 4/2) clay films; massive; firm in position, friable when disturbed; common fine pores; 25 percent pebbles; strongly acid in upper part ranging to alkaline below a depth of 70 inches.

The A horizon is silt loam or loam and ranges from brown to very dark grayish brown in color. The B horizon ranges from loam to light clay loam and from dark brown to yellowish brown. The fragipan is 10 to 35 inches thick. Depth of leaching ranges from 30 to 100 inches. Bedrock is generally more than 10 feet below the surface.

Carlisle series

In the Carlisle series are deep, very poorly drained organic soils that formed from decomposed woody, grassy, and sedgy material. The organic material of the Carlisle soils is more than 42 inches thick, whereas that of the Willette soils is 12 to 42 inches thick. In Carlisle soils the organic material does not occur in alternate layers with silty material, as it does in Kerston soils.

Representative profile of Carlisle muck in a cultivated field (Knox Township, NW¼ sec. 11, T. 17 N., R. 5 W.):

1—0 to 10 inches, black (10YR 2/1) muck; strong, medium and fine, granular structure; friable; slightly acid; abrupt, smooth boundary.

2—10 to 22 inches, black (5YR 2/1) muck; massive; somewhat firm; abundant roots; medium acid.

3—22 to 32 inches, very dark gray (5YR 3/1) organic material; massive; friable or very friable; no roots; medium acid.

4—32 to 66 inches, dark-brown (7.5YR 3/2) partly decomposed wood and moss material; massive; friable or very friable; medium acid in upper part, ranging to neutral at depth of 38 inches and below.

In some places the surface layer contains a small amount of mineral material. The subsurface layers range from black to very dark grayish brown and from medium acid to neutral. The thickness of the combined organic layers is more than 42 inches.

Cavode series

The Cavode series consists of somewhat poorly drained soils that have a moderately fine textured solum and overlie black carbonaceous shale. Associates in the same drainage sequence are the moderately well drained Wharton soils.

Representative profile of a Cavode silt loam in a cultivated field (Madison Township, SE¼SE¼ sec. 13, T. 10 N., R. 2 W.):

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) silt loam with a few, fine, distinct mottles of reddish brown (5YR 4/4); moderate, very fine, granular structure; friable; strongly acid; abrupt, smooth boundary.

A2—9 to 11 inches, dark grayish-brown (10YR 4/2) silt loam with many, coarse, faint mottles of grayish brown (10YR 5/2) and dark brown (7.5YR 3/3); weak, medium, angular blocky structure; friable; abundant roots; strongly acid; abrupt, smooth boundary.

B1g—11 to 14 inches, coarsely mottled grayish-brown (10YR 5/2) and brown (10YR 4/3) silt loam; weak, medium, angular blocky structure; firm; abundant roots; 10 percent hard, dark-brown and black concretions; very strongly acid; abrupt, smooth boundary.

B21tg—14 to 17 inches, mottled grayish-brown (10YR 5/2) and dark yellowish-brown (10YR 4/4) fine silt loam with many black manganese stains and hard concretions; moderate, medium to fine, subangular blocky structure; very thin, gray (10YR 5/1) clay films on ped faces; firm; plentiful roots; very strongly acid; abrupt, smooth boundary.

B22tg—17 to 40 inches, mottled gray (10YR 5/1) and strong-brown (7.5YR 5/6) silty clay loam with many black manganese stains; moderate, very coarse, prismatic structure breaking to strong, coarse to fine, angular blocky; gray (N 5/0) clay films 4 to 8 millimeters thick on ped faces; firm or very firm in lower part; few roots; 3 percent small fragments of black shale; very strongly acid; gradual boundary.

B3g—40 to 60 inches, mottled gray (N 5/0) and strong-brown (7.5YR 4/6) silty clay loam; moderate, very coarse, angular blocky structure; thick, gray (N 5/0) films on ped faces; very firm; 20 percent fragments of black shale in lower part; strongly acid in upper part and ranges to medium acid in lower part; clear, smooth boundary.

R—60 inches +, bedrock consisting of black clay shale; neutral in field, medium acid when tested in laboratory.

The Ap horizon is dark grayish brown or dark brown. In some places the B horizon is silty clay loam or silty clay. The solum of Cavode soils in this county is 4 to 6 feet thick over bedrock and is thicker than that considered typical for the series.

Chagrin series

The Chagrin series consists of well-drained soils that formed in alluvium washed from acid glacial till and the underlying sandstone, siltstone, and shale materials.

These soils are silt loam or loam and medium acid or slightly acid throughout. In the same drainage sequence are the moderately well drained Lobdell soils, the somewhat poorly drained Orrville soils, the poorly drained Wayland soils, and the very poorly drained Papakating soils.

Representative profile of Chagrin silt loam in a weedy area (St. Clair Township, NE¼ sec. 5, T. 6 N., R. 1 W.):

Ap—0 to 12 inches, dark yellowish-brown (10YR 3/4) silt loam; moderate, fine, granular structure; friable; medium acid; abrupt, smooth boundary.

C1—12 to 20 inches, dark-brown (7.5YR 4/4) silt loam; weak structure or structureless; friable; plentiful roots; medium acid; gradual, smooth boundary.

C2—20 to 27 inches, dark-brown (7.5YR 4/4) silt loam; weak structure or structureless; friable; plentiful roots; slightly acid; gradual, smooth boundary.

C3—27 to 35 inches, dark-brown (7.5YR 4/4) silt loam; weak structure or structureless; slightly firm; neutral.

The Ap horizon ranges from dark yellowish brown to dark grayish brown. The C horizon is silt loam or loam and ranges from dark brown to dark yellowish brown. An occasional layer of sandy loam occurs in the profile. The soil is medium acid or slightly acid to a depth of about 30 inches.

The definition of the Chagrin series is being studied over a general area larger than this county. As a result of the study, the name Chagrin may not be retained for soils having the characteristics just described.

Chili series

The Chili series consists of well-drained soils that developed from sandy and gravelly glacial outwash. Associates in the same drainage sequence are the thin, well drained Conotton soils, the moderately well drained Bogart soils, the somewhat poorly drained Jimtown soils, the poorly drained Damascus soils, and the very poorly drained Olmsted soils. The Chili soils have a finer textured solum than the Conotton soils.

Representative profile of a Chili gravelly loam in a weedy area (CO-42; Elk Run Township, SE¼NE¼ sec. 20, T. 11 N., R. 2 W.):

Ap—0 to 8 inches, dark-brown (10YR 3/4) gravelly loam; weak, fine, granular structure; friable; 25 percent gravel; very strongly acid; clear, smooth boundary.

B1—8 to 18 inches, brown (7.5YR 4/4) gravelly sandy loam; weak, medium, subangular blocky structure; very friable; 60 percent gravel; very strongly acid; clear, wavy boundary.

B2t—18 to 45 inches, dark-brown (7.5YR 4/4) fine gravelly sandy clay loam or sandy loam; weak, medium, angular blocky structure; very friable; clay films, which are slightly darker than matrix, cover 75 percent of surface of sand grains and pebbles; strongly acid; gradual boundary.

C1—45 to 53 inches, dark-brown (7.5YR 4/4) gravelly sandy loam; massive; very friable to noncoherent; 75 percent gravel; some pebbles coated by clay; medium acid; clear, smooth boundary.

C2—53 to 120 inches, brown (10YR 4/3) sand and gravel; single grain (structureless); noncoherent; 60 percent gravel; mildly alkaline; weak effervescence at depth of 70 inches, 6.9 percent CaC03 equivalent; sand and gravel more than 20 feet deep. (Pebble count at 120 inches: 1,055 pieces. These were 41 percent sandstone, 17 percent limestone, 12 percent quartzite, 9 percent chert, 9 percent granite, 8 percent concretions, and 4 percent quartz.)

The A horizon is silt loam, loam, or gravelly loam and ranges from dark brown to yellowish brown. The B horizon is dark grayish brown, dark brown, brown, strong brown, or reddish brown. The B2t horizon is light clay loam, sandy clay loam, or fine loam and has a gravel content ranging from 20 to 50 percent. In thickness the solum ranges from 30 to 48 inches. The depth to calcareous material is 60 to more than 100 inches.

Chilo series

The Chilo series consists of very poorly drained soils on nonglacial terraces. These soils developed in silty alluvium that washed from soils formed in residuum from local sandstone, siltstone, and shale. Generally, the alluvium is saturated by seepage that likely has passed slowly through calcareous material. The A horizon of Chilo soils is thick and dark colored, and the main part of the subsoil is gleyed. In the same drainage sequence are the well drained Allegheny soils, the moderately well drained Monongahela soils, the somewhat poorly drained Tyler soils, and the poorly drained Purdy soils.

Representative profile of Chilo silty clay loam in a cultivated field (St. Clair Township, NW¼ sec. 7, T. 6 N., R. 1 W.):

Ap—0 to 8 inches, very dark brown (10YR 2/2) silty clay loam; strong, medium, angular blocky structure breaking to moderate, fine, granular peds; firm when moist, slightly sticky when wet, very hard when dry; abundant roots; no pebbles; medium acid; abrupt, smooth boundary.

A12—8 to 12 inches, very dark gray (10YR 3/1) silty clay loam with common, coarse, faint mottles of dark grayish brown (10YR 4/2); strong, medium, angular blocky structure; very thin, dark-gray (10YR 3/1) clay films on ped faces; firm; plentiful roots; no pebbles; strongly acid; clear, smooth boundary.

B21tg—12 to 17 inches, dark-gray (10YR 4/1) silty clay loam with many, fine, distinct mottles of strong brown (7.5YR 5/6) and black (10YR 2/1); strong, medium, angular blocky structure; very thin, mottled brown (10YR 5/3), black (10YR 2/1), and dark-gray (10YR 4/1) clay films on ped faces; firm; plentiful roots; few fine pores; no pebbles; strongly acid; abrupt, smooth boundary.

B22tg—17 to 30 inches, gray (10YR 5/1) coarse silty clay loam with many, medium, distinct mottles of yellowish brown (10YR 5/8); weak, coarse, angular blocky structure; gray (10YR 5/1) clay films 1 millimeter thick on ped faces; firm; no roots; many medium peds; many iron and manganese concretions; no pebbles; strongly acid; abrupt, smooth boundary.

B23tg—30 to 34 inches, yellowish-brown (10YR 5/6) silt loam with common, fine, distinct mottles of strong brown (7.5YR 5/8) and gray (10YR 6/1); weak, coarse, angular blocky structure breaking to weak, medium, angular blocky; gray (10YR 6/1) films of silty clay loam, 1 millimeter thick, on ped faces; friable; no roots; no pebbles; strongly acid; abrupt, smooth boundary.

B3—34 to 38 inches, brown (10YR 5/3) gravelly loam with many, medium, distinct mottles of strong brown (7.5YR 5/6); strong, medium, angular blocky structure; firm; 50 percent of pebbles coated with manganese stain and rotted so that they crush in fingers; strongly acid.

C—38 to 50 inches +, weakly stratified layers, dominantly loam, gravelly loam, and silt loam; color is variable but mostly grayish brown (10YR 5/2) and brown (10YR 5/3); massive; strongly acid in upper part and grades to medium acid with depth.

The Ap horizon ranges from very dark brown to black. The B horizon generally ranges from silty clay loam to loam but has thin layers of silty clay. The solum is 4 to 15 feet thick and is strongly acid or medium acid.

The profile described as representative of Chilo soils in Columbiana County is more acid than is characteristic for the series. If further study results in a narrowing of the allowable variations in reaction, the soils now mapped as Chilo in this county might be excluded from the series.

Conotton series

The Conotton series consists of shallow, well-drained soils that developed from gravelly glacial outwash. Associated with them in the same drainage sequence are the well-drained, finer textured Chili soils.

Representative profile of a Conotton gravelly loam in a forested area (Elk Run Township, SE¼ sec. 20, T. 11 N., R. 2 W.):

A1—0 to 5 inches, black (10YR 2/1) gravelly loam; weak, fine, granular structure; very friable; 50 percent fine gravel; strongly acid; abrupt, smooth boundary.

B2t—5 to 13 inches, dark-brown (10YR 3/3) fine gravelly sandy loam; weak, medium, subangular blocky structure; very friable; patchy, brown (7.5YR 4/4) clay coatings on pebbles and bridging between sand grains; plentiful roots; 70 percent fine gravel; strongly acid; gradual boundary.

B3—13 to 30 inches, dark-brown (10YR 3/3) gravelly sandy loam; massive; loose; plentiful roots; 70 percent fine gravel; strongly acid; clear, wavy boundary.

C—30 inches +, brown (10YR 4/3) gravelly loamy sand; single grain (structureless); loose; no roots; 70 percent fine gravel; slightly acid in upper part, ranging to alkaline at a depth of 60 to 120 inches.

The B horizon is gravelly loam or gravelly sandy loam; it is dark brown or reddish brown and has a hue of 5YR to 10YR.

Damascus series

The Damascus series is made up of poorly drained soils that developed on glacial outwash terraces. Associates in the same drainage sequence are the well drained Chili soils, the moderately well drained Bogart soils, the somewhat poorly drained Jimtown soils, and the very poorly drained Olmsted soils. The Damascus soils developed from coarser textured material than the Sebring soils. They are similar to the Frenchtown soils but are more gravelly and lack a fragipan.

Representative profile of Damascus silt loam in a cultivated field (Fairfield Township, NE¼ sec. 11, T. 12 N., R 2 W.):

Apg—0 to 8 inches, dark grayish-brown (2.5Y 4/2) silt loam with common, fine, distinct mottles of light brownish gray (2.5Y 6/2) and reddish brown (5YR 4/3); moderate, medium, granular structure; friable; 12 percent pebbles; medium acid; abrupt, smooth boundary.

B1g—8 to 12 inches, grayish-brown (2.5Y 5/2) loam with many, fine, distinct mottles of yellowish brown (10YR 5/6); moderate, fine, subangular blocky structure; thick, light-gray (10YR 7/1) loamy films on ped faces; friable; plentiful roots; 12 percent pebbles; strongly acid to medium acid; abrupt, wavy boundary.

B21tg—12 to 15 inches, grayish-brown (2.5Y 5/2) fine loam with many, medium, prominent mottles of strong brown (7.5YR 5/6); weak, very coarse, platy structure breaking to weak, medium, subangular blocky; thin, degraded, gray (10YR 6/1) and dark grayish-brown (10YR 4/2) clay films on ped faces and in pores; friable; plentiful roots; 12 percent pebbles; few concretions of iron and manganese; strongly acid; gradual boundary.

B22tg—15 to 17 inches, mottled brown (7.5YR 3/4) and gray (N 5/0) coarse clay loam with many iron and manganese concretions; moderate, fine, angular and subangular blocky structure; thick, degraded, grayish-brown (2.5Y 5/2) clay films on ped faces; friable; plentiful roots; 5 percent pebbles; strongly acid; abrupt, smooth boundary.

B23tg—17 to 22 inches, mottled grayish-brown (2.5Y 5/2) and strong-brown (7.5YR 5/6) fine loam; very weak, fine, angular blocky structure; thick, patchy, dark grayish-brown (2.5Y 4/2) clay films; friable; few roots; 10 percent pebbles; medium acid; abrupt, wavy boundary.

B24tg—22 to 26 inches, yellowish-brown (10YR 5/6) gravelly fine loam with many, coarse, gray (10YR 5/1) mottles; weak, medium, subangular blocky structure; patchy, gray clay films 1 to 10 millimeters thick; friable; no roots; 15 percent pebbles; medium acid; abrupt, smooth boundary.

B25tg—26 to 33 inches, mottled strong-brown (7.5YR 5/6) and brown (7.5YR 5/2) gravelly sandy clay loam to sandy loam; weak, medium, subangular blocky structure; gray (N 5/0) patchy clay films 1 millimeter thick; friable; 40 percent pebbles; slightly acid; gradual, smooth boundary.

B3g—33 to 45 inches, gray (10YR 5/1) gravelly loam to sandy loam; massive; very friable; 55 percent pebbles; neutral.

Cg—45 to 75 inches +, dark grayish-brown (10YR 4/2) gravelly sandy loam; massive; loose; 70 percent pebbles; mildly alkaline.

Texture in the B horizon generally ranges from silt loam to sandy loam but, in places, is clay loam. In some places, at a depth of 15 to 20 inches, there is a horizon weakly cemented by iron. The outwash ranges from 30 to 100 inches in thickness and overlies lacustrine material or layers of till.

Dekalb series

The Dekalb series consists of well-drained soils on uplands. These soils developed in material weathered from bedrock, mainly coarse-textured, weakly bonded sandstone. They are channery loam to channery sandy loam throughout. The Dekalb soils are more sandy and less silty than the Muskingum and Weikert soils.

Representative profile of a Dekalb loam in a forested area (CO–72; Madison Township, center of sec. 2, T. 10 N., R. 2 W.):

A11—0 to ¼ inch, very dark brown (10YR 2/2) loam mixed in a mat of roots; weak, fine, granular structure; very friable; 10 percent channery fragments of sandstone; extremely acid; abrupt, smooth boundary.

A12—¼ inch to 1½ inches, dark grayish-brown (10YR 4/2) coarse loam; weak, fine, granular structure; friable; 10 percent channery fragments of sandstone; extremely acid; abrupt, smooth boundary.

B1—1½ to 8 inches, yellowish-brown (10YR 5/4) coarse loam with dark-brown (10YR 4/3) stains; weak, fine, granular structure; friable; abundant roots; 10 percent channery fragments of sandstone; extremely acid; gradual, smooth boundary.

B21—8 to 14 inches, yellowish-brown (10YR 5/4) channery loam; weak, medium, subangular blocky structure; friable but more nearly firm than B1 horizon; plentiful roots; many medium pores; 15 percent channery fragments of sandstone; extremely acid; clear, smooth boundary.

B22—14 to 19 inches, yellowish-brown (10YR 5/4) channery loam; weak, fine, subangular blocky structure; friable but more nearly firm than B21 horizon; plentiful roots; many medium pores; 25 percent channery fragments of sandstone that are easily crushed; extremely acid; gradual, smooth boundary.

C1—19 to 29 inches, yellowish-brown (10YR 5/4) channery sandy loam with black manganese stains on faces of sandstone fragments; massive; friable; few roots; 60 percent channery fragments of sandstone that are easily crushed; strongly acid; gradual, smooth boundary.

R—29 to 40 inches, yellowish-brown (10YR 5/6); oxidized, soft quartzitic sandstone; cementing material has been removed by chemical weathering; very strongly acid.

In some areas the A horizon is sandy loam or stony loam. Forested areas have an A1 horizon ranging from black to very dark grayish brown or dark grayish brown in color and from 1 to 5 inches in thickness. In cultivated areas the Ap horizon is brown to dark brown. The B horizon is 8 to 30 inches thick and, in some places, occurs directly over layers of weathered, weakly bonded sandstone. In places the B horizon is sandy loam. The depth to bedrock ranges from 24 to 36 inches.

Ernest series

The Ernest series consists of moderately well drained soils that developed in thick colluvium derived from siltstone, sandstone, and shale. Associates in the same drainage sequence are the well-drained Laidig soils. The Ernest soils developed in colluvial material, whereas the Monongahela soils developed in alluvium on terraces. Ernest soils occur closely with the shallow Weikert and Muskingum soils, which developed in material weathered from siltstone.

Representative profile of an Ernest silt loam in a brushy area (Yellow Creek Township, NW¼ sec. 10, T. 9 N., R. 2 W.):

A1—0 to 1 inch, very dark brown (10YR 2/2) silt loam; weak, fine, granular structure; friable; 5 percent channery fragments; very strongly acid; abrupt, smooth boundary.

A2—1 to 9 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, fine, granular structure; friable; abundant roots; 5 percent channery fragments; very strongly acid; abrupt, smooth boundary.

B1—9 to 11 inches, yellowish-brown (10YR 5/4) silt loam; moderate, fine, angular blocky structure; friable to firm; plentiful roots; 5 percent channery fragments; very strongly acid; abrupt, smooth boundary.

B21t—11 to 16 inches, yellowish-brown (10YR 5/4) to light olive-brown (2.5Y 5/4) coarse silty clay loam; moderate, fine, subangular blocky structure; thin, dark grayish-brown (10YR 4/2) clay films on ped faces; friable to firm; plentiful roots; many fine and medium pores; 25 percent channery fragments; very strongly acid; abrupt, smooth boundary.

B22t—16 to 23 inches, brown (10YR 5/3) coarse silty clay loam with many, fine, faint mottles of reddish brown (5YR 4/4); moderate, fine, subangular blocky structure; thin clay films on ped faces; firm; plentiful roots; few fine pores; 20 percent channery fragments; very strongly acid; abrupt, smooth boundary.

Bx1—23 to 34 inches, finely mottled strong-brown (7.5YR 5/6) and gray (10YR 5/1) silty clay loam; fragipan with strong, medium, angular blocky structure breaking to strong, fine, angular blocky; gray (N 5/0) clay 1 millimeter thick on faces of fine peds; few fine roots; few fine pores; 20 percent channery fragments and fine pebbles; strongly acid; horizon is in the lower part of poorly sorted alluvium and colluvium; clear, smooth boundary.

Bx2—34 to 48 inches, dark-brown (7.5YR 4/4) silty clay with many, medium, distinct mottles of gray (N 5/0); strong, coarse, angular blocky structure breaking to strong, fine, angular blocky; gray clay 3 millimeters thick on ped faces; firm or very firm; very few pores; 5 percent pebbles; strongly acid; horizon is in the upper part of alluvium that is poorly sorted; clear, smooth boundary.

C1—48 to 62 inches, dark-brown (7.5YR 4/4) silty clay loam with many, coarse, distinct mottles of gray (10YR 5/1) and common vertical seams of gray (10YR 5/1), up to 9 inches thick; weak, very coarse, prismatic structure breaking to moderate, fine, angular blocky; gray clay 2 millimeters thick on ped faces; firm; few roots on vertical faces; many fine pores; medium acid; horizon is in the lower part of alluvium; abrupt, smooth boundary.

C2—62 to 108 inches, large, irregular masses of olive-brown (2.5Y 4/4) channery silty clay loam and dark reddish-gray (5YR 4/2) silty clay; vertical seams of gray (N 5/0) clay, 1 millimeter thick, with fossil roots; massive; 20 percent flat fragments of siltstone and very small pebbles of local rocks; pH 6.8 (neutral).

The A horizon ranges from very dark grayish brown to yellowish brown In places the B horizon ranges from light olive brown to brown. The fragipan is 5 to 25 inches thick. The solum ranges from very strongly acid to medium acid.

The soil described as representative developed in colluvium that overlies alluvium at a depth of 24 to 62 inches. These materials were deposited in this sequence in areas along benches and terraces and on the side slopes of valleys.

Fitchville series

In the Fitchville series are somewhat poorly drained soils that developed on terraces from medium-textured lacustrine material. Associates in the same drainage sequence are the moderately well drained Glenford soils, the poorly drained Sebring soils, and the poorly drained, dark-colored Luray soils. The Fitchville soils developed from finer textured material than the Jimtown soils.

Representative profile of a Fitchville silt loam in a brushy area (Yellow Creek Township, near center of NW¼ sec. 10, T. 9 N., R. 2 W.):

A1—0 to 1 inch, black (N 2/0) coarse silt loam; weak, very fine, granular structure; friable; extremely acid; abrupt, wavy boundary.

A21—1 to 6 inches, brown (10YR 5/3) silt loam with few, medium, dark yellowish-brown (10YR 4/4) variegations; weak, fine, granular structure; friable; very strongly acid; abrupt, wavy boundary.

A22—6 to 9 inches, grayish-brown (10YR 5/2) silt loam with many, medium, yellowish-brown (10YR 5/6) mottles; weak, medium, granular structure; friable; very strongly acid; abrupt, smooth boundary.

B1tg—9 to 14 inches, variegated brown (10YR 5/3) and dark-brown (7.5YR 4/4) silty clay loam; moderate, medium, subangular blocky structure; friable; plentiful roots; no pebbles; very strongly acid; clear, smooth boundary.

B21tg—14 to 22 inches, strong-brown (7.5YR 5/6) silty clay loam with many gray (10YR 5/1) and reddish-brown (5YR 4/4) mottles; moderate, coarse, angular blocky structure breaking to strong, fine, angular blocky; thick, light brownish-gray (10YR 6/2) films of silty clay on ped faces; less friable than B1g horizon; plentiful roots; no pebbles; very strongly acid; abrupt, wavy boundary.

B22tg—22 to 32 inches, strong-brown (7.5YR 5/6) silty clay loam; weak, very coarse, prismatic structure breaking to strong, coarse, angular blocky; very thick, gray (N 5/0) and grayish-brown (10YR 5/2) clay films and black manganese stains on ped faces; firm; no roots; few small pebbles and concretions; material is laminated; very strongly acid; gradual, smooth boundary.

B23tg—32 to 42 inches, dark yellowish-brown (10YR 4/4) silty clay loam with common, medium, grayish-brown (2.5Y 5/2) mottles and coarse, black manganese stains; strong, fine, angular blocky structure; thick, grayish-brown (2.5Y 5/2) clay films on ped faces; firm; 5 percent pebbles; material is laminated with clay films on laminae; strongly acid; gradual boundary.

B3g—42 to 54 inches, yellowish-brown (10YR 5/6) silty clay loam with common, coarse, light brownish-gray (2.5Y 6/2) mottles and black manganese stains; weak, coarse, angular blocky structure; firm; no pebbles; material is laminated with light brownish-gray (10YR 6/2) clay films on laminae; medium acid in upper part and slightly acid in lower part.

IIC—54 to 135 inches, yellowish-brown (10YR 5/6) silty clay that is alkaline at a depth of 100 inches.

In some places the A horizon is very dark grayish brown to dark grayish brown. The B horizon ranges from fine silt loam to silty clay loam. The substratum is glacial till or lacustrine material ranging from loam to silty clay.

Frenchtown series

The Frenchtown series consists of poorly drained soils that developed from loam to clay loam till. Associates in the same drainage sequence are the Wooster, Canfield, Rittman, Ravenna, Wadsworth, and Marengo soils. The Frenchtown soils lack the gravel of the Damascus soils, and they have a fragipan that is missing in Damascus soils.

Representative profile of Frenchtown silt loam in pasture (CO–108; Salem Township, SE¼NW¼ sec. 19, T. 15 N., R. 3 W.):

A1—0 to 2 inches, dark-gray (N 4/0) silt loam with a few, medium, distinct mottles of gray (10YR 5/1) and strong brown (7.5YR 5/6); moderate, fine, granular structure; friable; common pebbles; strongly acid; abrupt, wavy to irregular boundary.

A2g—2 to 7 inches, grayish-brown (2.5Y 5/2) silt loam with common, medium, prominent mottles of dark reddish brown (5YR 3/2); weak, fine, granular structure; friable; common pebbles; strongly acid; clear, smooth boundary.

A3g—7 to 10 inches, grayish-brown (2.5Y 5/2) silt loam with many, medium, prominent mottles of yellowish brown (10YR 5/4 and 5/6); weak, medium, angular blocky structure breaking to weak, very fine, granular; thin, grayish-brown (10YR 5/2) silty films on ped faces; friable; common pebbles; strongly acid; abrupt, wavy boundary.

B1t—10 to 16 inches, yellowish-brown (10YR 5/6) silt loam with many, common, distinct mottles of grayish brown (10YR 5/2) and strong brown (7.5YR 5/6); moderate, medium, subangular blocky structure; grayish-brown (10YR 5/2) silty films 1 millimeter thick on ped faces; clay films in pores; friable; common pebbles; strongly acid; clear, smooth boundary.

B21tg—16 to 21 inches, mottled gray (5Y 5/1) and yellowish-brown (10YR 5/6) loam; mottles many, medium, and prominent; moderate, medium, subangular blocky structure; mottled gray and yellowish-brown, degraded silty clay films 1 millimeter thick on ped faces; friable; common pebbles; strongly acid; abrupt, wavy boundary.

Bx1—21 to 28 inches, olive-brown (2.5Y 4/4) loam with many, medium, prominent, gray (10YR 5/1) mottles and black manganese stains; fragipan with weak, medium, angular blocky structure; gray (N 5/0) clay films 2 millimeters thick on horizontal ped faces and gray clay films 10 millimeters thick on vertical ped faces; firm; common pebbles; strongly acid; abrupt, wavy boundary.

Bx2—28 to 34 inches, olive-brown (2.5Y 4/4) loam with many, medium, prominent mottles of dark reddish brown (5YR 3/4) and gray (10YR 5/1); fragipan with weak, very thick, platy structure; gray (N 5/0) clay films 5 millimeters thick on vertical ped faces; firm but less so than Bx1 horizon; common pebbles; slightly acid; gradual boundary.

C1—34 to 42 inches, olive-brown (2.5Y 4/3) loam; weak, very coarse, prismatic structure breaking to fine, angular blocky; films on prism faces are in three layers; innermost layer is yellowish-brown (10YR 5/6) loam 5 millimeters thick, middle layer is light-gray (N 6/0) clay loam 10 millimeters thick, and outermost layer is dark-gray (5YR 4/1) clay 1 millimeter thick; friable; common pebbles; neutral; gradual boundary.

C2—42 to 58 inches, dark-brown (10YR 4/3) loam with a vertical, light-gray, calcareous clayey seam 15 millimeters thick; massive; friable; common pebbles; effervesces strongly, 6.7 percent $CaCO_3$ equivalent.

The present concept of the Frenchtown series is a broad one. Further study over a large area is needed to determine whether the series should be redefined. If the concept is changed, the soil described in the preceding profile may not fall within the allowable range of the Frenchtown series.

Glenford series

In the Glenford series are moderately well drained soils on terraces. These soils developed from medium-textured lacustrine materials 2 to 5 feet thick over glacial till or outwash. Associates in the same drainage sequence are the somewhat poorly drained Fitchville soils, the poorly drained Sebring soils, and the very poorly drained Luray soils. The Glenford soils developed from finer textured material than the Bogart soils.

Representative profile of a Glenford silt loam in a forested area (Knox Township, SW¼NE¼ sec. 15, T. 17 N., R. 5 W.):

A1—0 to 1 inch, very dark brown (10YR 2/2) silt loam; weak, very fine, crumb structure; friable; 3 percent pebbles; strongly acid; abrupt, smooth boundary.

A21—1 to 5 inches, dark grayish-brown (10YR 4/2) silt loam with very thin coatings of material from A1 horizon in cracks; weak, fine, granular structure; friable; 3 percent pebbles; strongly acid; abrupt, smooth boundary.

A22—5 to 9 inches, brown (10YR 5/3) silt loam; weak, thick, platy structure breaking to weak, medium, granular peds; friable; abundant roots; very few pebbles; strongly acid; abrupt, smooth boundary.

B1t—9 to 17 inches, yellowish-brown (10YR 5/4) fine silt loam with many, fine, faint mottles of brown (10YR 5/3); weak, coarse, subangular blocky structure breaking to weak, medium, angular blocky peds; very thin, brown and pale-brown silty films on ped faces; friable; plentiful roots; many fine and medium pores; very few pebbles; strongly acid; clear, smooth boundary.

B21t—17 to 23 inches, dark yellowish-brown (10YR 4/4) silty clay loam with many, medium, distinct mottles of brown (7.5YR 5/3) and grayish brown (10YR 5/2); weak, coarse, angular blocky structure breaking to moderate, medium, angular blocky peds; thin, brown (10YR 5/3), degraded clay films on fine peds; friable; plentiful roots on ped faces; few fine pores with thin clay films; very few pebbles; strongly acid; clear, smooth boundary.

B22—23 to 29 inches, strong-brown (7.5YR 5/6) silty clay loam with many, medium, distinct mottles of brown (10YR 5/3); strong, coarse, angular blocky structure breaking to strong, medium, angular blocky peds; grayish-brown, degraded silty clay films 2 millimeters thick on ped faces; few fine pores; very few pebbles; strongly acid; clear, smooth boundary.

B31—29 to 36 inches, strong-brown (7.5YR 5/8) silt loam and light brownish-gray (10YR 6/2) silty clay in equal amounts; weak, medium, prismatic structure breaking to moderate, fine, angular blocky; grayish-brown (10YR 5/2) silty clay films 2 to 10 millimeters thick on prism faces and very thin, brown (10YR 5/3) films on ped faces; firm; few roots on ped faces; few fine pores; very few pebbles; strongly acid; clear, smooth boundary.

B32—36 to 43 inches, masses of strong-brown (7.5YR 5/6) loam and gray (10YR 5/1) silty clay in equal amounts; weak, fine, angular blocky structure; not so firm as B31 horizon; gray (10YR 6/1) silty clay films 2 to 10 millimeters thick on vertical faces; few roots; many fine and medium pores; 8 percent pebbles; strongly acid; abrupt boundary.

C—43 inches +, stratified layers of silty, sandy, and clayey materials; sandy layers are discontinuous and, in places, are missing; neutral or alkaline.

In some places the A horizon is very dark grayish brown. In places the B horizon is heavy silt loam, heavy loam, or clay loam.

Gresham series

The Gresham series consists of somewhat poorly drained soils that developed from medium-textured, slightly limy glacial till. These soils occur on the lower part of side slopes in valleys, where they receive seepage from higher slopes. Associates in the same drainage sequence are the well drained Hanover soils and the moderately well drained Titusville soils. The Gresham soils are more deeply weathered than the Ravenna soils.

Representative profile of a Gresham silt loam in a forested area (CO-97; Center Township, SE¼NE¼ sec. 28, T. 14 N., R. 3 W.):

A1—0 to 2 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, very fine, granular structure; very friable; 1 percent pebbles; very strongly acid; abrupt, irregular boundary.

A2—2 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium, granular structure; friable; 2 percent pebbles; very strongly acid; abrupt, smooth boundary.

A3—8 to 12 inches, brown (10YR 5/3) silt loam; weak, medium, granular structure; friable; abundant roots; 2 percent pebbles; very strongly acid; abrupt, smooth boundary.

B1t—12 to 16 inches, yellowish-brown (10YR 5/6) fine silt loam with many, medium, faint mottles of grayish brown (10YR 5/2); moderate, medium, subangular blocky structure; friable: plentiful roots; many fine and medium pores; 2 percent pebbles; very strongly acid; abrupt, smooth boundary.

B21t—16 to 22 inches, yellowish-brown (10YR 5/4) light silty clay loam with many, medium, distinct mottles of gray (10YR 5/1) and reddish brown (5YR 4/4); moderate, medium, subangular blocky structure; grayish-brown (10YR 5/2), silty ped faces 1 millimeter thick; friable; plentiful roots; common fine pores; 5 percent pebbles; very strongly acid; abrupt, wavy boundary.

Bx1—22 to 27 inches, dark yellowish-brown (10YR 4/4) light silty clay loam with many, medium, distinct mottles of gray (10YR 5/1); fragipan with moderate, medium, subangular blocky structure breaking to moderate, fine, angular blocky; mottled dark-brown (7.5YR 4/4) and gray (10YR 5/1) clay ped faces 2 millimeters thick; firm; few roots; common fine and medium pores; 8 percent pebbles; very strongly acid; clear, smooth boundary.

Bx2—27 to 36 inches, dark-brown (7.5YR 4/4) silty clay loam with many, medium, prominent mottles of gray (N 5/0); fragipan with moderate, medium, angular blocky structure; dark grayish-brown (10YR 4/2) clay 1 millimeter thick on ped faces, and clay coatings in pores; firm; few roots; many fine and medium pores; 10 percent pebbles; very strongly acid; gradual, smooth boundary.

Bx3—36 to 60 inches, dark yellowish-brown (10YR 4/4) silty clay loam with many, medium, distinct mottles of grayish brown (2.5Y 5/2); fragipan with weak, medium, prismatic structure breaking to moderate, medium, angular blocky; gray (N 2/0) silty clay films, 5 to 10 millimeters thick, and coarse manganese stains on ped faces; firm; few roots; few fine pores; 10 percent pebbles; very strongly acid; abrupt, wavy boundary.

C1—60 to 126 inches, olive-brown (2.5Y 4/4), coarse silt loam with common, coarse, distinct mottles of strong brown (7.5YR 5/6); weak, very coarse, prismatic structure breaking to weak, medium, angular blocky; gray (N 5/0) silty films 5 millimeters thick on clay ped faces in upper part; films range to thin and dark brown in lower part; less firm than above; few roots on prism faces in upper part; few fine pores; 10 percent pebbles; strongly acid to neutral; abrupt, smooth boundary.

C2—126 to 168 inches, light olive-brown (2.5Y 5/4) to olive (5Y 5/3) silty clay loam to loam with zones of strong brown (7.5YR 5/6) one-half inch thick; massive; firm or very firm; 15 percent pebbles; calcareous; abrupt, wavy boundary.

C3—168 to 196 inches, olive-gray (5Y 4/2) clay loam; massive; dark-gray (N 4/0) vertical faces; very firm; 15 percent pebbles; calcareous, effervesces weakly; unoxidized glacial till. Pebble count of 200 pieces: 36 percent dark-gray shale (fire clay), 32 percent sandstone, 14 percent olive siltstone, 6 percent concretions, 6 percent limestone, 2 percent coal, and 4 percent schist, granite, chert, and quartzite.

The A horizon is very dark grayish brown or dark grayish brown. In some places the B horizon is silty clay loam, silt loam, or clay loam. Color in the B horizon ranges from yellowish brown to dark brown. The depth of leaching ranges from 60 to 126 inches.

Guernsey series

The Guernsey series consists of moderately well drained soils that developed in mixed material derived from limestone, sandstone, siltstone, and shale. Guernsey soils are texturally similar to the Wharton soils, which developed from black clay shale, and to the Summitville soils, which developed from a mixture of clay shale, sandstone, and siltstone.

Representative profile of a Guernsey silt loam in pasture (CO-99; Hanover Township, NE¼ sec. 25, T. 15 N., R. 4 W.):

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, fine, granular structure; friable; abundant roots; strongly acid; abrupt, smooth boundary.

A2—8 to 11 inches, dark-brown (10YR 4/3) fine silt loam; weak, fine, subangular blocky structure breaking to moderate, medium, granular; friable when moist, sticky when wet; abundant roots; very strongly acid; abrupt, smooth boundary.

B1—11 to 16 inches, dark yellowish-brown (10YR 4/4) fine silt loam; moderate, medium, subangular blocky structure breaking to moderate, fine, subangular blocky; very thin, degraded, dark-brown (10YR 4/3) films on ped faces; friable when moist, sticky and slightly plastic when wet; plentiful roots; many fine and medium pores; very strongly acid; abrupt, smooth boundary.

B21t—16 to 21 inches, dark yellowish-brown (10YR 4/4) coarse silty clay loam; strong, medium, subangular to angular blocky structure breaking to strong, fine, angular blocky peds; very thin, degraded clay films on ped faces; friable when moist, sticky and slightly plastic when wet; plentiful roots; many fine and medium pores; very strongly acid; clear, smooth boundary.

B22t—21 to 26 inches, dark yellowish-brown (10YR 4/4) silty clay loam with many, coarse, gray (10YR 5/1) mottles; strong, medium, angular blocky structure; very thin, dark-brown (10YR 4/3) clay films on ped faces; firmer than horizon above when moist, sticky and plastic when wet; plentiful to few roots; few fine pores; very strongly acid; clear, smooth boundary.

B23t—26 to 38 inches, yellowish-brown (10YR 5/6) clay with many, medium mottles of dark gray (10YR 4/1), strong brown (7.5YR 5/6), and light olive brown (2.5Y 5/3); few coarse manganese stains; crushed color is dark yellowish brown (10YR 4/4); strong, coarse, angular blocky structure breaking to moderate, medium, angular blocky peds; thin, dark, yellowish-brown (10YR 4/4) clay films on ped faces; firm when moist, sticky and plastic when wet; few roots; few fine pores; strongly acid; wavy boundary.

C—38 to 50 inches, mottled brown (10YR 5/3) and brownish-yellow (10YR 6/6) silty clay; firm; no roots; strong effervescence; mottled olive (5Y 5/4) and gray (N 5/0) silty clay occurs below depth of 44 inches; 30 percent channery fragments of limestone.

The A horizon is very dark grayish brown or dark brown, and the B horizon ranges from dark yellowish brown or dark brown to yellowish brown. Texture of the Bt horizon is silty clay loam or clay. The thickness of the solum ranges from 36 to 50 inches.

Hanover series

The Hanover series consists of well-drained soils that developed from medium-textured, slightly limy glacial till. Associates in the same drainage sequence are the moderately well drained Titusville soils and the somewhat poorly drained Gresham soils. The Hanover soils have a more weathered, more deeply leached solum than the Wooster soils.

Representative profile of a Hanover silt loam in a forested area (CO-81; Middleton Township, SE. corner of SE¼ sec. 21, T. 7 N., R. 1 W.):

A1—0 to 2 inches, very dark brown (10YR 2/2) silt loam; weak, fine, granular structure; very friable; abundant roots; 5 percent pebbles; medium acid; abrupt, wavy boundary.

A2—2 to 10 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, coarse, granular structure; friable; abundant roots; 10 percent pebbles and cobbles; very strongly acid; clear, smooth boundary.

B1t—10 to 20 inches, dark-brown (7.5YR 4/4) silt loam; weak, fine to medium, subangular blocky structure; degraded clay films in lower part of horizon; friable; more gritty than horizon above; plentiful roots; common medium pores; 10 percent pebbles and cobbles; very strongly acid; clear, wavy boundary.

Bxt—20 to 50 inches, dark-brown (7.5YR 4/4) loam; moderate fragipan with moderate, coarse, angular blocky structure; degraded clay films and large, coarse manganese stains on ped faces and on pebbles; firm; plentiful roots; many medium pores; 20 percent gravel; extremely acid; gradual boundary.

B2t—50 to 62 inches, dark yellowish-brown (10YR 4/4) loam to gravelly sandy loam with common, fine, prominent mottles of grayish brown (10YR 5/2) and common, medium manganese stains; weak, coarse, angular blocky structure; dark-brown (7.5YR 4/4) films on ped faces and in pores; firm; few roots; many fine and medium pores; 50 percent gravel and cobbles; peds fracture around pebbles; extremely acid; clear, wavy boundary.

B3—62 to 81 inches, dark yellowish-brown (10YR 4/4) loam to gravelly sandy loam with many, medium, distinct mottles of brown (10YR 5/3); weak, medium to coarse, angular blocky structure; friable; a few roots; many medium pores; 50 percent gravel; very strongly acid; gradual, wavy boundary.

C—81 to 90 inches, yellowish-brown (10YR 5/4) sandy loam; massive; very friable; a few roots; 50 percent gravel; 50 percent sandy loam bodies in loam till; many medium pores; very strongly acid.

In some places the A horizon is dark brown to brown. The upper B horizon ranges from loam to silty clay loam in texture and from dark brown to yellowish brown in color. Generally, the lower B horizon contains less gravel than that in the representative soil.

Jimtown series

The Jimtown series consists of somewhat poorly drained soils that developed from glacial outwash on terraces. Associates in the same drainage sequence are the well drained Chili soils, the moderately well drained Bogart soils, the poorly drained Damascus soils, and the very poorly drained Olmsted soils. The Jimtown soils developed from coarser textured material than the Fitchville soils.

Representative profile of a Jimtown silt loam in pasture (West Township, NW¼SW¼ sec. 30, T. 16 N., R. 5 W.):

Ap—0 to 9 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, fine, granular structure; friable; 10 percent pebbles; neutral (field limed); abrupt, smooth boundary.

B1—9 to 15 inches, dark grayish-brown (10YR 4/2) silt loam with many, fine, grayish-brown (10YR 5/2) and dark-brown (7.5YR 4/4) mottles; moderate, medium and fine, subangular blocky structure; friable; abundant roots; 5 percent pebbles; neutral (field limed); abrupt, wavy boundary.

B21t—15 to 21 inches, brown (10YR 4/3) fine loam with many, medium, reddish-brown (5YR 4/4) and grayish-brown (10YR 5/2) mottles and soft iron and manganese concretions; moderate, fine, angular blocky structure; thin, degraded, dark-brown (7.5YR 4/3) clay films on peds and in pores; 10 percent pebbles; slightly to medium acid; abrupt, wavy boundary.

IIB22t—21 to 25 inches, dark grayish-brown (10YR 4/2) gravelly sandy loam with many, medium, dark-red (2.5YR 3/6) and brown (10YR 5/3) mottles; weakly cemented by iron but breaking to weak, medium, angular blocky structures; firm in place but friable when disturbed; dark grayish-brown clay films in pores, on pebbles, and as bridges between sand grains; few roots; 60 percent pebbles; medium acid; gradual, wavy boundary.

IIIB—25 to 58 inches, stratified brown gravelly loamy sand and dark grayish-brown sandy loam; structureless; very friable; 50 percent pebbles; slightly acid in upper part ranging to neutral at depth of 52 inches.

The A horizon is silt loam or loam and, in some places, is gravelly. It is dark grayish brown to very dark grayish brown. The B horizon generally is brownish and has grayish and reddish mottles. In some places the B horizon has a thin layer of silty clay loam or a layer of outwash that is weakly cemented by iron and is firm but porous. The glacial outwash from which the Jimtown soils developed is more than 3 feet thick in areas where it lies over till or lacustrine material, but in places it ranges to more than 10 feet in thickness.

Kerston series

In the Kerston series are very poorly drained organic soils that consist of alternate layers of silty material and organic material, chiefly muck. In this respect the Kerston soils differ from the Carlisle and Willette soils. Also, the Kerston soils are deeper than the shallow Willette soils.

Representative profile of Kerston muck (Perry Township, SW¼ sec. 7, T. 15 N., R. 3 W.):

1—0 to 2 inches, black (N 2/0) silty muck; friable; moderate, fine, granular structure; slightly acid; abrupt, smooth boundary.

2—2 to 5 inches, very dark grayish-brown (10YR 3/2) silt loam; massive; friable; neutral; abrupt, smooth boundary.

3—5 to 9 inches, black (N 2/0) muck; moderate, medium, granular structure; friable; neutral; abrupt, smooth boundary.

4—9 to 12 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, medium, granular structure; friable; neutral.

5—12 to 20 inches, black (N 2/0) granular muck with thin layers of undecomposed, fibrous peat; massive; neutral.

6—20 inches +, layers of black (10YR 2/1) muck, very dark grayish-brown (10YR 3/2) silt loam, and very dark brown (10YR 2/2) peat; neutral.

Although the layers of muck, peat, and mineral material are interstratified, they vary greatly in thickness and arrangement. The horizons below the surface layer range from medium acid to neutral. The mineral material in the alternate layers is clayey to sandy but is dominantly silt loam.

Laidig series

In the Laidig series are well-drained soils of the uplands that developed in colluvium derived mainly from sandstone. The colluvium ranges from 10 to 50 feet in thickness. Laidig soils have a solum of very strongly acid stony loam to sandy loam. They are similar to the moderately well drained Ernest soils, which developed from relatively finer textured colluvial material.

Representative profile of a Laidig stony loam in a forested area (CO–61; St. Clair Township, NE. corner of SW¼ sec. 1, T. 6 N., R. 1 W.):

A11—0 to 1 inch, black (10YR 2/1) stony loam; weak, coarse, medium, and fine, crumb structure; very friable; 5 percent channery fragments of sandstone, but there are many large stones and boulders on surface; very strongly acid; clear, smooth boundary.

A12—1 to 3 inches, very dark grayish-brown (10YR 3/2) and very dark gray (10YR 3/1) stony loam; weak, fine, crumb structure; friable; 5 percent channery fragments of sandstone; very strongly acid; abrupt, smooth boundary.

B21t—3 to 26 inches, yellowish-brown (10YR 5/4) stony loam; weak, fine, subangular blocky structure; friable; common, thin, brown (10YR 4/4) clay films on ped surfaces and sand grains; abundant roots; 10 percent channery fragments of sandstone; very strongly acid; clear, smooth boundary.

B22t—26 to 32 inches, yellowish-brown (10YR 5/4) heavy sandy loam with few, medium, faint stains of very pale brown (10YR 7/4) and mottles of dark grayish brown (10YR 4/2); weak, fine, subangular blocky structure; friable; few roots; 10 percent channery fragments of sandstone; very strongly acid; gradual, wavy boundary.

Bx1—32 to 38 inches, yellowish-brown (10YR 5/4) heavy sandy loam with dark grayish-brown (10YR 4/2) coatings; weak fragipan with weak, medium, subangular blocky structure; firm; few roots; 10 percent channery fragments of sandstone; very strongly acid; clear, smooth boundary.

IIBx2—38 to 51 inches, dark grayish-brown (10YR 4/2) loam with common, coarse, distinct mottles of (N 5/0) gray and stains of light yellowish brown (10YR 6/4); fragipan with strong, very coarse, prismatic structure breaking to strong, coarse, angular blocky strucure; very firm; few roots; material is laminated and water-laid but contains about 10 percent channery fragments of sandstone; very strongly acid; abrupt, smooth boundary.

IIC—51 to 60 inches, brown (10YR 5/3) stony loamy sand; rotted fragments of sandstone, arranged at angles to each other, and sandy soil material; single grain; noncoherent; strongly acid.

The A horizon ranges from loam to sandy loam in texture and from black to very dark grayish brown in color. The B horizon ranges from loam to sandy loam and from yellowish brown to dark grayish brown. The substratum is deep colluvium, alluvium, or outwash materials. At a depth of 8 to 13 inches, the content of fine clay increases slightly, and clay coatings are on the peds and in the pores in the B21t horizon. The increase in clay content between the depths of 38 and 51 inches (IIBx2 horizon) is attributed to a lithologic discontinuity.

Lobdell series

The Lobdell series consists of moderately well drained soils that formed in alluvium washed from acid glacial till and materials derived from sandstone and siltstone. These soils are loam or silt loam and medium acid or slightly acid throughout. In the same drainage sequence as the Lobdell soils are the very poorly drained Papakating soils, the poorly drained Wayland soils, the somewhat poorly drained Orrville soils, and the well-drained Chagrin soils.

Representative profile of Lobdell silt in a field used for pasture (Salem Township, SE. corner of SE¼ sec. 15, T. 15 N., R. 3 W.):

Ap—0 to 14 inches, very dark grayish-brown (10YR 3/2) silt loam; strong, fine, granular structure; friable; slightly acid; gradual, smooth boundary.

C1—14 to 22 inches, dark-brown (10YR 3/3) silt loam; moderate, fine, granular structure; friable; plentiful roots; slightly acid; clear, smooth boundary.

C2—22 to 28 inches, dark-gray (10YR 4/1) silt loam with many, fine, faint mottles of dark yellowish-brown (10YR 3/4); dark brown (10YR 3/3) when crushed; massive; friable; plentiful roots; medium acid; abrupt, smooth boundary.

C3—28 to 33 inches, pale-brown (10YR 6/3) loam with many, medium, prominent mottles of gray (10YR 5/1) and dark reddish brown (5YR 3/4); massive; friable; plentiful roots; medium acid; abrupt, smooth boundary.

C4—33 to 42 inches, pale-brown (10YR 6/3) sandy loam with many, medium, prominent mottles of gray (10YR 5/1) and yellowish brown (10YR 5/6); massive; friable; no roots; medium acid or slightly acid.

The A horizon is brown or very dark grayish brown. Mottling occurs below a depth of 20 to 30 inches.

The definition of the Lobdell series is being studied over a general area larger than Columbiana County. At the conclusion of the study, the name Lobdell may not be retained for soils having the preceding characteristics.

Lorain series

The Lorain series consists of very poorly drained soils that developed from lacustrine deposits of clay and silty clay in depressional areas. The Lorain soils developed from finer textured materials than the Luray soils.

Representative profile of Lorain clay in a pastured area (Knox Township, SE¼SE¼ sec. 21, T, 17 N., R. 5 W.):

A1—0 to 10 inches, black (N 2/0) clay; few; fine, prominent mottles or stains of yellowish red (5YR 4/8) in former root channels; strong, medium, granular structure; friable; many medium and coarse pores; slightly acid; abrupt, smooth boundary.

B21g—10 to 15 inches, black (5YR 2/1) clay (finer textured than A1 horizon); center of peds dark reddish brown (5YR 2/2); strong, medium, angular blocky structure breaking to strong, fine, angular blocky; firm; plentiful roots; no pores; slightly acid; abrupt, wavy boundary.

B22g—15 to 21 inches, very dark gray (10YR 3/1) clay with many, fine, faint mottles of very dark grayish brown (10YR 3/2) and dark gray (10YR 4/1); weak, very coarse, prismatic structure and strong, coarse, angular blocky structure breaking to strong, medium, angular blocky peds; black (N 2/0) films on ped faces; firm; plentiful roots; no pores; strongly acid; abrupt, wavy boundary.

B23tg—21 to 29 inches, dark-gray (10YR 4/1) fine silty clay with common, medium, prominent mottles of dark reddish brown (5YR 3/4); weak, very coarse, prismatic structure breaking to strong, coarse, angular blocky peds; dark-gray (N 4/0) films on ped faces; firm; few roots; common fine pores; strongly acid; abrupt, wavy boundary.

A1bg—29 to 33 inches, black (N 2/0) clay with dark red (10YR 3/6) in fossil root channels and many, medium, faint mottles of dark gray (10YR 4/1); strong, fine, subangular blocky structure; dark-gray (N 4/0) films on ped faces; few roots; many fine and medium pores; slightly acid; abrupt, wavy boundary.

B21bg—33 to 41 inches, very dark gray (N 3/0) silty clay with many, medium, prominent mottles of dark reddish brown (5YR 3/4); strong, fine, angular blocky structure; firm; few roots; few medium pores; more gritty than the other horizons; neutral.

B22bg—41 to 48 inches, dark-gray (N 4/0) silty clay with dark reddish brown (5YR 3/4) in root channels; moderate, medium, platy structure; black (N 2/0) films on ped faces; firm; few roots; few medium pores; neutral.

The A and B horizons and the substratum are clay or silty clay. The B horizon ranges from gray to black. The substratum is lacustrine material or glacial till. Rock fragments are lacking throughout the profile.

Loudonville series

The Loudonville series consists of well-drained soils that developed from medium-textured glacial till. These soils occur closely with the deep Hanover and Wooster soils. In the Illinoian glacial area, where till is thin or lacking, Loudonville soils also occur with the shallower Muskingum and Weikert soils.

Representative profile of a Loudonville silt loam in a cultivated field (Middleton Township, SW¼SE¼ sec. 8, T. 7 N., R. 1 W.):

Ap—0 to 8 inches, dark-brown (10YR 4/3) silt loam; weak, fine, granular structure; friable; many medium pores; 10 percent pebbles and channery fragments; very strongly acid; abrupt, wavy boundary.

B1t—8 to 13 inches, brown to dark-brown (7.5YR 4/4) fine silt loam; weak, medium, subangular blocky structure; clay flows present; friable; plentiful roots; many fine and medium pores; 10 percent pebbles and channery fragments; very strongly acid; clear, smooth boundary.

B21t—13 to 25 inches, dark-brown (7.5YR 3/4) fine loam; moderate, medium, subangular blocky structure; friable; plentiful roots; many fine pores; 15 percent pebbles and channery fragments; very strongly acid; clear, smooth boundary.

B22t—25 to 30 inches, brown to dark-brown (7.5YR 4/3) loam with few, medium stains of manganese; weak, medium, angular blocky structure; clay flows on ped surfaces; firm; plentiful to few roots; few fine pores; 20 percent pebbles and channery fragments; very strongly acid; abrupt, wavy boundary.

IIB3—30 to 38 inches, dark yellowish-brown (10YR 4/4) channery loam with brown to dark-brown (7.5YR 4/3) ped faces; weak, medium, subangular blocky structure; friable; no roots; many fine pores; 45 percent channery fragments and 15 percent pebbles; very strongly acid; wavy to irregular boundary.

IIR—38 inches +, olive (5Y 4/3), hard siltstone in beds ¼ to ½ inch thick.

The A horizon is silt loam or loam and is dark grayish brown or dark brown. In some places the B horizon is silty clay loam and strong brown or yellowish brown. The depth to bedrock ranges from 20 to 42 inches.

Luray series

In the Luray series are very poorly drained soils that lie in depressional areas on terraces. These soils developed from lacustrine materials made up of silt loam and silty clay loam. Associates in the same drainage sequence are the moderately well drained Glenford soils, the somewhat poorly drained Fitchville soils, and the poorly drained Sebring soils. The Luray soils have a finer textured solum than the Olmsted soils and a coarser textured solum than the Lorain soils.

Representative profile of Luray silty clay loam in an area used for pasture (Knox Township, SW¼SE¼ sec. 9, T. 17 N., R. 5 W.):

A11—0 to 6 inches, very dark brown (10YR 2/2) coarse silty clay loam with many, fine, faint mottles of dark reddish brown (5YR 3/4); moderate, medium, granular structure; friable; neutral; clear, smooth boundary.

A12—6 to 8 inches, very dark gray (10YR 3/1) fine silt loam with many, fine, faint mottles of dark reddish brown (5YR 3/2); weak, fine, granular structure; friable; 2 percent glacial pebbles; neutral; abrupt, irregular boundary.

B1—8 to 13 inches, grayish-brown (10YR 5/2) silt loam with many, medium, distinct mottles of strong brown (7.5YR 5/6); weak, fine, subangular blocky structure; friable; plentiful roots; neutral.

B21g—13 to 20 inches, mottled grayish-brown (10YR 5/2) and strong-brown (7.5YR 5/6) loam; weak, medium, subangular blocky structure; degraded, grayish-brown (2.5Y 5/2) silty films on ped faces; friable; plentiful roots; many fine and medium pores; 5 percent glacial pebbles; neutral; abrupt, smooth boundary.

B22tg—20 to 30 inches, mottled dark reddish-brown (5YR 3/3) and strong-brown (7.5YR 5/6) loam; moderate, medium, subangular blocky structure; degraded, gray (N 5/0) silty clay films 3 to 10 millimeters thick on ped faces; firm; few roots; many fine pores;

15 percent glacial pebbles; slightly acid; abrupt, smooth boundary.

IIB23tg—30 to 40 inches, dark yellowish-brown (10YR 4/4) coarse silty clay loam with few, coarse, prominent mottles of gray (10YR 5/1); moderate, very coarse, angular blocky structure; dark-gray (N 4/0) clay films 10 millimeters thick on ped faces; firm; few roots; few fine pores; 5 percent glacial pebbles; neutral; gradual, smooth boundary.

IIB3tg—40 to 56 inches, dark yellowish-brown (10YR 4/4) coarse silty clay loam; weak, very coarse, prismatic structure; dark-gray (N 4/0) clay films 10 millimeters thick on ped faces; roots none; few fine pores; 5 percent glacial pebbles; neutral; zones of gray (10YR 5/1) between ped faces and matrix; gradual boundary.

IICg—56 to 68 inches, dark grayish-brown (2.5Y 4/2) coarse silty clay loam; gray (10YR 5/1) clay films 10 millimeters thick on ped faces; oxidized dark yellowish brown (10YR 4/4) between ped faces and matrix; no roots; 5 percent glacial pebbles; strong effervescence.

The A horizon ranges from black to very dark brown in color and from silt loam to silty clay loam in texture. The B horizon ranges from loam to clay loam and from strongly acid to neutral. The substratum is stratified material or glacial till consisting of silty clay loam to loam.

Marengo series

The Marengo series consists of medium acid to neutral, very poorly drained soils that developed from clay loam or loam till in depressional areas on uplands. Associates in the same drainage sequence are the well drained Wooster soils, the moderately well drained Rittman and Canfield soils, the somewhat poorly drained Wadsworth and Ravenna soils, and the poorly drained Frenchtown soils.

Representative profile of Marengo silty clay loam in a field used for pasture (Perry Township, SW. corner of NW¼ sec. 25, T. 17 N., R. 4 W.):

A1—0 to 11 inches, black (10YR 2/1) silty clay loam with common, coarse, faint mottles of dark gray (10YR 4/1) and common, fine, faint mottles of dark reddish brown (5YR 3/4); strong, fine, granular structure; friable when moist, sticky when wet; many fine and medium pores; 5 percent pebbles; many hard concretions (buckshot); medium acid; clear, smooth boundary.

B11g—11 to 14 inches, very dark gray (10YR 3/1) loam with many, fine, faint mottles of black (10YR 2/1); strong, fine, granular structure; friable when moist, sticky when wet; roots common; many pores; 5 percent pebbles; many hard concretions; slightly acid; clear, wavy boundary.

B12g—14 to 17 inches, grayish-brown (2.5Y 5/2) loam; strong, fine, granular structure; friable when moist, sticky when wet; plentiful roots; many fine and medium pores; 10 percent pebbles; many concretions; slightly acid; abrupt, wavy boundary.

B21g—17 to 20 inches, grayish-brown (10YR 5/2) loam with many, fine, faint mottles of brown (10YR 5/3) and yellowish brown (10YR 5/4); weak, medium, angular blocky structure breaking to moderate, fine, granular peds; very thin, grayish-brown clay films on ped faces; friable; few roots; many medium pores with clay films; pebbles 10 percent; many concretions; slightly acid; abrupt, wavy boundary.

B22tg—20 to 26 inches, small masses of gray (N 5/0) clay and dark yellowish-brown (10YR 4/4) loam; moderate, medium, angular blocky structure; gray silty clay films 3 millimeters thick on vertical ped faces; thin, mottled grayish-brown (10YR 5/2) and gray (N 5/0), degraded clay films on horizontal ped faces; firm when moist, sticky when wet; roots occasional; common medium and fine pores; 10 percent pebbles; slightly acid; clear, irregular boundary.

B23tg—26 to 30 inches, dark grayish-brown (10YR 4/2) coarse clay loam with many, medium, distinct mottles of gray (N 5/0); moderate, very coarse, angular blocky structure breaking to weak, fine, angular blocky peds; gray (N 5/0) clay films 5 millimeters thick on vertical ped faces that, in turn, are coated by thin, dark-gray (10YR 4/1) silty clay; dark-gray clay films 1 millimeter thick on horizontal ped faces that, in turn, are coated by dark reddish-brown (5YR 3/2) stains of manganese; firm; few roots on vertical ped faces; many fine pores; 10 percent pebbles; slightly acid; gradual boundary.

B24tg—30 to 35 inches, dark-brown (10YR 4/3) clay loam; very coarse polygons, coated with dark-gray (10YR 4/1) clay films, breaking to weak, fine, angular blocky structure; vertical ped faces 8 millimeters thick; dark reddish-brown (5YR 3/2) stains of manganese on horizontal ped faces; firm; roots occasional on vertical ped faces; many fine pores; 10 percent pebbles; neutral; gradual boundary.

B25g—35 to 40 inches, dark grayish-brown (10YR 4/2) fine loam; coarse polygons breaking to weak, medium, platy structure; vertical ped faces have strong-brown (7.5YR 5/6) loam interiors 5 millimeters thick; gray (N 5/0) silty clay centers 2 millimeters thick and very dark gray (N 3/0) clay films 8 millimeters thick on exteriors; very thin, dark-brown (7.5YR 3/2) clay films on horizontal faces; less firm than B24tg horizon; roots occasional on vertical ped faces; common fine pores; 10 percent pebbles; mildly alkaline; gradual boundary.

B3—40 to 46 inches, dark-brown (10YR 4/3) fine loam; coarse polygons breaking to weak, medium, platy structure; vertical ped faces as in B23 horizon; very thin, brown (7.5YR 4/3) clay films on horizontal ped faces; friable when moist; roots occasional on vertical ped faces; common fine pores; 8 percent pebbles; mildly alkaline; gradual boundary.

C1—46 to 53 inches, olive-brown (2.5Y 4/3) loam; massive but with gray (N 5/0) vertical clay seams 5 millimeters thick; friable; 8 percent pebbles; very weak effervescence.

The A horizon is silt loam or silty clay and is black to very dark grayish brown. The B horizon ranges from silt loam to clay loam and is highly mottled or coated with grayish and brownish colors. The substratum ranges from loam to clay loam.

Monongahela series

The Monongahela series consists of moderately well drained soils that developed in medium-textured alluvium on terraces in the unglaciated area of the county. Associates in the same drainage sequence are the well-drained Allegheny soils, the somewhat poorly drained Tyler soils, the poorly drained Purdy soils, and the very poorly drained Chilo soils. The Monongahela soils are more deeply leached than the Glenford soils, which developed from glacial drift.

Representative profile of a Monongahela silt loam in a cultivated area (CO-70; St. Clair Township, NE¼SE¼ sec. 8, T. 6 N., R. 1 W.):

Ap—0 to 8 inches, dark-brown (10YR 3/3) silt loam; weak fine, granular structure; plentiful roots; friable; no fragments; very strongly acid; abrupt, smooth boundary.

A3—8 to 11 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, fine, subangular blocky structure breaking to weak, very fine, granular to crumb; common fine and medium pores; plentiful roots; few pebbles; extremely acid; clear, smooth boundary.

B1t—11 to 15 inches, yellowish-brown (10YR 5/4) silt loam; weak, fine, subangular blocky structure; friable;

plentiful roots; common fine and medium pores; few pebbles; extremely acid; clear, smooth boundary,

B21t—15 to 25 inches, strong-brown (7.5YR 5/6) silty clay loam with common, fine, faint mottles of reddish brown (5YR 4/4) and brown (10YR 5/3); moderate, medium, subangular blocky structure; olive-brown (2.5Y 4/4), degraded, patchy clay films on ped faces; friable; plentiful roots; few fine pores; few pebbles; some ped faces are gray silt; extremely acid; abrupt, smooth boundary.

Bx1—25 to 31 inches, dark-brown (7.5YR 3/4) coarse silty clay loam; fragipan with moderate prismatic structure breaking to moderate, medium, angular blocky peds that, in turn, break into thin laminae; dark-gray (10YR 4/1) and black, manganese-stained, irregular clay films 1 to 5 millimeters thick on prism faces; firm; few roots on prism faces; few pebbles; common fine pores; extremely acid; clear, smooth boundary.

Bx2—31 to 56 inches, yellowish-brown (10YR 5/4) coarse silty clay loam with few, medium, distinct mottles of gray (10YR 5/1); fragipan with weak, very coarse, prismatic structure breaking to weak thick platy (plates appear to be laminae); gray (10YR 5/1) clay films 1 to 2 millimeters thick on prism faces; thin stains of black manganese on films, and thin, dark reddish-gray (5YR 4/2) clay films on laminae; firm; plentiful roots on prism faces; common fine and medium pores; 10 percent fine gravel except in silty layer in center of horizon; very strongly acid; clear boundary.

IIB3—56 to 71 inches, brown (10YR 4/3) gravelly silty clay loam; weak, fine, subangular blocky structure; thin, dark grayish-brown (10YR 4/2) clay coatings on fine peds and in pores; firm; roots common; common fine and medium pores; 25 percent channery fragments and small, flat, rounded pebbles; medium acid; abrupt, smooth boundary.

The Ap horizon is dark brown or dark grayish brown. The upper B horizon is silty clay loam or clay loam and has grayish mottles at a depth of 18 to 26 inches. Texture of the lower B horizon ranges from silty clay loam to gravelly sandy loam. Bedrock occurs at a depth of 4 feet or more. In places where the Monongahela soils are on higher benches, chroma is higher than that given for the representative soil.

Muskingum series

The Muskingum series consists of well-drained soils of the uplands that developed from siltstone. These soils are channery silt loam or silt loam, have a nonskeletal B horizon, and are very strongly acid or extremely acid. They are similar to the Weikert soils, which have a skeletal B horizon. The Muskingum soils have a thinner, less sandy solum than the Dekalb soils.

Representative profile of a Muskingum channery silt loam in a forested area (Wayne Township, SE. corner of SE¼ sec. 16, T. 13 N., R. 3 W.):

A1—0 to 1½ inches, dark-brown (10YR 3/3) channery silt loam; weak, medium to fine, granular structure; very friable; 10 percent channery fragments of siltstone; very strongly acid; abrupt, smooth boundary.

A2—1½ to 7 inches, brown (10YR 4/3) channery silt loam; weak, fine, granular structure; friable; 15 percent channery fragments of siltstone; very strongly acid; clear, smooth boundary.

B2—7 to 16 inches, yellowish-brown (10YR 5/4) channery silt loam; weak, medium, subangular blocky structure; friable; plentiful roots; 25 percent channery fragments of siltstone; very strongly acid; clear, smooth boundary.

C—16 to 20 inches, yellowish-brown (10YR 5/4) siltstone bedrock with some silt loam material between thin layers of bedrock; bedrock is rotted so that fragments, when rubbed, crush easily to fine material; few roots; very strongly acid; gradual boundary.

R—20 to 24 inches, weathered olive (5Y 4/3) siltstone bedrock; a few roots in cracks; very strongly acid.

The solum ranges from dark brown to yellowish brown in color and from 15 to 25 inches in thickness. It is very strongly acid or extremely acid. The depth to bedrock ranges from 20 to 30 inches.

Negley series

The Negley series consists of deep, well-drained soils that developed from glacial outwash. Associated with these soils are the well drained Parke soils and the moderately well drained Rainsboro soils. The Negley soils are more deeply leached than the Chili soils, which developed in glacial material of Wisconsin age.

Representative profile of a Negley gravelly loam in a forested area (CO–100; Center Township, SE¼NE¼ sec. 20, T. 14 N., R. 3 W.):

A1—0 to 1 inch, black (10YR 2/1) gravelly sandy loam; weak, very fine, granular structure; friable; 20 percent pebbles; strongly acid; abrupt, wavy boundary.

A2—1 to 9 inches, yellowish-brown (10YR 5/4) gravelly loam; weak, very fine, granular structure; friable; 20 percent pebbles; extremely acid; abrupt, smooth boundary.

B1t—9 to 11 inches, dark yellowish-brown (10YR 4/4) gravelly loam; weak, fine, angular blocky structure; brown (7.5YR 4/4), degraded clay on ped faces; friable; 30 percent gravel, extremely acid; clear, wavy boundary.

B21t—11 to 28 inches, dark-brown (7.5YR 4/4) gravelly clay loam to sandy clay loam with common, coarse stains of black manganese; moderate, medium, angular to subangular blocky structure; thin, reddish-brown (5YR 4/4) clay coatings on all pebbles; firm in place but friable when disturbed; 50 percent gravel with thin, reddish-brown (5YR 4/4) clay coatings on all pebbles; extremely acid; gradual boundary.

B22t—28 to 39 inches, dark-brown (7.5YR 4/4) gravelly sandy clay loam; weak, medium and fine, angular blocky structure; firm in place but friable when disturbed; 60 percent gravel with thin, reddish-brown (5YR 4/4) clay coatings on pebbles; very strongly acid; clear, wavy boundary.

B23—39 to 72 inches, dark-brown (7.5YR 4/4) gravelly sandy loam; very weak, medium and fine, angular blocky structure; friable; 60 percent gravel with thin clay coatings on pebbles, in pores, and as bridges between sand grains; very strongly acid; abrupt, smooth boundary.

B3—72 to 99 inches, dark yellowish-brown (10YR 4/4) gravelly sandy loam; weak, coarse, angular blocky structure; friable; 30 percent gravel; thin clay films on pebbles and as bridges between sand grains; very strongly acid; abrupt, smooth boundary.

C1—99 to 135 inches, brown (10YR 5/3) gravelly loamy sand; single grain; noncoherent; 40 percent gravel; very strongly acid.

C2—135 to 267 inches, brown (10YR 5/3) gravelly sandy loam; single grain; noncoherent; 70 percent gravel; slightly acid.

C3—267 to 300 inches, dark grayish-brown (10YR 4/2) gravelly sandy loam; strong effervescence; $CaCO_3$ equivalent 2.4 percent (lab). Pebble count at 300-inch depth (311 pieces): 40 percent sandstone, 11 percent siltstone, 15 percent limestone, 9 percent quartzite and quartz, 4 percent granite, 14 percent concretions, 6 percent chert, and 1 percent gneiss schist.

The B horizon ranges from 35 to 100 inches in thickness, from gravelly sandy loam to gravelly sandy clay loam in texture, and from dark brown to yellowish brown or dark yellowish brown in color. The depth to calcareous material ranges from 15 to 25 feet.

Olmsted series

The Olmsted series consists of very poorly drained soils that developed from slightly limy glacial outwash in depressional areas on terraces. These soils have a textural B horizon and are slightly acid or neutral. Associates in the same drainage sequence are the well drained Chili soils, the moderately well drained Bogart soils, the somewhat poorly drained Jimtown soils, and the poorly drained Damascus soils. The Olmsted soils have a coarser textured solum than the Luray and Lorain soils.

Representative profile of Olmsted silt loam (Fairfield Township, SE¼NE¼ sec. 11, T. 12 N., R. 2 W.):

Ap—0 to 10 inches, very dark brown (10YR 2/2) silt loam; moderate, coarse, granular structure; friable; 5 percent pebbles; medium acid; abrupt, wavy boundary.

B21tg—10 to 14 inches, grayish-brown (2.5Y 5/2) loam with many, coarse, dark yellowish-brown (10YR 4/4) mottles and few black manganese stains; weak, medium, subangular blocky structure; very thin, degraded, grayish-brown (2.5Y 5/2) clay films on ped faces; friable; plentiful roots; few fine pores; 5 percent pebbles; few lenses of sandy loam; medium acid; abrupt, wavy boundary.

B22tg—14 to 19 inches, grayish-brown (2.5Y 5/2) loam with many, coarse, brown (7.5YR 4/4) mottles and few black manganese stains; weak, medium, angular blocky structure; thin, degraded, grayish-brown (2.5Y 5/2) clay films on vertical and horizontal ped faces; less friable than horizon above; few roots; common medium pores; 5 percent pebbles; less sand than B21tg horizon; slightly acid; gradual, smooth boundary.

B23tg—19 to 25 inches, grayish-brown (2.5Y 5/2) fine loam with many, medium, brown (7.5YR 4/4) mottles and common black concretions; moderate, medium and fine, angular blocky structure; thin, grayish-brown (2.5Y 5/2) clay films cover about 60 percent of the horizontal and vertical ped faces; friable but more nearly firm than B22tg horizon; no roots; common medium and fine pores; 5 percent pebbles; small bodies of bog iron ore are forming; neutral; clear, smooth boundary.

B24tg—25 to 32 inches; dark grayish-brown coarse loam with many, coarse, brown (7.5YR 4/4) and grayish-brown (2.5Y 5/2) mottles; weak, very thick, platy structure breaking to very weak, medium, angular blocky; moderate, grayish-brown (2.5Y 5/2) clay films cover about 60 percent of the vertical and horizontal ped faces; common coarse to fine pores with clay films; 10 percent pebbles; abrupt, wavy boundary.

B3g—32 to 44 inches, mottled gray (10YR 5/1) and brown (7.5YR 4/4) gravelly loam; weak, medium, angular and subangular blocky structure; thick patchy clay films on horizontal ped faces; friable when moist, slightly sticky when wet; many medium pores with clay flows; 15 percent pebbles; neutral; abrupt, smooth boundary.

IIC—44 to 57 inches, mottled gray (5/0) and brown (7.5YR 4/4) clay loam; massive; friable when moist, sticky when wet; 10 percent pebbles; neutral; material is water deposited but contains too much clay for typical outwash.

The Ap horizon is very dark brown or black and, in some places, is loam. The B horizon ranges from gray to brown and is mottled with yellowish brown to reddish brown. In the B horizon the texture generally is gravelly loam or loam, but there are a few thin strata of silty clay loam to clay loam or of gravelly sandy loam. Unconformable layers of fine-textured material are common. Thickness of the solum ranges from 30 to 45 inches.

Orrville series

In the Orrville series are somewhat poorly drained soils that formed in alluvium. The alluvium washed from soils on uplands that are dominated by acid glacial till and by the underlying sandstone, siltstone, and shale materials. Orrville soils are loam or silt loam throughout and are medium acid or slightly acid. Associates in the same drainage sequence are the very poorly drained Papakating soils, the poorly drained Wayland soils, the moderately well drained Lobdell soils, and the well drained Chagrin soils.

Representative profile of Orrville silt loam in a brushy area (Center Township, NW¼NE¼ sec. 15, T. 14 N., R. 3 W.):

Ap—0 to 12 inches, dark-brown (10YR 3/3) silt loam; moderate, fine, granular structure; friable; abundant roots; medium acid; clear, smooth boundary.

C1g—12 to 15 inches, dark-brown (10YR 3/3) silt loam with many, fine, faint mottles of gray (10YR 5/1); massive; friable; abundant roots; medium acid; abrupt, smooth boundary.

C2g—15 to 23 inches; dark grayish-brown (10YR 4/2) silt loam with many, medium, prominent mottles of dark reddish brown (5YR 3/5) and grayish rown (10YR 5/2); massive; friable to firm; plentiful roots; medium acid; abrupt, smooth boundary.

C3g—23 to 32 inches, dark reddish-brown (2.5YR 3/4) loam with many, coarse, prominent mottles of dark reddish gray (5YR 4/2); this horizon has many iron concretions; massive; friable; plentiful roots; medium acid; abrupt, smooth boundary.

C4g—32 to 45 inches, very dark gray (N 3/0) silt loam; massive; friable; medium acid.

In some places the A horizon is dark gray to dark grayish brown. The depth to mottling ranges from 8 to 15 inches.

The definition of the Orrville series is being studied over a general area larger than Columbiana County. At the conclusion of the study, the name Orrville may not be retained for soils having the foregoing characteristics.

Papakating series

The Papakating series consists of very poorly drained soils that lie on flood plains and formed in acid glacial material derived mostly from sandstone, siltstone, and shale. These soils are loam to silty clay loam throughout the solum and are medium acid or slightly acid. Associates in the same drainage sequence are the well drained Chagrin soils, the moderately well drained Lobdell soils, the somewhat poorly drained Orrville soils, and the poorly drained Wayland soils.

Representative profile of Papakating silty clay loam in a swampy area (Salem Township, NW. corner of SW¼ sec. 14, T. 15 N., R. 3 W.):

A11—0 to 5 inches, very dark brown (10YR 2/2) silty clay loam with common, fine, faint mottles of dark brown (7.5YR 4/4); moderate, fine, granular structure; friable; abundant roots; many coarse pores; slightly acid; clear, smooth boundary.

A12—5 to 13 inches, black (10YR 2/1) clay loam with common, fine, faint mottles of dark brown (10YR 4/3); moderate, coarse, granular structure; abundant roots; few coarse pores; slightly acid; clear, smooth boundary.

C1g—13 to 16 inches, black (5Y 2/1) clay loam with common, medium, distinct mottles of dark grayish brown

(2.5Y 4/2); firm; abundant roots; few fine pores; few pebbles; slightly acid; clear, wavy boundary.

C2g—16 to 21 inches, dark grayish-brown (2.5Y 4/2) loam with many, coarse, distinct mottles of yellowish brown (10YR 5/6); moderate, medium, angular blocky structure; firm; plentiful roots; few fine pores; 8 percent coarse pebbles; slightly acid; abrupt smooth boundary.

IIC3g—21 to 26 inches, dark grayish-brown (10YR 4/2) gravelly loam with common, fine, faint mottles of brown (10YR 5/3); friable; plentiful roots; 60 percent gravel; slightly acid.

The soil described in the representative profile has a thicker, darker A horizon than that typical for the series in other areas. The A horizon is very dark brown, black, or very dark gray. The C1g and C2g horizons range from silty clay loam to loam and from gray to black.

Parke series

The Parke series consists of well-drained soils that developed from silty material 10 to 25 inches thick over glacial outwash. Associates in the same drainage sequence are the well drained Negley soils and the moderately well drained Rainsboro soils. The Parke soils are more weathered than the Chili soils and have a thicker B horizon.

Representative profile of a Parke silt loam in a field of alfalfa (CO–29; Liverpool Township, center of sec. 18, T. 5 N., R. 1 W.):

A1—0 to 2 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, very fine, crumb structure; friable; 3 percent pebbles; neutral (field limed); abrupt, smooth boundary.

A2—2 to 10 inches, dark-brown (10YR 4/3) silt loam with few, coarse, faint stains of very dark gray (10YR 3/1); weak, fine, crumb structure; friable; 3 percent pebbles; very strongly acid; abrupt, smooth boundary.

B1—10 to 16 inches, dark-brown (7.5YR 4/4) silt loam; moderate, medium, subangular blocky structure; friable; 1 percent pebbles; very strongly acid; clear, smooth boundary.

B21t—16 to 23 inches, dark-brown (7.5YR 4/4) fine silt loam with common, fine, black manganese stains; moderate, medium, subangular blocky structure; very thin, reddish-brown (5YR 5/4) clay films on ped faces; friable; 3 percent pebbles; very strongly acid; clear, smooth boundary.

IIB22t—23 to 44 inches, yellowish-red (5YR 4/6) sandy clay loam; strong, coarse, angular blocky structure; very thin, reddish-brown (5YR 4/4) and black stains of manganese on clay ped faces; firm; 10 percent rotted pebbles; very strongly acid; gradual, smooth boundary.

IIB23t—14 to 92 inches, yellowish-red (5YR 4/6) gravelly sandy clay loam to gravelly sandy loam with common, medium, black manganese stains 1 millimeter thick; moderate, very coarse, subangular blocky structure breaking to thick, platy; yellowish-red (5YR 4/6) clay films on horizontal ped faces; firm; 30 percent rotted pebbles and a few fragments of plinthite; very strongly acid; gradual boundary.

IIB3—92 to 108 inches, strong-brown (7.5YR 4/6) gravelly loamy sand with many, coarse, faint mottles of dark yellowish brown (10YR 4/4); black manganese-stained ped faces; very weak, coarse, subangular blocky structure; firm in place, friable when disturbed; 50 percent rotted pebbles coated with clay; strongly acid; gradual boundary.

IIC1—108 to 120 inches, dark-brown (10YR 4/3) gravelly loamy sand with many, coarse, black manganese stains; single grain (structureless); slightly firm in place, very friable when disturbed; 70 percent rotted pebbles, which crush in the fingers when rubbed; strongly acid; gradual boundary.

IIC2—120 to 204 inches, dark reddish-brown (5YR 4/4) gravelly sandy loam; single grain (structureless); very friable to noncoherent at a 204-inch depth; 70 percent pebbles that increase in hardness at a 204-inch depth; pebble count of 950 pieces: 69 percent oxidized sandstone and siltstone that break in fingers, 6 percent chert ghosts, 12 percent strongly altered quartzite, 9 percent ghosts of granite and other crystalline rocks, and 4 percent concretions; strongly acid; gravel extends to estimated depth of 40 feet; large masses of plinthite are in gravelly glacial outwash at depth of 20 to 30 feet.

The A horizon is brown, dark brown, or very dark grayish brown. In some places the B horizon is yellowish brown, and in places it is loam or silty clay loam.

Purdy series

The Purdy series is made up of poorly drained soils that developed in alluvium derived from sandstone and shale in the unglaciated part of the county. Associates in the same drainage sequence are the well drained Allegheny soils, the moderately well drained Monongahela soils, the somewhat poorly drained Tyler soils, and the very poorly drained Chilo soils. The Purdy soils are more deeply leached than the Sebring soils.

Representative profile of Purdy silt loam in a pastured area (CO–57; St. Clair Township, SW¼ sec. 6, T. 6 N., R. 1 W.):

Ap—0 to 9 inches, gray (10YR 5/1) silt loam with many, small, black and brown concretions of iron; weak, thick, platy structure breaking to weak, very fine, subangular blocky peds; friable; abundant roots; 10 percent concretions; very strongly acid; abrupt, smooth boundary.

A2g—9 to 13 inches, pale-brown (10YR 6/3) silt loam with many, fine, distinct mottles of strong brown (7.5YR 5/8); weak, thick, platy structure breaking to strong, fine, subangular blocky peds; grayish-brown (10YR 5/2) films on ped faces; friable when moist, slightly hard when dry; plentiful roots; 40 percent concretions; very strongly acid; abrupt, wavy boundary.

B1tg—13 to 17 inches, grayish-brown (10YR 5/2) coarse silty clay loam with many, medium, distinct mottles of brown (7.5YR 4/4); moderate, coarse and medium, prismatic structure breaking to moderate, fine, subangular blocky peds; grayish-brown (10YR 5/2) silty clay films 3 millimeters thick on ped faces; firm; plentiful roots on ped faces; many medium pores with clay flows; no pebbles; very strongly acid; abrupt, smooth boundary.

Bx1—17 to 22 inches, strong-brown (7.5YR 4/6) light silty clay loam with many, medium, prominent mottles of grayish brown (10YR 5/2); fragipan with moderate, very coarse and medium, prismatic structure breaking to moderate, coarse, angular structure and very thick, platy peds; grayish-brown (10YR 5/2) coatings 5 millimeters thick on vertical ped faces; very firm; roots common on prism faces; many medium pores; very strongly acid; clear, smooth boundary.

Bx2—22 to 26 inches, mottled strong-brown (7.5YR 5/6) and grayish-brown (10YR 5/2) light silty clay loam; moderate, very coarse, angular blocky structure within very coarse prisms; grayish-brown (10YR 5/2) clayey coatings 8 millimeters thick on prism faces; firm; no roots; common medium pores; no pebbles; weak fragipan; prism tends to break along horizontal cleavage; very strongly acid; clear, smooth boundary.

Bx3—26 to 39 inches, mottled reddish-brown (5YR 4/4) and grayish-brown (10YR 5/2) light silty clay loam; very coarse prismatic structure breaking to moderate, very coarse, angular blocky; grayish-brown (10YR 5/2) clayey coatings 8 millimeters thick on ped faces; firm; few fine pores; no pebbles; very strongly acid; clear, smooth boundary.

Bx4—39 to 58 inches, yellowish-brown (10YR 5/4) silty clay loam; prism faces coated with gray (10YR 5/1) clay, 1 millimeter thick, that has coarse stains of manganese; strong fragipan with strong, coarse, prismatic structure breaking to strong, very thick, platy; firm; no roots; common fine pores; 5 percent pebbles; strongly acid; gradual boundary.

Bx5—58 to 73 inches, yellowish-brown (10YR 5/4) silty clay loam with common, fine, faint mottles of light brownish gray (10YR 6/2) and strong brown (7.5YR 5/6); prism faces of grayish-brown (10YR 5/2) clay, 1 millimeter thick, and thin plate faces of light olive brown (2.5Y 5/4) with coarse manganese stains; fragipan with strong, very coarse, prismatic structure breaking to strong, very thick, platy; firm; no pores; no pebbles; medium acid; gradual boundary.

The Ap horizon is gray to dark gray. The upper B horizon ranges from silt loam to silty clay loam. Texture in the fragipan is silty clay loam to gravelly loam.

Rainsboro series

The Rainsboro series consists of moderately well-drained soils that have a fragipan. These soils developed from silty material 10 to 25 inches thick over gravelly glacial outwash of Illinoian and pre-Illinoian ages. Associated soils are those of the well-drained Negley series and the well-drained Parke series. The Rainsboro soils are more deeply leached and weathered than the Bogart soils.

Representative profile of a Rainsboro silt loam in a pastured area (Middleton Township, SE¼ sec. 26, T. 7 N., R. 1 W.):

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

B1—10 to 13 inches, yellowish-brown (10YR 5/4) silt loam; weak, medium, platy structure breaking to weak, medium and fine, subangular blocky structure; friable; few pebbles; strongly acid; clear, smooth boundary.

B21—13 to 19 inches, yellowish-brown (10YR 5/4) fine silt loam; moderate, medium and fine, subangular blocky structure; friable; plentiful roots; few pebbles; strongly acid; abrupt, wavy boundary.

B22t—19 to 24 inches, yellowish-brown (10YR 5/4) fine silt loam with many, coarse, reddish-brown (5YR 4/4) and light brownish-gray (10YR 6/2) mottles; weak, medium, platy structure breaking to weak, medium, subangular blocky structure; thin, degraded, dark yellowish-brown (10YR 4/4) clay films on ped faces and patchy, degraded, dark-brown (7.5YR 4/4) clay films; friable; plentiful roots; few pebbles; strongly acid; clear, irregular boundary.

IIBx1—24 to 32 inches, dark-brown (7.5YR 4/4) silt loam to loam with many, medium, gray (10YR 5/1) mottles and few manganese stains; weak, coarse, angular blocky structure; thick, degraded, reddish-gray (5YR 5/2) clay films on ped faces and gray (5YR 5/1) clay films 5 millimeters thick in seams; firm; few pebbles; horizon is laminated; strongly acid; clear boundary.

IIBx2—32 to 43 inches, dark-brown (7.5YR 4/4) fine loam with common, medium, grayish-brown (10YR 5/2) mottles; weak, medium, platy structure; gray (10YR 6/1) vertical silty clay loam seams 20 millimeters thick; thin, brown (10YR 4/3) clay coats on horizontal ped faces; firm; 5 percent pebbles; strongly acid.

IIIB2—43 to 47 inches, dark yellowish-brown (10YR 4/4) coarse gravelly sandy loam with many, coarse, pale-brown (10YR 6/3) mottles; weak, coarse, subangular blocky structure; clay bridges on the sand grains; friable; 25 percent pebbles; very strongly acid.

IVC1—47 to 56 inches, dark-brown (7.5YR 3/4) fine sandy loam; massive; very friable; few pebbles; very strongly acid.

VC2—56 to 71 inches, yellowish-red (5YR 4/6) sandy loam with common, coarse, reddish-yellow (5YR 6/6) stains; massive; very friable; gravelly layer in lower part; very strongly acid.

The A horizon ranges from dark grayish brown to brown. The upper B horizon ranges from silt loam to gravelly sandy clay loam and generally is dark brown to reddish brown. In most places the lower B horizon and the substratum contain layers of glacial till or fine-textured material. The depth to bedrock ranges from 10 to 30 feet. Normally, Rainsboro soils are strongly acid or very strongly acid.

Ravenna series

The Ravenna series consists of somewhat poorly drained soils that developed from slightly limy loam till. Associates in the same drainage sequence are the well drained Wooster soils, the moderately well drained Canfield soils, the poorly drained Frenchtown soils, and the very poorly drained Marengo soils. The Ravenna soils do not have the fine-textured B horizon that characterizes the Wadsworth soils.

Representative profile of a Ravenna silt loam in an idle area (CO-25; Fairfield Township, near center of sec. 30, T. 12 N., R. 2 W.):

A1—0 to 1 inch, black (10YR 2/1) silt loam; moderate, very fine, granular structure; very friable when moist; abundant roots; very strongly acid; abrupt, smooth boundary.

A2—1 to 11 inches, brown (10YR 4/3) silt loam with few, fine, faint mottles of dark yellowish brown (10YR 4/4) and black ferromanganese; moderate, fine, crumb structure; very strongly acid; friable when moist; abundant roots; 10 percent pebbles; abrupt, smooth boundary.

B21—11 to 15 inches, mottled yellowish-brown (10YR 5/6) and pale-brown (10YR 6/3) silt loam; mottles are many, medium, and faint; moderate, coarse, subangular blocky structure breaking to moderate, medium, subangular blocky; friable; few roots; 10 percent pebbles; very strongly acid; abrupt, smooth boundary.

Bx1—15 to 24 inches, mottled strong-brown (7.5YR 4/6) and pale-brown (10YR 6/3) loam; mottles are many, coarse, and prominent; fragipan with strong, coarse, prismatic structure breaking to strong, medium, subangular blocky; grayish-brown (10YR 5/2) clayey coatings 3 millimeters thick on prism faces; firm in place; friable when disturbed; 10 percent pebbles; strongly acid; clear, smooth boundary.

Bx2—24 to 32 inches, mottled brown (7.5YR 4/4) and gray (10YR 6/1) loam; mottles are many, coarse, and prominent; fragipan with moderate, coarse, subangular blocky peds; gray (10YR 6/1) clayey coatings 5 millimeters thick on prism faces; firm; few roots; very strongly acid; 10 percent pebbles; clear, smooth boundary.

Bx3—32 to 48 inches, brown (10YR 4/3) loam with common, fine, prominent mottles of light reddish-brown (5YR 6/4) and light brownish gray (10YR 6/2); fragipan with strong, very coarse, prismatic structure breaking to weak, coarse, subangular blocky structure; gray (10YR 6/1) clayey coatings 5 millimeters thick on prism faces; friable; few roots on prism faces; 20 percent pebbles; very strongly acid.

C1—48 to 70 inches, brown (10YR 4/3) loam; strong, very coarse, prismatic structure breaking to weak, coarse, subangular blocky structure; gray (10YR 5/1) coatings on prism faces; friable; few roots; 20 percent pebbles; slightly acid in upper part and neutral in lower part.

C2—70 to 96 inches, dark yellowish-brown (10YR 4/4) loam; massive (structureless) breaking to subangular blocky peds; firm in place, friable when disturbed; 20 percent pebbles; mildly alkaline; weakly calcareous.

The A horizon is silt loam or loam. The B horizon generally is brown or yellowish brown. The depth of leaching ranges from 45 to 100 inches. Bedrock is 5 feet or more below the surface. Ravenna soils have pale-brown mottles and grayish films on ped faces, a textured B horizon at a depth of 11 to 32 inches, and a fragipan.

Rittman series

In the Rittman series are moderately well drained soils that developed from slightly limy clay loam till. Associates in the same drainage sequence are the somewhat poorly drained Wadsworth soils, the poorly drained Frenchtown soils, and the very poorly drained Marengo soils. The Rittman soils have a finer textured solum than the Canfield soils, which developed from loam till.

Representative profile of a Rittman silt loam in a cultivated area (Knox Township, SE¼ sec. 20, T. 17 N., R. 5 W.):

Ap—0 to 7 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, medium, granular structure; friable; 5 percent pebbles; slightly acid; abrupt, smooth boundary.

B11t—7 to 10 inches, yellowish-brown (10YR 5/4) and brown (7.5YR 4/4) silt loam; moderate, medium, subangular blocky structure; very thin, yellowish-brown (10YR 5/4) clay films on ped faces; friable; abundant roots; 5 percent pebbles; strongly acid; clear, smooth boundary.

B12t—10 to 14 inches, yellowish-brown (10YR 5/4) clay loam; strong, medium, subangular blocky structure; very thin, dark-gray (10YR 4/1) clay films on peds; friable when moist, nonplastic when wet; roots abundant; 5 percent pebbles; strongly acid; abrupt, smooth boundary.

B21t—14 to 17 inches, dark-brown (7.5YR 4/4) clay loam with many, fine, dark grayish-brown (10YR 4/2) mottles; strong, coarse, angular blocky structure breaking to strong, medium, angular blocky; dark grayish-brown (10YR 4/2) clay films 1 millimeter thick on ped faces; very firm when moist, slightly plastic when wet; plentiful roots; very strongly acid; 5 percent pebbles; gradual, smooth boundary.

B22t—17 to 22 inches, dark yellowish-brown (10YR 3/4) clay loam; very strong, coarse, angular blocky structure breaking to very strong, medium, angular blocky; dark grayish-brown (10YR 4/2) vertical clay films and dark-brown (10YR 4/3) horizontal clay films, both 1 millimeter thick, and black manganese stains on ped faces; very firm; plentiful roots; 5 percent pebbles; very strongly acid; gradual, smooth boundary.

Bx1—22 to 34 inches, dark-brown (10YR 3/3) clay loam; strong fragipan with strong, coarse and medium, angular blocky peds; thin, discontinuous, dark grayish-brown (10YR 4/2) clay films on the vertical ped faces, dark-brown (7.5YR 3/4) clay films on the horizontal ped faces, and many black manganese stains on all ped faces; very firm when moist, nonplastic when wet; few roots on vertical ped faces; 5 percent pebbles; strongly acid; gradual, smooth boundary.

Bx2—34 to 41 inches, dark grayish-brown (10YR 4/2) clay loam; fragipan with strong, coarse, angular blocky structure; very thin, dark-brown (10YR 3/3) clay films and black manganese stains on ped faces; very firm; no roots; 5 percent pebbles; neutral; clear, smooth boundary.

Bx3—41 to 49 inches, dark-brown (10YR 4/3) clay loam; strong, medium, angular blocky structure; very thin, dark grayish-brown (10YR 4/2) clay films on ped faces; firm; 5 percent pebbles; mildly alkaline.

C—49 to 78 inches, olive-brown (2.5Y 4/3) clay loam with gray and yellowish-brown vertical streaks; few clay seams in upper part; massive; firm; 5 percent pebbles; large soft concretions of lime; mildly alkaline.

The B horizon is clay loam, silt loam, or silty clay loam, and it is yellowish brown, dark yellowish brown, brown, dark brown, or dark grayish brown. This horizon is strongly acid or very strongly acid to a depth of 30 inches and is calcareous at a depth of 40 to 60 inches.

Sebring series

The Sebring series consists of poorly drained soils that developed from deposits of medium-textured lacustrine materials in nearly level areas on terraces and the glacial till plain. Associates in the same drainage sequence are the moderately well drained Glenford soils, the somewhat poorly drained Fitchville soils, and the very poorly drained Luray soils. The Sebring soils developed from finer textured materials than the Damascus soils.

Representative profile of Sebring silt loam in a pastured area (Knox Township, center of SE¼ sec. 9, T. 17 N., R. 5 W.):

A1—0 to 1 inch, very dark brown (10YR 2/2 silt loam.

A2g—1 to 8 inches, grayish-brown (10YR 5/2) silt loam with common, fine, faint mottles of yellowish brown (10YR 5/4); weak, medium, granular structure; friable; abundant roots; 5 percent glacial pebbles; horizon contains brown and black (buckshot) concretions; very strongly acid; abrupt, smooth boundary.

B1g—8 to 11 inches, mottled yellowish-brown (10YR 5/6) and grayish-brown (10YR 5/2) silt loam; fine subangular blocky structure; degraded, light olive brown (2.5Y 5/3), thin silty films on ped faces; friable; plentiful roots; many fine and medium pores; 5 percent pebbles; very strongly acid; abrupt, smooth boundary.

B21tg—11 to 17 inches, mottled strong-brown (7.5YR 5/6) and gray (10YR 5/1) silty clay loam; moderate, medium, angular blocky structure; degraded, gray (10YR 5/1) and light brownish-gray (10YR 6/12) silty clay films 3 millimeters thick on ped faces; friable when moist, slightly sticky when wet; few roots; common fine pores; very strongly acid; clear, smooth boundary.

B22tg—17 to 21 inches, brown (10YR 4/3) silty clay loam with common, fine, faint mottles of gray (10YR 5/1); moderate, medium, angular blocky structure breaking into moderate, very fine, angular blocky peds; gray (10YR 5/1) clay films 1 millimeter thick on ped faces; very firm; few roots on ped faces; few fine pores; very strongly acid; gradual, smooth boundary.

B23g—21 to 28 inches, brown (10YR 4/3) silty clay loam with weak, very coarse, prismatic structure and moderate, medium, angular blocky structure breaking into weak, fine, angular blocky peds; degraded, gray (5Y 5/1) clay films 1 millimeter thick on ped faces; very firm; no roots; few fine pores; brown stains in the pattern of fine roots; slightly acid; gradual, smooth boundary.

B24g—28 to 36 inches, brown (10YR 4/3) silty clay loam; weak, coarse, angular blocky structure breaking into weak, fine, angular blocky; degraded, gray (2.5Y 5/1) clay films 1 millimeter thick on ped faces; less firm than horizon above; no roots; few fine pores;

neutral; horizon includes some layers of silt; gradual, smooth boundary.

B3g—36 to 43 inches, brown (10YR 4/3) silty clay loam; weak, coarse, angular blocky structure breaking into weak, fine, angular blocky; gray (N 5/0) clay films 3 millimeters thick on ped faces; firm; few fine pores; neutral; abrupt, smooth boundary.

IIC—43 to 60 inches, brown (10YR 5/3) loamy sand; single grain; noncoherent; 3 percent glacial pebbles; slightly acid; horizon consists of sandy outwash.

The A horizon ranges from silt loam to silty clay loam in texture and from dark gray to grayish brown or very dark brown in color. It has weak to moderate, medium, granular structure. The B horizon ranges from loam to silty clay loam. It is strong brown or brown to yellowish brown and has grayish mottles. Structure in the B horizon is moderate, medium, subangular blocky or weak, coarse, angular blocky. The solum is strongly acid or very strongly acid to a depth of 20 to 30 inches; below that depth it is slightly acid or neutral.

Summitville series

The Summitville series consists of moderately well drained soils that developed from mixed materials derived from red clay shale, sandstone, and siltstone. In texture the Summitville soils are similar to the Wharton soils, which developed from black clay shale, and to the Guernsey soils, which developed from mixed limestone, sandstone, and shale materials and are browner and less red than the Summitville soils.

Representative profile of a Summitville silt loam in a pastured area (CO–96; Wayne Township, near center of NE¼ sec. 28, T. 13 N., R. 3 W.):

Ap—0 to 7 inches, thick, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; friable; 1 percent channery fragments; very strongly acid; abrupt, smooth boundary.

A2—7 to 11 inches, brown (10YR 5/3) silt loam with common, coarse, faint mottles of yellowish brown (10YR 5/6) and a few manganese stains; weak, fine, angular blocky structure; friable; roots abundant; 5 percent channery fragments of sandstone and siltstone; very strongly acid; abrupt, wavy boundary.

B21t—11 to 14 inches, strong-brown (7.5YR 5/6) silty clay loam with many, fine, faint variegations of dark brown (7.5YR 4/4); moderate, medium, subangular blocky structure breaking to moderate, fine, angular blocky; very thin, yellowish-brown (10YR 5/4) silty films on ped faces; friable when moist, sticky when wet; roots common; 5 percent channery fragments of sandstone and siltstone; very strongly acid; abrupt, wavy boundary.

B22—14 to 18 inches, reddish-brown (5YR 4/3) coarse clay with many, fine, faint mottles of reddish gray (5YR 5/2); moderate, medium, subangular blocky structure breaking to moderate, fine, angular blocky; thin, brown (7.5YR 5/2), degraded clay films on ped faces; friable when moist, slightly sticky when wet; few roots; common fine and medium pores; 10 percent channery fragments of siltstone and sandstone; very strongly acid; clear, smooth boundary.

B23t—18 to 25 inches, reddish-brown (2.5YR 4/4) channery coarse clay with many, medium, distinct mottles of reddish gray (5YR 5/2) and brown (7.5YR 4/4) and fine manganese stains; weak, medium, angular blocky structure breaking to strong, fine, angular blocky; thin, reddish-gray, degraded clay films on ped faces; firm; sticky; roots occasional; many medium pores; 15 percent channery fragments of siltstone; very strongly acid; clear boundary.

IIB24—25 to 30 inches, weak-red (2.5YR 4/2) clay with common, coarse, distinct mottles of reddish brown and few, coarse manganese stains; moderate, medium, angular blocky structure breaking to strong, fine, angular blocky; thin clay films on ped faces; firm when moist, sticky when wet; no roots; very strongly acid; interlaced with brown zone.

IIB25—30 to 34 inches, yellowish-brown (10YR 5/6) silty clay with many, coarse, prominent mottles of gray (N 6/0); moderate, medium, angular blocky structure breaking to strong, fine, angular blocky; thin, dark reddish-gray (5YR 4/2) clay films on ped faces; firm when moist, slightly sticky when wet; 5 percent channery fragments of sandstone; very strongly acid; wavy boundary.

C—34 to 50 inches, weak-red (10R 4/2) clay; massive; very firm when moist, sticky and very plastic when wet; neutral.

The solum ranges from 30 to 60 inches in thickness. The A horizon ranges from dark grayish brown to dark brown. The B horizon ranges from strong brown to yellowish red, from silty clay loam to clay, and from medium acid to very strongly acid. Grayish mottles occur below a depth of 14 to 30 inches. The substratum is calcareous or acid, and it consists of material derived from red clay shale or from brown siltstone, shale, or sandstone.

Titusville series

The Titusville series consists of moderately well drained soils that developed from medium-textured, slightly limy glacial till. Associates in the same drainage sequence are the well-drained Hanover soils and the somewhat poorly drained Gresham soils. The Titusville soils have a more deeply leached solum than the Canfield soils.

Representative profile of a Titusville silt loam in a forested area (CO–143; Center Township, SW¼ sec. 22, T. 14 N., R. 3 W.):

A1—0 to 1 inch, black (10YR 2/1) silt loam; moderate, medium, granular structure; friable; 5 percent glacial pebbles; very strongly acid; abrupt, wavy boundary.

A21—1 to 7 inches, dark grayish-brown (10YR 4/2) silt loam with many brown (10YR 4/3) variegations; moderate, fine, granular structure; friable; 5 percent glacial pebbles; very strongly acid; abrupt, wavy boundary.

A22—7 to 10 inches, yellowish-brown (10YR 5/4) silt loam with many, medium, light olive brown (2.5Y 5/4) variegations; moderate, fine, subangular blocky structure; friable; plentiful roots; 5 percent glacial pebbles; very strongly acid; abrupt, smooth boundary.

B1—10 to 14 inches, yellowish-brown (10YR 5/4) fine silt loam with many, common, light olive brown (2.5Y 5/4) variegations; moderate, medium and fine, subangular blocky structure; degraded, loamy and deeply pitted, light olive brown films on ped faces; friable; plentiful roots; many medium pores; 10 percent glacial pebbles; very strongly acid; clear, smooth boundary.

B21—14 to 19 inches, brown (7.5YR 4/4) fine loam; moderate, medium, angular blocky structure; thin, yellowish-brown (10YR 5/4), degraded and pitted clay films on ped faces; friable but more nearly firm than B1 horizon; plentiful roots; many fine pores; 10 percent glacial pebbles; very strongly acid; abrupt, wavy boundary.

Bx1—19 to 30 inches, consists of two intermingled zones: 75 percent of horizon is brown (10YR 5/3) coarse clay loam with common, gray (10YR 5/1) mottles and black manganese stains; moderate fragipan with moderate, medium and coarse, angular blocky structure; gray and dark-gray (N 5/0 and 4/0) clay films 10 millimeters thick on ped faces; firm; roots occasional on ped faces; common medium pores; 15 percent glacial pebbles; 25 percent of horizon is dark-red (2.5YR 3/6) fine clay loam with common, medium, gray (N 5/0) mottles and black manganese stains; degraded and pitted, grayish, reddish, and brownish clay films on ped faces; other properties are the same as those in the brown zone; strongly acid; clear, wavy boundary.

Bx2—30 to 42 inches, yellowish-brown (10YR 5/4) fine loam with dark-gray (N 4/0) masses of clay, about 5 millimeters thick, encased in or coated by gray (10YR 5/1) loam about 5 millimeters thick; fragipan with weak, thick, platy structure; gray (10YR 5/1) clay films 3 millimeters thick on vertical ped faces; thin, dark grayish-brown (10YR 4/2) clay films on horizontal ped faces; many black manganese stains on all ped faces; firm; few roots on ped faces; few medium pores; 15 percent glacial pebbles; strongly acid; clear, smooth boundary.

Bx3—42 to 47 inches, dark yellowish-brown (10YR 4/4) fine loam; weak, thick, platy structure; dark-gray (N 4/0) outer clay films 1 to 10 millimeters thick with gray (10YR 5/1), clayey inner rinds 5 millimeters thick on vertical ped faces; thin, discontinuous, dark yellowish-brown and black manganese-stained clay films on horizontal ped faces; less firm than Bx2 horizon; roots occasional on ped faces; few coarse pores with clay films; 15 percent glacial pebbles; medium acid; gradual, smooth boundary.

C1—47 to 70 inches, olive-brown (2.5Y 4/4) fine loam with masses of dark-gray (N 4/0) clay surrounded by gray (N 5/0) silty clay loam; weak, very coarse, angular blocky structure; thin, discontinuous, dark reddish-brown (5YR 3/3) and black manganese-stained clay films on horizontal ped faces; friable; no roots; 15 percent glacial pebbles; medium acid; gradual, smooth boundary.

C2—70 to 120 inches, olive-brown (2.5Y 4/3) loam; weak, thick, platy structure; few gray (N 5/0) and dark reddish-brown (5YR 3/3), very thin clay films and few gray (10YR 5/1) clay films 5 millimeters thick; friable; few fine pores; 15 percent glacial pebbles; neutral; gradual boundary.

C3—120 to 168 inches, olive-brown (2.5Y 4/3) loam; massive; friable; 15 percent glacial pebbles; neutral.

C4—168 to 216 inches, dark grayish-brown (2.5Y 4/2) loam; massive; friable; 15 percent glacial pebbles; neutral.

C5—216 to 230 inches, very dark gray (5Y 3/1) loam; massive; friable; 15 percent glacial pebbles; weakly effervescent; blue; unoxidized glacial till.

The A horizon is grayish brown to dark grayish brown. In some places the B horizon is fine loam or silty clay loam. The depth to mottling ranges from 15 to 25 inches, and the depth of leaching ranges from 12 to 18 feet. Bedrock is more than 4 feet below the surface.

Tyler series

The Tyler series consists of somewhat poorly drained soils that developed in medium-textured alluvium on terraces in the unglaciated area of the county. The alluvium was derived from local shale, siltstone, and sandstone. Associates in the same drainage sequence are the well drained Allegheny soils, the moderately well drained Monongahela soils, and the poorly drained Purdy soils. The Tyler soils are more deeply leached than the Fitchville soils.

Representative profile of a Tyler silt loam in a cultivated area (CO-50; St. Clair Township, SE¼SW¼ sec. 6, T. 6 N., R. 1 W.):

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; weak, thin, platy structure; friable; abundant roots; no pebbles; slightly acid; abrupt, smooth boundary.

B1t—7 to 11 inches, mottled dark yellowish-brown (10YR 4/6) and light olive-brown (2.5Y 5/3) silt loam; mottles are many, fine, and faint; weak, medium, subangular blocky structure; grayish-brown (10YR 5/3) films on ped faces; friable; plentiful roots; many fine pores; no pebbles; strongly acid; abrupt, smooth boundary.

B21t—11 to 16 inches, mottled yellowish-brown (10YR 5/6) and light olive-brown (2.5Y 5/3) fine silt loam; mottles are many, medium, and faint; weak, very coarse, subangular blocky structure breaking to weak, medium, subangular blocky peds; thin, patchy, brown (10YR 5/3) silty films on ped faces; friable; plentiful roots; common fine pores; 2 percent pebbles; extremely acid; abrupt, smooth boundary.

Bx1—16 to 21 inches, mottled dark-brown (7.5YR 4/4) and light olive-brown (2.5Y 6/3) fine silt loam; mottles are many, medium, and distinct; weak fragipan with coarse prismatic structure breaking to weak, thick, platy; pale-brown (10YR 6/3), clayey coatings 1 millimeter thick on vertical faces; firm; plentiful roots common on prism faces; many medium pores; 5 percent pebbles; manganese stains in lower part of horizon; extremely acid; abrupt, smooth boundary.

Bx2—21 to 27 inches, mottled dark-brown (7.5YR 4/4) and brown (10YR 5/3) silt loam with many, coarse manganese stains; strong fragipan with moderate, coarse, prismatic structure breaking to moderate, fine, subangular blocky; pale-brown (10YR 6/3), clayey coatings 5 millimeters thick on prism faces; firm; few roots; no pores; 10 percent pebbles; thin clay coatings on fine peds; very strongly acid; clear, smooth boundary.

Bx3—27 to 45 inches, yellowish-brown (10YR 5/4) gravelly clay loam with many, medium manganese stains; strong fragipan with strong, very coarse, prismatic structure breaking to strong, medium, angular blocky; gray (10YR 5/1), clayey coatings 8 millimeters thick on prism faces; gray (10YR 5/1) clay films 1 millimeter thick on ped faces; firm; few roots; no pores; 15 percent pebbles; very strongly acid; abrupt, smooth boundary.

Bx4—45 to 73 inches, yellowish-brown (10YR 5/4) coarse silty clay loam with common, faint, light brownish-gray (10YR 6/2) and strong-brown (7.5YR 5/6) mottles; fragipan with strong, very coarse, prismatic structure breaking to strong, very thick, platy; grayish-brown (10YR 5/2), clayey coatings 1 millimeter thick on prism faces; thin, light olive-brown (2.5Y 5/4) platy units with coarse manganese stains; firm; no pores; no pebbles; strongly acid; gradual boundary.

C1—73 to 98 inches, gray (10YR 6/1) silty clay loam with many, fine, distinct mottles of yellowish brown (10YR 5/8); weak, very coarse, prismatic structure breaking to weak, very coarse, subangular blocky; brown (10YR 5/3) films on ped faces; firm; no pores; no pebbles; medium acid; gradual boundary.

C2—98 to 110 inches, dark-brown (7.5YR 3/4) gravelly loam with many, fine, faint, brown (10YR 5/3) mottles and manganese stains; moderate, fine, subangular blocky structure; firm to friable; 75 percent pebbles; slightly acid; clear boundary.

C3—110 to 120 inches, strong-brown (7.5YR 5/6) coarse silty clay with many, medium, distinct, gray (N 6/0) mottles and manganese stains; vertical, gray (N 5/0) clay masses 2 inches thick at 24-inch intervals; firm; no pebbles; medium acid; gradual boundary.

C4—120 to 126 inches, strong-brown (7.5YR 5/8) coarse silty clay loam with many, medium, distinct, gray (10YR 6/1) mottles and manganese stains; moderate, coarse, subangular blocky structure; brown (10YR 5/3) ped faces stained with manganese; firm; 5 percent pebbles; slightly acid; alluvium extends to a depth greater than 126 inches.

The solum is strongly acid or medium acid. In some places the B horizon is brown to reddish brown and has grayish mottles. In places between the depths of 11 and 45 inches, there are light olive-brown and pale-brown mottles and gray clay films.

Upshur series

The Upshur series consists of well-drained soils that developed in fine-textured materials having reddish hues. Typically, these soils are underlain by reddish clay shale that varies in characteristics within short distances. The shale is interbedded with a little siltstone, sandstone, and lighter colored shale. In sloping areas the solum and the underlying materials show the effects of downhill slumping, solifluction, and mixing. The Upshur soils have a finer textured upper solum than the Summitville soils, and the plasticity of their clay is greater. In contrast to the solum of the Guernsey soils, that of the Upshur soils has reddish hues and a lower pH in the upper part.

Representative profile of an Upshur clay in a cultivated area (CO-124; SW¼ sec. 34, T. 12 N., R. 3 W.):

Ap—0 to 7 inches, dark reddish-brown (2.5YR 3/4) clay; strong, fine, subangular blocky structure; firm when moist, very plastic when wet; siltstone fragments; strongly acid; abrupt, smooth boundary.

B1—7 to 10 inches, dark reddish-brown (2.5YR 3/4) clay; strong, fine, angular blocky structure; firm when moist, very plastic when wet; siltstone fragments; strongly acid; clear, smooth boundary.

B21t—10 to 14 inches, reddish-brown (2.5YR 4/4) clay; strong, medium, angular blocky structure; continuous, weak-red clay films on ped faces; firm when moist, very plastic when wet; siltstone fragments; strongly acid; clear, smooth boundary.

B22t—14 to 20 inches, yellowish-red (5YR 4/6) clay; strong, medium, angular blocky structure; continuous, weak-red clay films on ped faces; firm when moist, plastic when wet; siltstone fragments; strongly acid; gradual, smooth boundary.

B3—20 to 30 inches, reddish-brown (5YR 4/4) clay; weak, fine, blocky structure; discontinuous, weak-red clay films on ped faces; firm when moist, plastic when wet; siltstone fragments; medium acid to neutral; gradual, wavy boundary.

C—30 inches +, soft, weak-red (2.5YR 4/2) clay shale; mildly alkaline.

The A horizon ranges to dark grayish-brown channery silt loam or dark reddish-gray clay. The B horizon is clay or silty clay. In places there are slickensides in the B horizon. The solum ranges from 20 to 48 inches in thickness and is strongly acid to neutral.

Wadsworth series

In the Wadsworth series are somewhat poorly drained soils that developed from slightly limy clay loam till. Associates in the same drainage sequence are the moderately well drained Rittman soils, the poorly drained Frenchtown soils, and the very poorly drained Marengo soils. The Wadsworth soils have a finer textured solum than the Ravenna soils, which developed from loam till.

Representative profile of a Wadsworth silt loam in a cultivated area (Knox Township, SE¼SE¼ sec. 21, T. 17 N., R. 5 W.):

Ap—0 to 9 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, fine, granular structure; friable; many pores; 1 percent pebbles; neutral; abrupt, smooth boundary.

B1t—9 to 14 inches, light olive-brown (2.5Y 5/4) silty clay loam with few, fine, prominent mottles of yellowish red (5YR 4/8) and many, fine, faint mottles of dark yellowish brown (10YR 4/4); weak, medium, subangular blocky structure; light olive-brown (2.5Y 5/5) ped faces with coarse, yellowish-red mottles; friable; many pores; 1 percent pebbles; medium acid; abrupt, smooth boundary.

B21t—14 to 18 inches, mottled light olive-brown (2.5Y 5/4) and yellowish-brown (10YR 5/8) silty clay loam; many, fine, distinct mottles; moderate, medium, angular blocky structure breaking to moderate, fine, angular blocky; very thin, light olive-brown (2.4Y 4/5), degraded clay films on ped faces; friable when moist, sticky when wet; plentiful roots; many fine pores; 5 percent pebbles; strongly acid; clear, smooth boundary.

Bx1—18 to 23 inches, mottled strong-brown (7.5YR 5/6) and grayish-brown (2.5Y 5/2) clay loam; mottles are many, medium, and distinct; weak fragipan with weak, thick, platy structure; degraded clay films on ped faces; vertical, gray clay seam starts in this horizon; firm when moist, slightly sticky when wet; few roots; common fine pores; 7 percent pebbles; strongly acid; abrupt, smooth boundary.

Bx2—23 to 30 inches, mottled dark yellowish-brown (10YR 4/4) and gray (10YR 5/1) loam; mottles are many, medium, and distinct; few, fine, black manganese stains; fragipan with weak, very coarse, prismatic structure breaking to weak, very coarse, angular blocky; gray (10YR 5/1), vertical clay films 2 millimeters thick and horizontal films 5 millimeters thick on ped faces; firm; plentiful roots on ped faces; few fine pores; 10 percent pebbles; strongly acid; gradual, smooth boundary.

Bx3—30 to 36 inches, brown (10YR 4/3) clay loam with many, medium, black manganese stains; fragipan with weak, very coarse, prismatic structure breaking to weak, medium, angular blocky structure; gray (10YR 5/1) films 10 millimeters thick on prism faces and gray clay 1 to 5 millimeters thick on horizontal faces; both with many, coarse, black manganese stains; firm; no roots; few fine pores; 10 percent pebbles; strongly acid; clear, wavy boundary.

Bx4—36 to 41 inches, brown (10YR 4/3) clay loam with common, medium, faint, yellowish-brown (10YR 5/6) mottles and few, fine manganese stains; weak fragipan with moderate, fine and medium, angular blocky structure; gray (10YR 5/1) clay films 10 millimeters thick on vertical ped faces; firm; few fine pores with clay films; 10 percent pebbles; neutral; gradual, wavy boundary.

C1—41 to 48 inches, olive-brown (2.5Y 4/4) clay loam with few, coarse, faint, yellowish-brown (10YR 5/6) mottles and few, fine manganese stains; weak, thick, platy structure breaking to weak, medium, angular blocky peds; dark-gray (5Y 4/1) clay films 1 millimeter thick on peds; friable; few fine pores; 10 percent pebbles; neutral; gradual boundary.

C2—48 to 60 inches, olive-brown (2.5Y 4/3) clay loam with few, coarse, faint mottles of yellowish brown (10YR 5/6); massive; gray (N 5/1) vertical clay seams 5 millimeters thick; friable; 10 percent pebbles; neutral; gradual boundary.

C3—60 to 72 inches, dark grayish-brown (2.5Y 4/2) clay loam with gray (N 5/1), vertical clay seams 5 millimeters thick; calcareous.

In some places the A horizon is dark grayish brown to grayish brown. The B horizon ranges from silty clay loam to fine loam; in places it is grayish brown and has olive-gray mottles. The Bx3 horizon is common to soils in the same catena as the Wadsworth soils. It is the horizon in which manganese staining is most intense. The depth of leaching ranges from 40 to 60 inches.

Wayland series

The Wayland series consists of poorly drained soils that formed in alluvium on flood plains. The alluvium was washed from both local and glacial materials derived from sandstone, siltstone, and shale on uplands. Wayland soils are mainly silt loam or silty clay loam and are strongly acid to slightly acid. Associates in the same drainage sequence are the very poorly drained Papakating soils, the somewhat poorly drained Orrville soils, the moderately well drained Lobdell soils, and the well drained Chagrin soils.

Representative profile of Wayland silt loam in a swampy, brushy area (CO-115; Salem Township, NW. corner of NW¼ sec. 13, T. 15 N., R. 3 W.):

A11—0 to 1 inch, very dark gray (10YR 3/1) silt loam; moderate, very fine, granular structure; very friable; slightly acid; clear, smooth boundary.

A12—1 to 4 inches, very dark gray (10YR 3/1) silt loam with many, fine, faint mottles of dark yellowish brown (10YR 3/4); very dark grayish brown (10YR 3/2) when crushed; moderate, medium, granular structure; friable; slightly acid; clear boundary.

B2g—4 to 10 inches, dark-gray (10YR 4/1) silt loam with many, distinct mottles of dark reddish brown (5YR 3/4); very dark grayish brown (10YR 3/2) when crushed; moderate, fine, angular blocky structure; friable; roots abundant; slightly acid; abrupt, wavy boundary.

C1—10 to 14 inches, dark grayish-brown (10YR 4/2) silt loam with many distinct mottles of dark reddish brown (5YR 3/4) and grayish brown (10YR 5/2); massive; friable; roots plentiful; many fine pores; few pebbles; slightly acid; clear, smooth boundary.

C2—14 to 22 inches, grayish-brown (2.5Y 5/2) silt loam with many, medium, distinct mottles of dark reddish brown (5YR 3/3) and dark brown (7.5YR 4/4); massive; friable; roots plentiful; many fine pores; few pebbles and soft iron concretions; slightly acid; gradual, smooth boundary.

IIC—22 to 37 inches, mottled dark-brown (7.5YR 4/4) sandy loam and light olive-brown (2.5Y 5/3) loam; mottles are many, coarse, and prominent; dark brown (10YR 4/3) when crushed; massive; friable; no roots; many fine pores; 20 percent pebbles; neutral.

In some places the A horizon is dark gray or very dark grayish brown. In places the B horizon ranges from brown to dark grayish brown or light olive brown and has grayish mottles. The solum is dominantly silt loam or loam but includes layers ranging from sandy loam to silty clay loam.

The definition of the Wayland series is being studied over a general area larger than Columbiana County. As a result of the study, the present name of the series may not be kept for soils having the preceding characteristics.

Weikert series

The Weikert series consists of well-drained soils of the uplands that developed over siltstone and some fine-grained standstone. These soils have a skeletal B horizon. They are shallower to bedrock than the Muskingum soils, and they have a thinner solum over sandstone than the Dekalb soils.

Representative profile of a Weikert shaly silt loam in a forested area (CO-85; Franklin Township, NE. corner of SE¼ sec. 26, T. 14 N., R. 4 W.):

A1—0 to 1 inch, very dark brown (10YR 2/2) shaly silt loam; weak, very fine, granular structure; friable; abundant roots; 15 percent fragments of olive siltstone; lower part of horizon is dark brown (10YR 3/3); very strongly acid; abrupt, irregular boundary.

A2—1 to 4 inches, brown (10YR 4/3) shaly silt loam; weak, fine to medium, granular structure; friable; abundant roots; many medium to coarse pores; 20 percent fragments of olive siltstone; extremely acid; clear, irregular boundary.

B2—4 to 7 inches, brown (10YR 5/3) shaly silt loam; weak, fine to medium, subangular blocky structure; friable; plentiful roots; 50 percent fragments of olive siltstone; pockets of material from A1 horizon in animal holes; extremely acid; clear, wavy boundary.

B3—7 to 12 inches, yellowish-brown (10YR 5/4) shaly silt loam; weak, medium, angular blocky structure; friable; plentiful roots; 70 percent layers of olive siltstone; very strongly acid; clear, wavy boundary.

C1—12 to 18 inches, layers of olive (5Y 5/4) siltstone, about 10 millimeters thick, with layers of silt loam, 1 millimeter thick, in horizontal cracks; roots and clay films are also in cracks in bedrock; very strongly acid; gradual boundary.

R—18 to 23 inches, olive (5Y 5/4) siltstone bedrock with a very few cracks containing roots, clay films, and layers of silt loam; very strongly acid.

Weikert soils range from strongly acid to extremely acid. The solum ranges from 12 to 16 inches in thickness.

Wellston series

The Wellston series consists of deep to moderately deep, well-drained soils that developed in material derived from siltstone and some fine-grained sandstone. Associated with these soils are the shallower Muskingum and Weikert soils.

Representative profile of a Wellston silt loam in a forested area (Madison Township, NW. corner of NW¼ sec. 34, T. 10 N., R. 2 W.):

A1—0 to ½ inch, very dark brown (10YR 2/2) silt loam; weak, very fine, crumb structure; very friable; extremely acid; abrupt, wavy boundary.

A2—½ inch to 6 inches, brown (10YR 4/3) silt loam; weak, fine, granular structure; friable; 10 percent small channery fragments of siltstone; extremely acid; abrupt, wavy boundary.

B1—6 to 9 inches, yellowish-brown (10YR 5/4) fine silt loam with material from A2 horizon in cracks and pores; weak, fine, subangular blocky structure; degraded, thin clay films on ped faces; friable but more nearly firm than horizon above; 15 percent channery fragments of siltstone; extremely acid; clear, smooth boundary.

B21t—9 to 25 inches, brown to strong-brown (7.5YR 5/5) channery silt loam in upper part to channery clay loam in lower part; moderate, fine, subangular blocky structure grading to moderate, fine, angular blocky in lower part; degraded, thin clay films on ped faces; friable; roots common; many fine pores; 25 percent channery fragments of siltstone in upper part, increasing to 40 percent in lower part; extremely acid; clear, smooth boundary.

B22t—25 to 31 inches, dark-brown (7.5YR 4/4) channery light clay loam; weak, fine, angular blocky structure; thin, reddish-brown (5YR 4/4) clay films and, on ped faces, large black stains of manganese; friable; few roots; few fine pores; 40 percent channery fragments of siltstone; extremely acid; clear, smooth boundary.

B3t—31 to 37 inches, yellowish-brown (10YR 5/4) channery loam; weak, medium to fine, angular blocky structure; discontinuous clay films on ped faces; ped faces 50 percent covered with black stains of manganese; friable; few roots; 50 percent channery fragments of siltstone arranged in horizontal layers, and soil material between the layers; extremely acid.

R—37 to 49 inches, dark yellowish-brown (10YR 3/4) oxidized, micaceous siltstone or very fine grained sandstone with zones of loam soil material, ½ inch thick, between the rock layers; extremely acid; rocks are soft and crush to soil when dug or removed with auger.

The B horizon ranges from yellowish brown to dark brown or strong brown. In some places it is coarse silty clay loam. The depth to bedrock ranges from 30 to 40 inches.

Wharton series

The Wharton series consists of moderately well drained soils that developed on black carbonaceous shale. These soils have a moderately fine textured solum. Associates in the same drainage sequence are the well-drained Weikert soils and the somewhat poorly drained Cavode soils. In texture the Wharton soils are similar to the Guernsey soils, which developed in mixed materials derived from limestone, sandstone, siltstone, and shale, and to the Summitville soils, which developed in mixed materials derived from red clay shale, sandstone, and siltstone.

Representative profile of a Wharton silt loam in a pastured area (CO–37; St. Clair Township, NW¼ sec. 28, T. 6 N., R. 1 W.):

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine, crumb structure; friable; abundant roots; 2 percent shale fragments; very strongly acid; abrupt, smooth boundary.

B21—8 to 13 inches, yellowish-brown (10YR 5/4) silt loam; moderate, medium, subangular blocky structure; very thin, brown (10YR 5/3) clay films on ped faces; slightly firm when moist, nonsticky when wet; few roots; 2 percent shale fragments; very strongly acid; gradual, smooth boundary.

B22—13 to 19 inches, brown (10YR 4/3) coarse silty clay loam; moderate, medium, subangular blocky structure; very thin, brown clay films on ped faces; slightly firm when moist, slightly sticky when wet; roots common; few fine pores; 10 percent small fragments of rotted shale; very strongly acid; abrupt, smooth boundary.

B23t—19 to 25 inches, yellowish-brown (10YR 5/4) silty clay loam; strong, medium, subangular blocky structure breaking to fine, subangular blocky peds; very thin, brown (10YR 5/3) clay films on ped faces; firm; few roots; no pores; 40 percent small fragments of rotted shale; fragments crush to soil when rubbed; very strongly acid; abrupt, smooth boundary.

C1—25 to 28 inches, mottled dark yellowish-brown (10YR 3/4) and grayish-brown (10YR 5/2) silty clay loam; mottles are in equal proportion; weak, coarse, subangular blocky structure; sticky when wet; few roots; very strongly acid; horizon is a mass of rotted shale fragments, which rub into silty clay loam; fragments have dark yellowish-brown centers and grayish-brown silty clay surfaces; abrupt, smooth boundary.

C2—28 to 38 inches, dark-brown (7.5YR 3/2) silty clay loam; rotted fragments of shale coated with very thin, dark-gray, (5YR 4/1) clay; dark brown (7.5YR 3/4) when crushed; strong, very coarse, angular blocky structure breaking to fragments of rotted shale 3 millimeters thick; friable when moist but sticky when wet and rubbed; few roots; strongly acid; abrupt, smooth boundary.

R—38 to 45 inches, dark-brown (7.5YR 3/2) fragments of rotted, black shale, 3 millimeters thick, very thinly coated with gray (N 5/0) clay; shale fragments do not easily rub into soil; strongly acid; gradual boundary.

The B horizon ranges from yellowish brown and light olive brown to brown in color and from silt loam to silty clay in texture. It has grayish mottles at a depth of 20 to 30 inches. The solum is strongly acid or very strongly acid. The Wharton soils in this county have a higher base saturation than that considered typical for the series.

Willette series

The Willette series consists of shallow, very poorly drained organic soils that formed from mixed woody, grassy, and sedgy materials underlain by clayey material. The Willette soils are shallower over the mineral substratum than the Carlisle soils. They also are shallower than the Kerston soils, which consist of alternate layers of silty material and muck.

Representative profile of Willette muck in a swamp (Fairfield Township, SE¼ sec. 5, T. 12 N., R. 2 W.):

1—0 to 10 inches, black (N 2/0) muck; moderate, fine, granular structure; medium acid; abrupt, wavy boundary.

2—10 to 26 inches, black (N 2/0) muck; moderate, fine, angular blocky structure; medium acid; clear, wavy boundary.

IIC—26 inches +, very dark gray (10YR 3/1) silty clay; massive; neutral.

The muck ranges from 12 to 42 inches in thickness. The substratum is fine silty clay loam to silty clay. The profile ranges from strongly acid to neutral.

Wooster series

The Wooster series consists of well-drained soils that developed from slightly limy loam glacial till. Associates in the same drainage sequence are the moderately well drained Canfield soils, the somewhat poorly drained Ravenna soils, the poorly drained Frenchtown soils, and the very poorly drained Marengo soils. The Wooster soils have a coarser textured solum than the Hanover soils and are less deeply leached.

Representative profile of a Wooster silt loam in a cultivated area (CO–4; Salem Township, center of NW¼ sec. 36, T. 15 N., R. 3 W.):

Ap—0 to 5 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, crumb structure; plentiful roots; friable; slightly acid; clear, smooth boundary.

A2—5 to 8 inches, yellowish-brown (10YR 5/4) coarse silt loam; massive in place (plowsole) but breaks up into weak, thin, platy units; plentiful roots; friable; strongly acid; gradual, smooth boundary.

B1t—8 to 15 inches, yellowish-brown (10YR 5/4) loam; strong, medium, subangular blocky structure; friable; plentiful roots; strongly acid; clear, wavy boundary.

B21t—15 to 19 inches, yellowish-brown (10YR 5/4) loam with brownish-yellow (10YR 6/8) variegations; moderate, medium, angular to subangular blocky structure; friable; strongly acid; wavy boundary.

Bx1—19 to 25 inches, dark yellowish-brown (10YR 4/4) loam with some black coatings; fragipan with weak, very coarse, prismatic structure breaking into weak, thick to very thick, platy structure or weak, medium, subangular structure; extremely firm in place; coarse skeleton about 10 percent, by volume, consists of fragments of sandstone and black shale and some rotten granite cobblestones strongly acid; gradual boundary.

Bx2—25 to 44 inches, dark yellowish-brown (10YR 4/4) coarse loam with pronounced black coatings on ped faces; fragipan with weak, very coarse, prismatic structure breaking into moderately thick, platy and medium, angular blocky structure; slightly acid; 10 percent pebbles.

C1—44 to 56 inches, olive-brown (2.5Y 4/4) coarse loam with some dark yellowish-brown (10YR 4/4) coatings; massive; very firm in place, firm when removed; 10 percent pebbles; no roots; neutral; diffuse boundary.

C2—56 inches +, olive-brown (2.5Y 4/4) coarse loam till; calcareous; friable (sampled at depth of 60 inches).

The A horizon ranges from dark grayish brown to yellowish brown. In some places the B horizon is dark brown, and in places it is sandy clay loam. The depth to carbonates ranges from 50 to 100 inches.

Laboratory Data

The results of laboratory analyses of 20 of the main soil series in Columbiana County are given in table 11. Samples were taken of representative soil profiles of these series. Detailed descriptions of the soils sampled are given in alphabetical order in the subsection "Descriptions of the Soil Series" and are identified by characterization number.

Particle size distribution was determined by the pipette method (*5*). The pH was determined by glass electrode, using soil and water in a ratio of 1:1. The percentage of organic matter was determined by first determining the organic-carbon content by modification of the Walkley-Black method (*11*). The content of organic carbon was multiplied by 1.72 to convert to percentage of organic matter.

Exchangeable calcium, magnesium, and potassium were displaced with neutral normal ammonium acetate (*4*). Potassium was determined by use of a Beckman model DU flame photometer. Calcium and magnesium were determined by the methods outlined by Barrows and Simpson

TABLE 11.—*Physical and chemical*

[Analyses made by Ohio Agricultural Research and

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*
Allegheny silt loam, CO-39.	A1	0-1½	5. 9	1. 9	0. 9	0. 7	4. 5	13. 9	71. 2	14. 9	3. 8
	A2	1½-7	. 6	1. 0	. 8	1. 8	5. 4	9. 6	75. 2	15. 2	3. 5
	B1	7-13	. 4	. 9	. 8	1. 5	6. 1	9. 7	72. 4	17. 9	5. 2
	B21t	13-22	. 8	1. 3	. 9	2. 1	9. 7	14. 8	63. 2	22. 0	6. 8
	B21t	22-30	. 8	1. 5	1. 0	2. 9	14. 6	20. 8	54. 5	24. 7	7. 8
	B22t	30-43	. 3	. 6	. 4	4. 1	26. 2	31. 6	41. 4	27. 0	8. 4
	B23t	43-52	. 3	. 6	. 5	2. 7	15. 3	19. 4	53. 7	26. 9	7. 2
	B24t	52-62	. 8	. 5	. 7	5. 1	24. 4	31. 5	45. 1	23. 4	6. 3
	B24t	62-68	. 5	1. 2	2. 4	6. 4	21. 3	31. 8	46. 3	21. 9	6. 1
	B3t	68-80	2. 2	2. 6	1. 8	1. 8	9. 6	18. 0	59. 6	22. 4	5. 6
	IIR	80-84	10. 5	11. 8	4. 4	3. 0	15. 0	44. 7	43. 4	11. 9	1. 5
Canfield silt loam, CO-67.	Ap	0-7	2. 2	4. 5	6. 8	8. 5	7. 4	29. 4	54. 0	16. 6	4. 7
	B1t	7-14	2. 7	5. 8	8. 8	11. 3	9. 4	38. 0	40. 3	21. 7	12. 6
	B21t	14-19	4. 0	12. 1	13. 5	34. 5	5. 6	69. 7	9. 2	21. 1	7. 6
	Bx1	19-24	4. 9	9. 8	6. 2	17. 2	9. 2	47. 3	32. 2	20. 5	8. 0
	Bx1	24-30	5. 2	6. 6	8. 9	12. 4	11. 9	45. 0	33. 8	21. 2	8. 0
	Bx2	30-38	4. 7	11. 1	8. 9	24. 3	10. 6	59. 6	24. 3	16. 1	7. 0
	C1	38-47	3. 1	9. 4	15. 6	18. 5	12. 2	58. 8	28. 2	13. 0	5. 7
	C2	47-55	1. 9	7. 5	6. 4	20. 1	11. 8	47. 7	34. 9	17. 4	5. 0
	C2	55-70	2. 5	6. 8	11. 0	13. 9	12. 0	46. 2	35. 2	18. 6	5. 9
Chili gravelly loam, CO-42.	Ap	0-8	4. 6	11. 3	11. 5	7. 4	5. 0	39. 8	44. 6	15. 6	3. 7
	B1	8-12	6. 6	18. 4	19. 5	12. 2	5. 3	62. 0	25. 0	13. 0	3. 4
	B1	12-18	11. 6	27. 5	21. 1	9. 9	3. 4	73. 5	15. 2	11. 3	4. 5
	B2t	18-23	12. 4	23. 6	18. 1	8. 4	4. 0	66. 5	15. 8	17. 7	8. 9
	B2t	23-28	15. 6	26. 4	16. 8	5. 6	2. 2	66. 6	12. 4	21. 0	11. 0
	B2t	28-37	18. 3	27. 2	18. 5	5. 4	3. 0	72. 4	8. 5	19. 1	10. 5
	B2t	37-45	22. 5	28. 3	17. 7	3. 7	3. 1	75. 3	5. 5	19. 2	13. 0
	C1	45-53	23. 7	29. 6	18. 9	3. 8	3. 3	79. 3	8. 1	12. 6	5. 9
	C2	53-60	15. 0	38. 0	25. 5	7. 1	2. 8	88. 4	4. 9	6. 7	3. 4
	C2	60-120	13. 1	44. 9	29. 6	5. 4	1. 7	94. 7	2. 1	3. 2	2. 2
Dekalb loam, CO-72.	A11	0-¼	1. 7	1. 9	3. 1	32. 3	5. 8	44. 8	44. 1	11. 1	3. 2
	A12	¼-1½	1. 1	3. 4	9. 0	28. 4	6. 4	48. 3	40. 9	10. 8	2. 6
	B1	1½-8	. 7	4. 0	9. 7	28. 3	5. 9	48. 6	39. 0	12. 4	1. 4
	B21	8-14	. 3	4. 0	10. 2	28. 2	6. 1	48. 8	37. 9	13. 3	1. 9
	B22	14-19	. 4	4. 2	11. 3	32. 4	6. 0	54. 3	32. 1	13. 6	3. 0
	C1	19-29	. 3	5. 9	18. 6	41. 4	7. 7	73. 9	16. 7	9. 4	2. 5
	R	29-40	. 1	6. 1	19. 4	42. 2	8. 3	76. 1	14. 2	9. 7	3. 0
Frenchtown silt loam, CO-108.	A1	0-2	1. 4	4. 6	6. 6	11. 0	6. 2	29. 8	57. 4	12. 8	1. 5
	A2g	2-7	2. 4	5. 5	8. 0	7. 8	9. 3	33. 0	50. 6	16. 4	3. 5
	A3g	7-10	1. 7	4. 7	7. 4	9. 8	5. 7	29. 3	50. 1	20. 5	4. 4
	B1t	10-16	1. 1	3. 8	7. 1	8. 4	6. 1	26. 5	51. 0	22. 5	7. 0
	B21tg	16-21	1. 0	4. 4	8. 3	12. 2	9. 1	35. 0	40. 3	24. 7	9. 4
	Bx1	21-28	2. 3	7. 1	12. 0	13. 7	8. 9	44. 0	32. 6	23. 4	9. 6
	Bx2	28-34	1. 9	6. 6	12. 5	14. 9	10. 7	46. 6	36. 6	16. 8	6. 4
	C1	34-42	3. 0	6. 2	11. 4	13. 9	9. 7	44. 2	37. 5	18. 3	6. 0
	C2	42-58	3. 1	7. 6	11. 1	12. 8	8. 8	43. 4	37. 5	19. 1	5. 6

(*3*). The exchangeable hydrogen was determined by the method outlined by Mehlich (*10*). The sum of exchangeable cations is the sum of exchangeable hydrogen, calcium, magnesium, and potassium. Total bases were determined by summation of the exchangeable calcium, magnesium, and potassium. The calcium-magnesium ratio is not shown if either the exchangeable calcium or the exchangeable magnesium is less than 1 milliequivalent per 100 grams of soil.

Table 12 gives data on clay mineralogy for selected horizons in three soils of the Canfield, Ravenna, and Wooster series. Samples of these soils were analyzed at the Soil Survey laboratory at Beltsville, Maryland. Table 13 gives data on clay mineralogy of the B2 horizon in soils of the Allegheny, Chili, and Parke series—soils that formed in alluvium of various ages. These analyses were made at the Soil Characterization Laboratory of The Pennsylvania State University under the direction of C. D. Jeffries. Clay minerals listed in both tables were determined by X-ray diffraction.

data for selected soils

Development Center. Dashes indicate no determination made]

pH	Organic matter	Exchangeable cations (milliequivalent per 100 grams of soil)						Base saturation	Calcium-magnesium ratio
		Hydrogen	Calcium	Magnesium	Potassium	Sum of exchangeable cations	Total bases		
	Percent							*Percent*	
5.2	27.8	28.6	16.7	3.3	1.2	49.8	21.2	43	5.1
4.5	2.7	12.1	1.3	.4	.5	14.3	2.2	15	----------
4.3	.8	10.1	.6	.4	.3	11.4	1.2	11	----------
4.5	----------	8.8	1.9	.8	.4	11.9	2.9	25	----------
4.7	----------	7.5	3.2	1.9	.3	12.9	5.4	42	1.7
4.6	----------	6.7	2.9	2.5	.3	12.4	5.7	46	1.2
4.8	----------	6.8	5.1	3.4	----------	15.5	8.7	56	1.5
4.8	----------	5.1	4.4	2.6	.2	12.3	7.2	59	1.7
4.8	----------	5.4	4.4	2.5	.2	12.5	7.1	57	1.8
4.9	----------	8.0	4.5	2.4	.2	15.1	7.1	47	1.9
5.3	----------	6.0	7.2	3.1	.2	16.5	10.5	64	2.3
6.5	2.6	4.5	7.5	.5	.3	12.3	8.3	65	----------
5.4	.4	6.0	5.4	.5	.1	12.0	6.0	50	----------
4.6	.1	8.7	3.7	1.0	.2	13.6	4.9	36	3.7
4.6	.1	8.4	3.7	1.7	.2	14.0	5.6	40	2.2
4.7	----------	7.8	3.7	1.8	.2	13.5	5.7	42	2.1
4.9	----------	5.5	3.0	1.9	.2	10.6	5.1	48	1.6
5.1	----------	3.9	3.0	1.7	.1	8.7	4.8	55	1.8
5.4	----------	3.3	4.1	1.8	.1	9.3	6.0	65	2.3
6.2	----------	2.3	5.8	1.9	.1	10.1	7.8	77	3.0
4.9	1.9	9.8	2.3	.5	.3	12.9	3.1	24	----------
4.8	.4	7.3	1.4	.4	.2	9.3	2.0	22	----------
5.0	.8	6.6	2.3	.4	.1	9.4	2.8	30	----------
5.1	.4	7.1	4.4	1.2	.2	12.9	5.8	45	3.7
5.1	----------	7.5	4.3	2.7	.3	14.8	7.3	49	1.6
5.1	----------	7.5	4.3	1.4	.3	13.5	6.0	44	3.1
5.4	----------	6.0	6.2	1.8	.3	14.3	8.3	58	3.4
6.0	----------	3.9	4.4	1.2	.2	9.7	5.8	60	3.7
7.3	----------	1.8	6.4	.8	.1	9.1	7.3	80	----------
7.6	----------	----------	----------	----------	----------	----------	----------	----------	----------
4.0	11.8	22.9	2.2	.6	.4	26.1	3.2	12	3.7
4.2	5.1	13.8	.5	.2	.2	14.7	.9	6	----------
4.3	1.1	6.6	.2	.1	.2	7.1	.5	7	----------
4.3	.3	4.8	.2	.1	.1	5.2	.4	8	----------
4.3	.4	5.5	.5	.2	.2	6.4	.9	14	----------
5.1	----------	2.9	2.1	.9	.1	6.0	3.1	52	----------
4.6	----------	4.2	1.3	.2	.1	5.8	1.6	28	----------
5.1	6.1	11.1	4.3	.8	.2	16.4	5.3	32	----------
5.3	1.5	12.5	2.7	.7	.1	16.0	3.5	22	----------
5.2	.7	7.3	2.9	.9	.1	11.2	3.9	35	----------
5.1	.3	7.7	3.6	1.2	.1	12.6	4.9	39	3.0
5.1	.3	6.1	4.3	1.4	.1	11.9	5.8	49	3.1
5.4	----------	6.8	6.5	2.2	.1	15.6	8.8	56	3.0
6.4	----------	2.4	6.2	2.1	.1	10.8	8.4	78	3.0
7.2	----------	----------	----------	----------	----------	----------	----------	----------	----------
7.8	----------	----------	----------	----------	----------	----------	----------	----------	----------

TABLE 11.—*Physical and chemical*

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*
Gresham silt loam, CO-97.	A1	0–2	3.0	2.1	1.4	1.6	1.6	9.7	68.3	22.0	5.0
	A2	2–8	2.8	2.4	1.7	2.3	2.2	11.4	68.8	19.8	2.6
	A3	8–12	1.8	3.5	2.2	2.2	1.7	11.4	66.0	22.6	4.0
	B1t	12–16	1.9	2.3	1.3	1.7	1.9	9.1	65.7	25.2	7.2
	B21t	16–22	1.5	2.0	1.3	1.7	2.3	8.8	63.1	28.3	9.2
	Bx1	22–27	3.0	2.6	1.6	2.4	3.3	12.9	58.4	28.7	10.8
	Bx2	27–36	1.7	2.5	1.7	1.6	2.4	9.4	60.4	30.2	12.6
	Bx3	36–48	.8	1.2	.8	1.2	1.8	5.8	59.9	34.3	16.6
	Bx3	48–60	6.3	5.0	2.6	3.1	4.6	21.6	55.2	23.2	8.3
	C1	60–70	2.1	1.7	1.1	2.1	5.1	12.1	67.5	20.4	6.4
	C1	70–96	3.0	4.1	4.3	7.5	8.1	27.0	43.6	29.4	7.7
	C1	96–110	2.9	4.5	4.9	8.8	8.3	29.4	43.5	27.1	7.5
	C1	110–126	1.7	4.2	7.2	9.6	7.4	30.1	44.5	25.4	5.8
	C2	126–146	.5	1.5	1.1	2.2	2.7	7.8	63.2	29.0	4.9
	C2	146–162	1.6	3.0	1.7	.7	1.8	8.8	58.1	33.1	4.7
	C2	162–168	2.9	4.4	4.1	5.5	4.9	21.8	47.2	31.0	6.4
	C3	168–196	3.0	4.5	4.2	6.8	6.8	25.3	45.0	29.7	7.7
Guernsey silt loam, CO-99.	Ap	0–8	1.5	1.9	2.0	2.7	2.8	10.9	70.1	19.0	3.8
	A2	8–11	.7	1.7	1.7	2.2	2.3	8.6	70.4	21.0	5.0
	B1	11–16	.8	1.7	1.5	1.9	2.1	8.0	64.7	27.3	8.8
	B21t	16–21	1.2	2.1	1.7	2.0	2.6	9.6	58.5	31.9	13.5
	B22t	21–26	1.2	1.9	1.6	1.1	4.6	10.4	53.1	36.5	14.5
	B23t	26–38	.3	.5	.6	1.2	1.7	4.3	36.2	59.5	25.2
	C	38–44	1.0	1.1	.5	.6	1.8	4.0	45.3	50.7	17.4
	C	44–50	.9	1.3	.9	1.3	1.5	5.9	44.3	49.8	14.6
Hanover silt loam, CO-81.	A1	0–2	1.7	5.0	6.4	6.4	4.4	23.9	62.6	13.5	2.3
	A2	2–10	2.2	5.5	4.1	10.6	4.8	27.2	63.0	9.8	1.2
	B1t	10–20	3.7	8.0	11.5	12.0	7.8	43.0	40.4	16.6	4.8
	Bxt	20–50	4.6	10.2	12.9	18.0	10.2	55.9	29.6	14.5	4.3
	B2t	50–62	7.0	12.7	16.1	17.3	10.3	63.4	24.2	12.4	4.7
	B3	62–81	5.7	13.3	17.8	17.0	11.2	65.0	26.2	8.8	2.8
	C	81–90	5.4	11.5	16.4	17.7	10.9	61.9	28.8	9.3	2.4
Laidig stony loam, CO-61.	A11	0–1	3.2	16.3	17.1	6.6	5.6	48.8	41.2	10.0	1.5
	A12	1–3	4.1	17.1	12.3	11.4	5.3	50.2	38.6	11.2	2.0
	B21t	3–8	4.0	8.4	8.2	7.8	7.0	35.4	51.6	13.0	2.8
	B21t	8–13	3.3	12.2	12.6	8.6	7.6	44.3	42.7	13.0	5.1
	B21t	13–19	4.5	24.0	22.6	12.7	6.7	70.5	20.9	8.6	2.6
	B21t	19–26	3.6	20.5	26.6	11.3	8.8	70.8	18.7	10.5	3.4
	B22t	26–32	4.5	22.9	22.2	12.5	6.7	68.8	22.6	8.6	4.2
	Bx1	32–38	8.7	25.6	24.0	7.6	5.4	71.3	20.3	8.4	2.9
	Bx2	38–51	3.1	5.8	2.1	5.3	16.7	33.0	46.2	20.8	4.7
	IIC	51+	8.2	23.8	15.1	23.8	8.2	79.1	15.5	5.4	1.2
Monongahela silt loam, CO-70.	Ap	0–8	1.6	1.8	.8	1.8	1.1	7.1	76.3	16.6	2.0
	A3	8–11	.6	1.3	.5	.7	.0	3.1	75.5	21.4	4.9
	B1t	11–15	.7	1.1	.3	.3	1.6	4.0	69.3	26.7	9.1
	B21t	15–22	.8	1.2	.5	.7	2.2	5.4	65.6	29.0	12.7
	B21t	22–25	1.7	2.7	1.3	1.6	.9	8.2	62.5	29.3	15.9
	Bx1	25–31	.9	1.9	1.1	1.2	3.8	8.9	64.0	27.1	12.7
	Bx2	31–41	3.1	4.4	1.7	1.9	2.1	13.2	59.5	27.3	8.5
	Bx2	41–48	1.3	2.5	1.0	1.3	3.3	9.4	65.4	25.2	8.4
	Bx2	48–56	3.2	4.9	2.4	3.6	6.4	20.5	50.7	28.8	7.9
	IIB3	56–65	4.8	5.6	3.7	7.5	12.3	33.9	38.7	27.4	6.5
	IIB3	65–68	.9	1.8	1.8	6.2	4.8	15.5	50.7	33.8	8.1
	IIB3	68–71	.4	.8	.7	.3	7.6	9.8	55.8	34.4	7.4

data for selected soils—Continued

pH	Organic matter	Exchangeable cations (milliequivalent per 100 grams of soil)						Base saturation	Calcium-magnesium ratio
		Hydrogen	Calcium	Magnesium	Potassium	Sum of exchangeable cations	Total bases		
	Percent							*Percent*	
4.9	12.0	17.6	9.1	1.4	0.5	28.6	11.0	38	6.5
4.7	3.5	14.1	2.5	.7	.3	17.6	3.5	20	---
4.7	1.4	11.6	1.3	.7	.2	13.8	2.2	16	---
4.6	.6	10.7	1.8	1.1	.2	13.8	3.1	22	1.6
4.6	.4	12.1	2.1	1.5	.2	15.9	3.8	24	1.4
4.6	---	12.6	2.1	2.1	.3	17.1	4.5	26	1.0
4.7	---	11.0	3.8	4.5	.3	19.6	8.6	44	.8
4.7	---	8.8	5.6	7.9	.3	22.6	13.8	61	.7
7.1	---	---	---	---	---	---	---	---	---
7.5	---	---	---	---	---	---	---	---	---
7.6	---	---	---	---	---	---	---	---	---
7.6	---	---	---	---	---	---	---	---	---
7.6	---	---	---	---	---	---	---	---	---
7.4	---	---	---	---	---	---	---	---	---
7.4	---	---	---	---	---	---	---	---	---
7.6	---	---	---	---	---	---	---	---	---
7.7	---	---	---	---	---	---	---	---	---
4.7	2.5	10.8	2.9	.7	.2	14.6	3.8	26	---
4.7	1.1	10.1	3.1	.6	.2	14.0	3.9	28	---
4.7	.6	9.9	4.5	.7	.2	15.3	5.4	35	---
4.7	.7	11.0	7.0	1.0	.2	19.2	8.2	43	7.0
4.8	---	10.7	9.7	1.1	.3	21.8	11.1	51	9.9
5.3	---	9.9	20.9	1.5	.3	32.6	22.7	70	13.9
7.6	---	---	---	---	---	---	---	---	---
8.0	---	---	---	---	---	---	---	---	---
5.9	9.3	11.7	12.3	1.1	.8	25.9	14.2	55	11.2
4.8	1.8	8.6	1.3	.3	.4	10.6	2.0	19	---
4.5	.4	7.5	.9	.4	.3	9.1	1.6	18	---
4.5	.3	7.5	1.0	.5	.2	9.2	1.7	18	---
4.5	---	7.2	.8	1.0	.2	9.2	2.0	22	---
4.7	---	5.6	.4	1.1	.2	7.3	1.7	23	---
4.8	---	4.6	1.3	1.1	.1	7.1	2.5	35	1.2
4.5	9.4	19.0	4.4	.8	.5	24.7	5.7	23	---
4.7	2.8	9.9	1.1	.3	.2	11.5	1.6	14	---
4.7	.4	5.9	1.7	.2	.1	7.9	2.0	25	---
4.4	.4	7.5	1.7	.2	.1	9.5	2.0	21	---
4.4	.1	5.5	.9	.2	.2	6.8	1.3	19	---
4.5	.1	4.9	1.0	.6	.2	6.7	1.8	27	---
4.5	---	4.5	1.2	.7	.2	6.6	2.1	32	---
4.7	---	3.6	1.2	.8	.2	5.8	2.2	38	---
4.4	---	9.6	1.8	2.8	.2	14.4	4.8	33	.6
5.1	---	11.3	5.0	2.5	.1	18.9	7.6	40	2.0
4.7	2.9	12.8	---	2.2	.4	---	---	---	---
4.4	1.0	12.2	1.2	.8	.2	14.4	2.2	15	---
4.4	.8	10.4	3.1	1.1	.2	15.0	4.6	31	2.8
4.5	.6	11.4	3.3	1.3	.3	16.3	4.9	30	2.5
4.4	.6	12.7	2.4	2.7	.3	18.1	5.4	30	.9
4.5	---	12.2	2.1	3.1	.3	17.7	5.5	31	.7
4.5	---	11.2	2.4	2.8	.2	16.6	5.4	33	.8
4.6	---	9.0	3.1	3.4	.2	15.7	6.7	43	.9
5.0	---	6.7	4.7	4.8	.2	16.4	9.7	59	1.0
5.8	---	5.5	5.8	3.5	.2	15.0	9.5	63	1.7
6.0	---	2.6	6.1	5.2	.2	14.1	11.5	82	1.2
6.1	---	2.1	7.7	5.6	.2	15.6	13.5	86	1.4

TABLE 11.—*Physical and chemical*

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*
Negley gravelly loam, CO-100.	A1	0–1	10.4	10.0	8.9	3.6	19.4	52.3	39.4	8.3	1.8
	A2	1–9	5.7	11.6	6.7	4.5	3.0	31.5	51.9	16.6	3.4
	B1t	9–11	8.9	15.7	6.8	3.6	2.4	37.4	40.0	22.6	6.7
	B21t	11–28	10.9	21.2	9.7	5.1	3.2	50.1	17.7	32.2	14.1
	B22t	28–39	10.1	23.2	15.9	8.7	5.1	63.0	14.3	22.7	9.3
	B23	39–72	13.7	28.0	16.5	5.2	8.2	71.6	13.9	14.5	5.8
	B3	72–99	15.8	27.3	18.6	9.1	3.8	74.8	11.2	14.0	4.7
	C1	99–135	11.1	40.0	23.5	6.4	2.3	83.3	9.1	7.6	2.4
	C2	135–267	13.7	27.8	21.0	10.0	3.5	76.0	9.9	14.1	4.6
	C3	267–300	14.8	27.1	18.2	10.8	4.4	75.3	11.3	13.4	5.7
Parke silt loam, CO-29.	A1	0–2	1.1	3.1	4.2	4.6	4.4	17.4	66.3	16.3	4.8
	A2	2–10	.9	2.7	4.1	4.8	4.0	16.5	66.8	16.7	4.1
	B1	10–16	.4	2.3	3.9	4.3	3.3	14.2	64.9	20.9	6.3
	B21t	16–23	.5	3.3	6.2	7.3	5.1	22.4	55.1	22.5	9.4
	IIB22t	23–44	1.0	7.4	17.1	20.7	8.4	54.6	23.5	21.9	9.6
	IIB23t	44–64	1.2	10.1	19.6	22.9	8.2	62.0	18.9	19.1	8.5
	IIB23t	64–82	2.2	12.7	22.3	24.5	8.5	70.2	15.8	14.0	6.2
	IIB23t	82–92	3.6	20.4	22.6	20.0	7.9	74.5	11.7	13.8	5.2
	IIB3	92–108	8.8	23.0	20.3	18.2	9.3	79.6	12.7	7.7	2.4
	IIC1	108–120	9.7	31.4	14.4	14.3	10.9	80.7	12.4	6.9	2.9
	IIC2	120–204	7.9	21.8	15.6	17.8	12.7	75.8	17.0	7.2	1.4
Purdy silt loam, CO-57.	Ap	0–9	5.3	4.9	4.5	4.0	2.6	21.3	64.1	14.6	1.5
	A2g	9–13	9.8	10.8	6.9	2.1	4.3	33.9	52.1	14.0	2.1
	B1tg	13–17	1.3	3.1	2.5	2.0	2.3	11.2	59.1	29.7	12.0
	Bx1	17–22	1.3	2.6	2.0	1.9	2.8	10.6	59.5	29.9	12.8
	Bx2	22–26	.5	1.9	1.5	1.1	3.1	8.1	63.7	28.2	13.0
	Bx3	26–31	.4	1.8	1.4	.3	3.9	7.8	65.1	27.1	12.6
Ravenna silt loam, CO-25.	A1	0–1	-----	-----	-----	-----	-----	43.3	45.6	11.1	-----
	A2	1–6	-----	-----	-----	-----	-----	34.8	50.0	15.2	-----
	A2	6–11	-----	-----	-----	-----	-----	30.4	51.0	18.6	-----
	B21	11–15	-----	-----	-----	-----	-----	41.5	35.9	22.6	-----
	Bx1	15–20	-----	-----	-----	-----	-----	42.7	36.4	20.9	-----
	Bx1	20–24	-----	-----	-----	-----	-----	40.3	38.2	21.5	-----
	Bx2	24–32	-----	-----	-----	-----	-----	39.2	37.0	23.8	-----
	Bx3	32–48	-----	-----	-----	-----	-----	49.3	36.2	14.5	-----
	C1	50	-----	-----	-----	-----	-----	50.8	33.4	15.8	-----
	C1	55	-----	-----	-----	-----	-----	46.9	35.3	17.8	-----
	C1	70	-----	-----	-----	-----	-----	47.6	34.0	18.4	-----
	C2	96	-----	-----	-----	-----	-----	44.4	37.9	17.7	-----
Summitville silt loam, CO-96.	Ap	0–7	2.4	3.9	3.1	4.5	2.3	16.2	63.6	20.2	4.2
	A2	7–11	1.8	2.2	3.1	5.6	2.7	15.4	60.6	24.0	5.2
	B21t	11–14	1.7	2.3	3.2	5.5	3.4	16.1	49.2	34.7	11.7
	B22	14–18	2.3	3.1	3.3	7.0	4.7	20.4	38.5	41.1	17.9
	B23t	18–25	2.2	3.8	3.9	6.2	4.4	20.5	35.4	44.1	20.0
	IIB2	25–34	.7	1.2	2.7	5.1	3.3	13.0	34.9	52.1	22.5
	C	34–50	.2	.5	.4	.7	.5	2.3	27.2	70.5	24.0
Titusville silt loam, CO-143.	A21	1–7	5.4	3.9	5.3	9.2	2.6	26.4	65.2	8.4	.3
	A22	7–10	.9	3.5	5.7	9.7	7.0	26.8	61.0	12.2	2.0
	B1	10–14	.9	5.2	5.4	10.7	7.0	29.2	57.0	13.8	3.0
	B21	14–19	1.4	5.5	7.1	11.4	8.8	34.2	49.1	16.7	5.2
	Bx1	19–30	2.2	5.0	5.8	10.3	9.8	33.1	46.4	20.5	6.3
	Bx2	30–42	1.5	5.3	7.2	11.0	10.7	35.7	46.7	17.6	4.9
	Bx3	42–47	1.4	4.8	6.6	11.2	8.9	32.9	50.1	17.0	4.4
	C1	47–60	1.1	4.8	7.2	11.4	9.2	33.7	45.3	21.0	7.2
	C1	60–70	1.4	6.6	9.8	15.4	10.4	43.6	41.9	14.5	3.6
	C2	70–88	1.7	5.9	9.2	15.1	9.7	41.6	43.1	15.3	3.5
	C2	88–120	1.5	5.6	7.9	12.7	9.1	36.8	45.9	17.3	4.3
	C4	168–216	2.2	7.0	9.2	4.9	20.0	43.3	42.8	13.9	3.0

data for selected soils—Continued

pH	Organic matter	Exchangeable cations (milliequivalent per 100 grams of soil)						Base saturation	Calcium-magnesium ratio
		Hydrogen	Calcium	Magnesium	Potassium	Sum of exchangeable cations	Total bases		
	Percent							*Percent*	
5.2		22.3	9.8	1.3	0.6	34.0	11.7	34	7.5
4.2	1.0	8.6	.5	.2	.2	9.5	.9	9	
4.2	.4	10.8	.4	.2	.2	11.6	.8	7	
4.3		14.5	1.4	.5	.4	16.8	2.3	14	
4.7		10.4	2.3	1.2	.4	14.3	3.9	27	2.0
4.7		8.9	1.5	1.2	.2	11.8	2.9	25	1.2
4.9		7.9	1.7	1.7	.2	11.5	3.6	31	1.0
4.8		9.4	1.7	1.7	.1	12.9	2.5	27	1.0
6.1		3.6	5.1	1.0	.1	9.8	6.2	63	5.0
7.7									
6.6	11.6	5.2	10.4	1.2	.5	17.3	12.1	70	8.7
4.8	1.8	10.6	1.7	.8	.3	13.4	2.8	21	
4.8	.6	7.6	2.6	.7	.4	11.3	3.7	33	3.7
4.8	.4	8.3	3.3	1.0	.5	13.1	4.8	37	3.3
4.7	.1	8.2	2.0	1.6	.5	12.3	4.1	33	1.2
4.7		8.8	1.1	1.7	.3	11.9	3.1	26	.6
4.8		6.7	.5	1.2	.2	8.6	1.9	22	
4.7		7.2	.6	1.3	.2	9.3	2.1	23	
5.1		5.1	.3	.8	.1	6.3	1.2	19	
4.9		6.2	.8	1.4	.2	8.6	2.4	28	
5.1		5.1	.8	1.3	.2	7.4	2.3	31	
5.1	2.3	9.9	4.1	.4	.2	14.6	4.7	32	
4.9	.6	10.1	2.1	.7	.1	13.0	2.9	22	
4.6	.2	12.5	2.3	2.6	.2	17.6	5.1	29	.9
4.6	.2	13.4	2.5	3.4	.3	19.6	6.2	32	.7
4.7	.1	12.3	2.5	3.9	.3	20.1	6.7	33	.6
4.7		11.7	2.8	4.6	.3	19.4	7.7	40	.6
4.4	7.7	18.1	.6	.3	.4	19.4	1.3	7	
4.7	1.5	8.6	.5	.3	.1	9.5	.9	9	
5.0	.6	6.3	1.3	1.0	.1	8.7	2.4	28	1.3
5.0	.4	7.3	1.6	1.4	.1	10.4	3.1	30	1.1
4.9	.4	7.5	1.5	1.4	.1	10.5	3.0	29	1.1
4.9	.4	8.2	1.4	1.4	.2	11.2	3.0	27	1.0
4.8	.3	9.0	1.8	1.7	.2	12.7	3.7	29	1.1
4.8	.3	5.4	1.7	1.8	.1	9.0	3.6	40	.9
5.6		3.5	4.1	2.4	.1	10.1	6.6	65	1.7
6.3		2.3	5.3	2.7	.1	10.4	8.1	78	2.0
6.9		1.2	5.1	2.2	.1	8.6	7.4	86	2.3
7.8									
4.8	1.9	11.3	1.5	.6	.2	13.6	2.3	17	
4.9	1.0	9.0	1.9	.7	.2	11.8	2.8	24	
4.9	.4	11.0	3.8	1.6	.2	16.6	5.6	34	2.4
4.8	.3	12.9	5.7	3.0	.3	21.9	9.0	41	1.9
4.7		13.0	6.2	4.4	.3	23.9	10.9	46	1.4
4.7		12.7	6.5	6.0	.3	25.5	12.8	50	1.1
6.4		1.8	9.4	12.7	.3	24.2	22.4	93	.7
4.7	1.4	8.2	.9	.5	.1	9.7	1.5	15	
4.5	.6	5.6	.7	.6	.1	7.0	1.4	20	
4.6	.4	5.4	1.4	1.0	.1	7.9	2.5	32	1.4
4.7	.3	5.9	2.5	1.7	.2	10.3	4.4	43	1.5
4.6		6.6	2.6	2.2	.2	11.6	5.0	43	1.2
4.8		6.5	2.3	2.2	.1	11.1	4.6	41	1.0
5.4		3.7	4.4	3.1	.1	11.3	7.6	67	1.4
5.9		3.0	6.0	4.1	.1	13.2	10.2	77	1.5
6.5		2.3	4.8	2.9	.1	10.1	9.8	77	1.7
6.6		1.7	4.5	2.6	.1	8.9	7.2	81	1.7
7.1	1.9								
8.1	2.9								

TABLE 11.—*Physical and chemical*

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*
Tyler silt loam, CO-50.	Ap	0-7	1.7	2.8	2.1	1.8	2.8	11.2	74.5	14.3	2.7
	B1t	7-11	3.2	2.5	1.4	.9	2.5	10.5	70.8	18.7	5.3
	B21t	11-16	.8	1.7	1.2	.7	3.4	7.8	70.0	22.2	7.9
	Bx1	16-21	.9	2.3	2.1	2.2	4.6	12.1	63.7	24.2	10.3
	Bx2	21-27	4.3	5.1	5.0	4.8	3.6	22.8	53.7	23.5	7.3
	Bx3	27-33	6.8	6.1	5.2	3.0	5.0	26.1	49.5	24.4	6.2
	Bx3	33-39	6.7	5.9	5.1	5.3	4.8	27.8	43.5	28.7	7.3
	Bx3	39-45	.5	1.2	1.3	2.4	5.9	11.3	52.3	36.4	10.2
	Bx4	45-58	.4	1.2	1.6	3.7	10.4	17.3	57.6	25.1	6.4
	Bx4	58-66	.5	1.5	1.5	1.6	9.2	14.3	58.5	27.2	7.0
	Bx4	66-73	.2	1.5	1.8	3.0	9.1	15.6	57.9	26.5	7.7
	C1	73-80	.2	1.3	1.8	3.7	10.5	17.5	56.9	25.6	6.8
	C1	80-88	.1	1.4	2.3	2.7	3.7	10.2	58.6	31.2	7.3
	C1	88-98	.1	1.2	1.9	2.3	4.2	9.7	62.0	28.3	6.6
	C2	98-110	13.8	9.9	4.8	7.4	7.7	43.6	31.9	24.5	6.2
	C3	110-120	.2	.6	1.2	3.1	6.3	11.0	44.8	44.2	17.5
	C4	120-126	.5	1.8	2.6	5.2	15.6	25.7	53.0	21.3	6.8
Weikert shaly silt loam, CO-85.	A1	0-1	1.6	1.7	.7	1.0	3.5	8.5	77.2	14.3	1.8
	A2	1-4	2.9	2.4	.9	.9	3.4	10.5	73.7	15.8	2.6
	B2	4-7	2.9	2.8	1.2	11.3	4.3	12.5	71.2	16.3	2.4
	B3	7-12	5.6	4.1	1.5	1.9	5.4	18.5	66.1	15.4	2.4
	C1	12-18	18.7	10.6	2.3	1.8	5.3	38.7	48.4	12.9	1.5
	R	18-23	10.3	9.8	2.9	2.2	5.2	30.4	52.8	16.8	2.5
Wharton silt loam, CO-37.	Ap	0-8	.6	1.6	1.1	.6	2.3	6.2	71.0	22.8	4.6
	B21	8-13	.3	1.3	1.0	.7	2.0	5.3	70.3	24.4	6.1
	B22t	13-19	.6	1.5	1.0	.7	2.5	6.3	63.7	30.0	8.4
	B23t	19-25	.9	2.3	1.2	1.7	1.7	7.8	56.4	35.8	8.6
	C1	25-28	1.1	2.5	1.1	1.5	1.8	8.0	53.9	38.1	7.6
	C2	28-33	1.2	2.8	1.1	1.4	2.0	8.5	53.1	38.4	8.8
	C2	33-38	.9	2.0	.9	.6	2.1	6.5	55.6	37.9	9.5
	R	38-45	1.1	3.2	1.5	1.5	2.9	10.2	55.8	34.0	5.4
Wooster silt loam, CO-4.	Ap	0-5	1.7	4.1	4.1	11.5	6.1	27.4	60.3	12.3	3.2
	A2	5-8	2.0	4.6	4.4	13.9	6.9	31.8	51.5	16.7	4.6
	B1t	8-15	2.0	4.8	5.1	16.1	9.0	37.0	42.5	20.5	8.1
	B21t	15-19	2.5	5.7	6.4	18.6	9.3	42.5	35.0	22.5	8.7
	Bx1	19-25	2.3	6.1	6.4	19.1	10.3	44.2	33.2	22.6	7.4
	Bx2	25-44	2.2	5.8	6.4	18.8	9.9	43.1	37.1	19.8	6.1
	C1	44-56	2.3	6.8	7.4	20.8	10.0	47.3	36.3	16.4	5.0
	C2	56+	2.8	7.5	7.7	21.1	10.4	49.5	35.2	15.3	4.0

data for selected soils—Continued

pH	Organic matter	Exchangeable cations (milliequivalent per 100 grams of soil)						Base saturation	Calcium-magnesium ratio
		Hydrogen	Calcium	Magnesium	Potassium	Sum of exchangeable cations	Total bases		
	Percent							*Percent*	
6.4	2.6	4.7	8.6	0.5	0.2	14.0	9.3	66	------
5.2	.3	5.5	4.6	.5	.1	10.7	5.2	49	------
4.4	.4	10.7	3.2	1.1	.2	15.2	4.5	30	3.0
4.4	.3	12.6	2.8	2.0	.2	17.6	5.0	28	1.4
4.7	.1	10.8	1.4	2.1	.2	14.5	3.7	26	.7
4.9	------	10.7	1.3	2.4	.1	14.5	3.8	26	.5
4.9	------	11.4	1.8	3.1	.1	16.4	5.0	30	.6
4.9	------	11.3	2.9	4.9	.2	19.3	8.0	41	.6
5.2	------	8.1	3.1	4.5	.1	15.8	7.7	49	.7
5.3	------	7.4	3.7	4.9	.1	16.1	8.7	54	.8
5.5	------	5.7	4.6	5.3	.1	15.7	10.0	64	.9
5.5	------	5.0	4.9	5.1	.1	15.1	10.1	67	1.0
5.8	------	4.9	5.9	6.2	.1	17.1	12.2	71	1.0
5.9	------	4.7	5.5	5.6	.1	15.9	11.2	70	1.0
6.1	------	6.2	5.6	5.1	.1	17.0	10.8	64	1.1
5.8	------	4.7	8.0	7.7	.2	20.6	15.9	77	1.0
6.0	------	3.4	4.9	4.3	.1	12.7	9.3	73	1.1
4.4	10.1	23.7	2.3	.8	.4	27.2	3.5	13	------
4.4	2.3	13.0	1.3	.5	.2	15.0	2.0	13	------
4.9	2.2	8.7	2.8	.6	.2	12.3	3.6	29	------
5.0	1.4	10.1	2.6	.5	.2	13.4	3.3	25	------
4.5	------	8.9	1.4	.7	.3	11.3	2.4	21	------
4.7	------	8.4	2.5	1.3	.1	12.3	3.9	32	2.0
4.6	2.0	14.0	2.9	.7	.3	17.9	3.9	22	------
4.7	.5	9.7	2.9	.7	.1	13.4	3.7	28	------
4.7	.3	11.3	5.0	1.0	.2	17.5	6.2	35	5.0
4.7	.2	13.6	5.0	1.6	.2	20.4	6.8	33	3.2
4.8	------	13.5	8.9	2.3	.2	24.9	11.4	46	3.9
5.0	------	10.6	11.2	3.5	.2	25.5	14.9	58	3.2
5.2	------	8.8	12.8	4.2	.3	26.1	17.3	66	3.0
5.3	------	8.1	13.3	4.2	.2	25.8	17.7	69	3.2
6.2	2.8	------	------	------	.1	------	------	------	------
4.9	.1	5.1	2.1	.4	.1	7.7	2.6	34	------
4.8	.3	6.2	2.6	.6	.2	9.6	3.4	35	------
4.9	.3	3.6	3.3	1.3	.2	8.4	4.8	57	2.5
5.0	.3	4.1	3.9	1.6	.2	9.8	5.7	58	2.4
6.2	1.7	3.2	8.4	1.9	.2	13.7	10.5	77	4.4
6.8	.6	2.2	5.5	1.3	.2	9.2	7.0	76	4.2
7.4	------	------	------	------	------	------	------	------	------

TABLE 12.—*Clay mineralogy of soils formed in loam glacial till of Wisconsin age*

Soil series	Depth	Horizon	Mineral content of clay fraction					
			Vermiculite	Vermiculite-mica (mixed layer)	Mica	Montmorillonite-vermiculite (mixed layer)	Montmorillonite	Kaolinite
	Inches							*Percent*
Canfield.	0–8	Ap	Abundant	None	Trace	None	None	5
	8–13	B1	Abundant	None	Trace	None	None	5
	13–19	B21	Moderate	Low	Low	None	None	5
	19–23	B22x	Low	Low	Low	None	None	15
	23–30	B22x	Trace	Moderate	Moderate	None	None	15
	30–43	B23x/B3x	Trace	Low	Abundant	None	None	15
	50–55	C1	Trace	None	Abundant	None	None	15
	100–140	C2	Trace	None	Dominant	None	None	15
Ravenna.	0–10	Ap	Moderate	Low	Low	None	None	8
	10–14	A3	Moderate	Low	Low	None	None	8
	14–18	B21	Low	Low	Low	Low	None	8
	18–23	B21	Low	None	Moderate	Moderate	None	8
	23–28	B22	Low	None	Moderate	Low	Moderate	8
	28–35	B23	Moderate	None	None	None	Abundant	10
	44–52	B32x	None	None	Abundant	Moderate	Moderate	10
	76–100	C1	None	None	Dominant	None	None	15
Wooster.	0–8	Ap	Abundant	Low	None	None	None	(1)
	8–15	B21	None	Moderate	Low	None	Low	10
	15–19	B22	Low	Moderate	Low	Moderate	Low	8
	19–25	B23	None	Moderate	Moderate	Low	Low	8
	25–28	B24	Moderate	Moderate	Low	None	Low	8
	28–31	B25x	Low	Moderate	Low	Low	Moderate	8
	31–38	B3x	None	None	Moderate	Moderate	Low	8

[1] Not determined.

TABLE 13.—*Clay mineralogy of the B2 horizon in soils developed in alluvium of various ages*

Soil series	Parent material	Mineral content of clay fraction			
		Kaolinite	Mica	Vermiculite	Chlorite
Allegheny	Nonglacial alluvium of very early Pleistocene age.	High	Present	Low	None.
Chili	Outwash of Wisconsin age	Low	Disordered	Disordered	Trace.
Parke	Outwash of Illinoian age	Present	Low	Low	None.
Parke	Outwash of very early Pleistocene age.	High	Low	Present	None.

General Nature of the Area

This section provides general information about Columbiana County. It discusses physiography, relief, and drainage; climate; organization and population; agriculture; and other subjects of general interest.

Physiography, Relief, and Drainage

Columbiana County is located on the dissected Allegheny Plateau. The bedrock underlying the county consists mainly of sandstone, siltstone, clay shale, and limestone, all of which were formed from sediments laid down during the Pennsylvanian period. Later, these rocks were elevated above sea level during the Juratriassic period and then were leveled, or peneplained, during the Cretaceous period. Further elevation and peneplation took place in several stages during the Tertiary period, so that today the land surface is a series of stepped levels.

Each level is a remnant of a stage of peneplation. The highest remnants are ridgetops at elevations of 1,250 to 1,320 feet and, above them, knobs as high as 1,447 feet. The highest level is called the Harrisburg Peneplain. The next lower level, which consists of benches and ridges at elevations of 1,100 to 1,160 feet, is known as the Worthington Peneplain. High-level valleys and terraces at 940- to 1,020-foot elevations were formed in preglacial times and are classed as Teay age valleys or as the Parker Strath (*14*).

The high valleys have been entrenched in the eastern part of the county through changes in drainage brought about by Pleistocene glaciation in the northern part of the county. This entrenchment resulted in the formation of narrow inner valleys and gorges, which range in elevation from 920 feet upstream to 650 feet along the Ohio River.

The sedimentary rocks underlying Columbiana County belong to the Conemaugh and Allegheny formations. On uplands in the southern part of the county, most of the rock layers exposed belong to the Lower Conemaugh formation. Here, the Allegheny rocks crop out in the valley walls and strike beneath the stream terraces. These rock layers dip about 4 feet per mile to the east and about 11 feet per mile to the south, though there is a syncline just north of Salineville and an anticline near East Liverpool (*14*).

The southern part of the county is unglaciated and is hilly and rugged. The largest areas of gently rolling land are on ridgetops and on benches and high terraces along a few streams. Most of the benches are thickly mantled by water-deposited material, the Calcutta silt (*7*). The terraces are mantled with early glacial outwash materials of complex origin (*6*) or with old alluvium. The areas between these benches and terraces are steep or very steep. A few cliffs occur along the lower part of Little Yellow Creek, the North Fork of Yellow Creek, and Little Beaver Creek. In many places there are narrow gorges. During an early interglacial stage the stream valleys were entrenched to an elevation of about 600 feet in the Ohio River valley. At the same time there was a collapse of valley walls so that colluvium was deposited on the lower slopes (*8*). Along the Ohio River the gently sloping or nearly level terraces and bottom lands range from a few hundred feet to one-half mile in width.

Extending in an east-west direction across the center of the county is a hilly area 3 to 5 miles wide that is covered by older glacial drift of Illinoian age (*19*). Illinoian glaciation either buried or incorporated older drift and unconsolidated materials. In this area the relief consists of broad, gently sloping or sloping ridgetops and benches having steep lower slopes, broad high-level terraces, and deep, narrow inner valleys or gorges. The valleys in this glacial area have an upper level of terraces formed by Illinoian glacial outwash. A lower terrace level is of Wisconsin glacial outwash. The glacial till of Illinoian age is thin on ridgetops and thick on benches. Illinoian till and outwash are about 70 percent material from local sedimentary rocks, mostly from the Conemaugh and Allegheny formations. The rest consists of material that was brought from Canada and other areas to the north.

Uplands in the northern part of the county are covered by thick glacial till of Wisconsin age. The till is mostly loam, though in the northwestern part of the county it is clay loam. These northern and northwestern areas are gently sloping or sloping in most places but are hilly near the stream valleys. Broad, gently sloping terraces and bottom lands occupy large areas along several major streams. Large gravelly kames are near East Palestine, Franklin Square, and Guilford and in the valley of North Georgetown. These kames are a source of glacial outwash terraces that lie along Sandy Creek, Little Beaver Creek and its tributaries, and the Mahoning River. Till and outwash of Wisconsin age are about 70 percent material of local origin, mostly sedimentary rocks. The rest is material transported from Canada and other areas to the north.

Most of Columbiana County is drained through Little Beaver Creek into the Ohio River. The southern part, however, is drained by Little Yellow Creek and the North Fork of Yellow Creek, which also flow into the Ohio River. The northwestern part is drained by the Mahoning River, and the western part is drained by Sandy Creek, which flows westward into the Tuscarawas River.

Climate [3]

The climate of Columbiana County is continental. Because the county is located west of the Appalachian Mountains, it is exposed to invasions of cold air from the north and to masses of warm, moist air from the south. Consequently, the annual range in temperature is much wider than that in marine climates. Precipitation is favorably distributed during the warm part of the year. Seasonally, it is greatest in June and July and is least in midwinter.

Table 14 gives temperature and precipitation data summarized from observations made at Millport. The weather station at Millport is in a valley at an elevation of 1,145 feet above sea level. At this location, temperature tends to be lower at night and higher during the day than the corresponding temperature on hilltops. Nevertheless, the data in table 14 are considered applicable to the entire county.

Table 15 shows the probability of freezing temperatures at Millport 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 not injured by frost unless the temperature falls 4 or more degrees below freezing.

Little statistical information is available regarding the depth of frost penetration in this county, but, in an average winter, soils in Ohio seldom freeze to a depth exceeding 12 inches. If a long period of severe cold occurs when snow is lacking, however, the soils freeze to a depth of 2 to 3 feet. In March, when warm periods normally arrive, soils frozen to a depth of 2 feet or more can be expected to thaw within a week to 10 days. Hence, the effects of an unusually cold winter do not necessarily carry over into spring.

In spring the temperature of the surface soil increases about as fast as that of the air, especially if the soil is bare. Warming is retarded, however, if the surface is mulched or is covered with heavy vegetation. Soils generally are warmest in valley bottoms and are coolest on uplands where they are exposed to stronger winds. Soils also are warmest on slopes facing south and west and are coolest on those facing north and east. Consequently, there can be a great difference in temperature of the surface soil within a short distance.

[3] By L. T. Pierce, State climatologist, U.S. Weather Bureau.

TABLE 14.—*Temperature and precipitation at Millport, Columbiana 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	One year in 10 will have [3]—		Average number of days with snow on ground [2]	Average depth of snow on days with snow on ground [2]
				Maximum temperature equal to or higher than—	Minimum temperature equal to or lower than—		Less than—	More than—		
	° F.	° F.	° F.	° F.	° F.	Inches	Inches	Inches		Inches
January	37. 2	19. 8	28. 5	54. 7	−2. 5	3. 08	1. 54	4. 88	16	2. 9
February	38. 6	19. 8	29. 2	55. 7	2. 1	2. 26	. 87	3. 50	11	2. 8
March	47. 3	25. 9	36. 6	66. 7	9. 8	3. 33	1. 38	5. 09	8	2. 3
April	60. 5	35. 3	47. 9	79. 3	21. 0	3. 32	1. 61	4. 48	1	. 9
May	71. 6	44. 8	58. 2	84. 7	30. 7	3. 78	1. 87	5. 15	0	0
June	80. 4	54. 2	67. 3	91. 7	40. 6	3. 99	2. 04	6. 22	0	0
July	84. 2	57. 6	70. 9	92. 9	45. 2	4. 27	2. 00	6. 69	0	0
August	83. 0	56. 4	69. 7	93. 7	42. 3	3. 36	1. 64	5. 11	0	0
September	76. 5	49. 1	62. 8	89. 8	34. 1	3. 02	1. 01	5. 24	0	0
October	64. 9	38. 9	51. 9	81. 5	26. 1	2. 47	1. 02	4. 24	(4)	(5)
November	49. 6	30. 2	39. 9	67. 3	15. 2	2. 34	1. 05	3. 78	3	3. 0
December	38. 7	21. 7	30. 2	56. 8	−. 4	2. 36	1. 15	3. 82	14	3. 1
Year	61. 0	37. 8	49. 4	----------	----------	37. 58	31. 84	43. 92	53	----------

[1] Based on 30-year record, through 1960.
[2] Based on 20-year record, through 1962.
[3] Based on 60-year record, through 1960.
[4] Less than 1 day.
[5] Trace.

TABLE 15.—*Probabilities of last freezing temperatures in spring and first in fall*

[Computed from records at Millport, Ohio]

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	April 12	April 22	May 5	May 21	June 4	June 17
2 years in 10 later than	April 6	April 17	April 30	May 15	May 29	June 11
5 years in 10 later than	March 26	April 6	April 19	May 4	May 18	May 31
Fall:						
1 year in 10 earlier than	November 4	October 23	October 11	September 28	September 15	September 3
2 years in 10 earlier than	November 9	October 28	October 16	October 3	September 20	September 8
5 years in 10 earlier than	November 19	November 8	October 27	October 13	September 30	September 18

Soil moisture varies widely during the year. The recharge season normally is winter, and nearly all the soils are saturated with water by the start of the growing season. If rainfall is normal in spring, soil moisture in cropped fields is ample until the end of June. But if spring is dry, a shortage of moisture can develop to a depth of 2 feet by the end of May. Chances are about 3 in 10 that at least 1 inch of rain will fall each week in spring. This amount of rainfall comes close to meeting the needs of all the common crops, even those of meadow and small grain. In summer, crops use much more water than they do in spring, and all but 10 to 20 percent of the moisture available in the soil is exhausted by the end of August. An exceptionally large amount of rainfall is needed in summer for the supply of available moisture to be kept above 50 percent of field capacity.

In an average year there are 73 clear days, 101 partly cloudy days, and 191 cloudy days in Columbiana County. The highest percentage of sunny days is late in summer and early in fall, whereas cloudy days are most common in winter. Relative humidity, which falls as the temperature rises, generally is near 50 percent on midsummer afternoons, though it may fall below 30 percent on a hot, dry day. Relative humidity is highest in winter, when it averages near 85 percent in early morning. The average windspeed is about 10 miles per hour throughout the year, but the wind may reach a velocity in excess of 40 miles per hour during a summer thunderstorm. Tornadoes are not unknown in this county, but they are much less frequent and cause less damage than tornadoes in States farther west and south. Most tornadoes in Ohio are poorly developed and touch down only briefly in short, narrow paths. In Columbiana County a tornado occurs about once every 5 or 6 years.

Organization and Population

Columbiana County was formed in 1803 from Jefferson and Washington Counties. The earliest recorded settlements were in 1797. Lisbon, the county seat, was laid out in 1802. By 1847, the population of the county had grown to 30,000, of whom a third were of German origin. Most of the rest were of English and Scotch-Irish extraction. Nearly all of these people came from Pennsylvania, but some came from Virginia.

In 1960, according to the U.S. Bureau of the Census, the population of the county was 107,004 and was 45 percent rural. East Liverpool, the largest city, had a population of 22,306. Other communities and their populations were: Salem, 13,854; Wellsville, 7,117; East Palestine, 5,232; Columbiana, 4,164; Lisbon, 3,579; Leetonia, 2,432; Calcutta, 2,221; and Salineville, 1,898.

Transportation

The county is served by three railroads, and it has 1,331 miles of roads and highways. The Federal and State highways, as well as many of the county and township roads, are hard surfaced. The others are graveled. U.S. Highways No. 30 and No. 62 cross the county. A large volume of freight transported on the Ohio River passes East Liverpool and Wellsville.

Community Facilities

In the county are 51 public schools and five parochial schools. Also in the county are 96 urban churches and 64 rural churches. Because the rural population is growing, many of the rural churches are gaining in membership and have added to their facilities.

A total of 14 daily and weekly newspapers are circulated in the county. Radio stations at East Liverpool, Salem, Youngstown, Alliance, and Canton and television stations in Cleveland, Youngstown, and Steubenville, Ohio, Pittsburgh, Pa., and Wheeling, W. Va., are received in all parts of the county.

Industries, Minerals, and Water Supply

In this county there are many manufacturing plants having a total of more than 12,000 employees. More than 40 industrial plants are in the East Liverpool-Wellsville area, 37 are in Salem, and others are in smaller communities scattered throughout the county. The main industries are ceramic plants, foundries, industrial furnaces, and plants that manufacture potter's supplies, machines and tools, plumbing fixtures, enamel, cement, chemicals, and machinery for steel and rolling mills.

Approximately 1,700,000 tons of coal are mined each year, and about 432,000 tons of clay and shale are used in the local ceramic industry. In addition, small amounts of oil and gas are taken from wells in the county, and some sand and gravel are used.

An adequate supply of water is found in layers of sandstone at depths of less than 250 feet. The Clarion, Lower Freeport, Hammond, and Massillon sandstones are good sources of water in the northern part of the county, and the Upper Freeport, Lower Freeport, Kittaning, and Clarion sandstones are best in the southern part. Brine generally is encountered at depths of 300 feet or more. The Ohio River provides water for East Liverpool, and water for Salem, Wellsville, and Salineville is provided by small streams. Springs occur throughout most of the county and commonly are used by individual landowners. Buried valleys are an undeveloped source of water and offer the possibility of a future supply.

Agriculture

Columbiana County is well situated for farming. Most of the soils are arable, and large markets are located within a distance of about 100 miles. Soils in the northern half of the county are productive, easily managed, and suited to all the common crops. Those in the southern half commonly are steeper, shallower, and not so profitable to farm.

According to the U.S. Bureau of the Census, about 122,000 acres in the county were cropped and 45,000 acres were pastured in 1959. Approximately 78,000 acres were forested and 24,000 acres were idle but reverting to forest. Urban areas occupied about 57,000 acres, and strip mines and pits occupied 13,000 acres. All but about 20 percent of the county has been used for crops and pasture at one time or another.

Dairying has provided most of the income from farm sales during the past decade, but poultry, beef cattle, greenhouse and nursery stock, fruit, sheep, and hogs also have been important. Hay, corn, wheat, and oats occupy 90 percent of the acreage in crops. Table 16 lists the acreage of principal crops in the county between 1939 and 1959. In table 17 are listed the number of livestock and the percentage of total farm income derived from various farm products between 1940 and 1959.

During the last 20 years, the land in farms and the number of farms have decreased, but the average size of farms has increased. The number of farm tenants has decreased sharply. The overall trend on farms of the county is toward greater mechanization and efficiency. In the last two decades, crop yields per acre have doubled and milk production per cow has increased about 10 percent.

TABLE 16.—*Acreage of principal crops in stated years*

Crop	1939	1949	1959
	Acres	*Acres*	*Acres*
Corn	21, 726	20, 629	18, 270
Oats	16, 981	17, 746	14, 713
Wheat	15, 129	19, 216	11, 560
Barley	11	258	1, 425
Hay	36, 670	31, 559	29, 768
Orchards	7, 389	4, 263	2, 688
Potatoes	3, 152	1, 019	889
			Number
Christmas trees sold			10, 583

TABLE 17.—*Number of livestock and percentage of total farm income derived from various farm products, in stated years*

Livestock and source of farm income	1940	1950	1959
	Number	*Number*	*Number*
All cattle	24, 735	27, 358	29, 835
Milk cows	16, 761	13, 468	12, 383
Hogs	8, 399	12, 351	10, 874
Sheep	6, 324	4, 355	4, 907
Chickens	224, 602	209, 767	264, 340
	Percent	*Percent*	*Percent*
Dairy products	41	49	53
Poultry and poultry products	19	14	10
Livestock and livestock products	17	14	17
Fruits	9	5	7
Other	14	18	13

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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.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

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.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, magnesium, sodium, potassium, and hydrogen.

Cation-exchange capacity. A measure of the total amount of exchangeable cations that can be held by the soil. It is expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7) or at some other stated pH value. The term as applied to soils is synonymous with base exchange capacity but is more precise in its meaning.

Channery soil. A soil that contains thin, flat fragments of sandstone, limestone, or schist, as much as 6 inches in length along the longer axis. A single piece is called a fragment.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

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.

Concretion. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrations of compounds, or of soil grains cemented together. The composition of some concretions in unlike that of the surrounding soil. Calcium carbonate and iron oxide are examples of material commonly found in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent; 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.

Creep, soil. The downward movement of masses of soil and soil material, primarily through the action of gravity. The movement is generally slow and irregular. It occurs most commonly when the lower part of the soil is nearly saturated with water, and it may be facilitated by alternate freezing and thawing.

Drainage, soil. The relative rapidity and extent of removal of water, under natural conditions, from on and within the soil.

Drift (or glacial drift). Material of any sort deposited by geologic processes in one place after having been removed from another; includes drift materials deposited by glaciers and by streams and lakes associated with them.

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. A loamy, brittle, subsurface horizon that is very low in organic matter and clay but is rich in silt or very fine sand. The layer is seemingly cemented when dry, has a hard or very hard consistence, and has a high bulk density in comparison with the horizon or horizons above it. When moist, the fragipan tends to rupture suddenly if pressure is applied, rather than to deform slowly. The layer is generally mottled, is slowly or very slowly permeable to water, and has few or many bleached fracture planes that form polygons. Fragipans are a few inches to several feet thick; they generally occur below the B horizon, 15 to 40 inches below the surface.

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.

Gleization. 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. The relative position of the several soil horizons in a typical soil profile, and their nomenclature, are as follows:

O horizon.—Organic horizon of mineral soils.

A horizon.—The horizon at the surface. From this horizon, except in dark-colored, Humic Gley soils, the soluble minerals and clay have been removed by percolating water. The major A horizon may be subdivided into A1, the part that is dark colored because of organic matter, and A2, the part that is leached and light colored. In woodlands, a layer of organic matter accumulates on top of the mineral soil; this layer is called the A0 horizon. When a soil is plowed these parts of the A horizon are mixed and the plow layer is called the Ap horizon.

B horizon.—The horizon in which clay oxides or other materials have accumulated, or in which alteration obliterates parent material structure. It may be subdivided into B1, B2, or B3 horizons.

C horizon.—The material immediately under the true soil. In chemical, physical, and mineral composition it is presumed to be similar to the material from which at least a part of the overlying solum has developed.

R horizon.—Underlying consolidated bedrock.

Roman numerals are prefixed to the master horizon or layer designations (O, A, B, C, R) to indicate lithologic discontinuities either within or below the solum. The first, or uppermost, material is not numbered, for the Roman numeral I is understood; the second, or contrasting, material is numbered II; and others are numbered III, IV, and so on, consecutively downward. Thus for example, a sequence from the surface downward might be A2, B1, IIB2, IIB3, IIC1, IIIC2.

Following are the symbols used in this report with those letters that designate the master horizons:

g—strong gleying.
p—plow layer.
t—illuvial clay.

Illuviation. The accumulation of material in a soil horizon through the deposition of suspended material and organic matter removed from horizons above. Since part of the fine clay in the B horizon (or subsoil) of many soils has moved into the B horizon from the A horizon above, the B horizon is called an illuvial horizon.

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.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Kame. An irregular, short ridge, or hill, of stratified glacial drift.

Kettle. A depressional area that has no surface drainage outlet.

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.

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, glacial. Crossbedded gravel, sand, and silt deposited by melt water as it flowed from the 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, soil.

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.

Podzolization. The process by which a soil is depleted of bases, becomes more acid, and develops a leached surface layer.

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		

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 arrrangement 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 mature soils 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 D 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."

Till (or glacial till). An unstratified deposit of earth, sand, gravel, and boulders transported by glaciers.

Till plain. A level or undulating land surface that was formed when glaciers deposited their till.

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.

Variant, soil. A soil whose properties are believed sufficiently different from other known soils to justify a new series name but whose geographic area is 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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If you wish to file an employment complaint, you must contact your agency's EEO Counselor (http://directives.sc.egov.usda.gov/33081.wba) within 45 days of the date of the alleged discriminatory act, event, or personnel action. Additional information can be found online at http://www.ascr.usda.gov/complaint_filing_file.html.

To File a Program Complaint

If you wish to file a Civil Rights program complaint of discrimination, complete the USDA Program Discrimination Complaint Form, found online at http://www.ascr.usda.gov/complaint_filing_cust.html or at any USDA office, or call (866) 632-9992 to request the form. You may also write a letter containing all of the information requested in the form. Send your completed complaint form or letter by mail to U.S. Department of Agriculture; Director, Office of Adjudication; 1400 Independence Avenue, S.W.; Washington, D.C. 20250-9419; by fax to (202) 690-7442; or by email to program.intake@usda.gov.

Persons with Disabilities

If you are deaf, are hard of hearing, or have speech disabilities and you wish to file either an EEO or program complaint, please contact USDA through the Federal Relay Service at (800) 877-8339 or (800) 845-6136 (in Spanish).

If you have other disabilities and wish to file a program complaint, please see the contact information above. If you require alternative means of communication for program information (e.g., Braille, large print, audiotape, etc.), please contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

Supplemental Nutrition Assistance Program

For additional information dealing with Supplemental Nutrition Assistance Program (SNAP) issues, call either the USDA SNAP Hotline Number at (800) 221-5689, which is also in Spanish, or the State Information/Hotline Numbers (http://directives.sc.egov.usda.gov/33085.wba).

All Other Inquiries

For information not pertaining to civil rights, please refer to the listing of the USDA Agencies and Offices (http://directives.sc.egov.usda.gov/33086.wba).