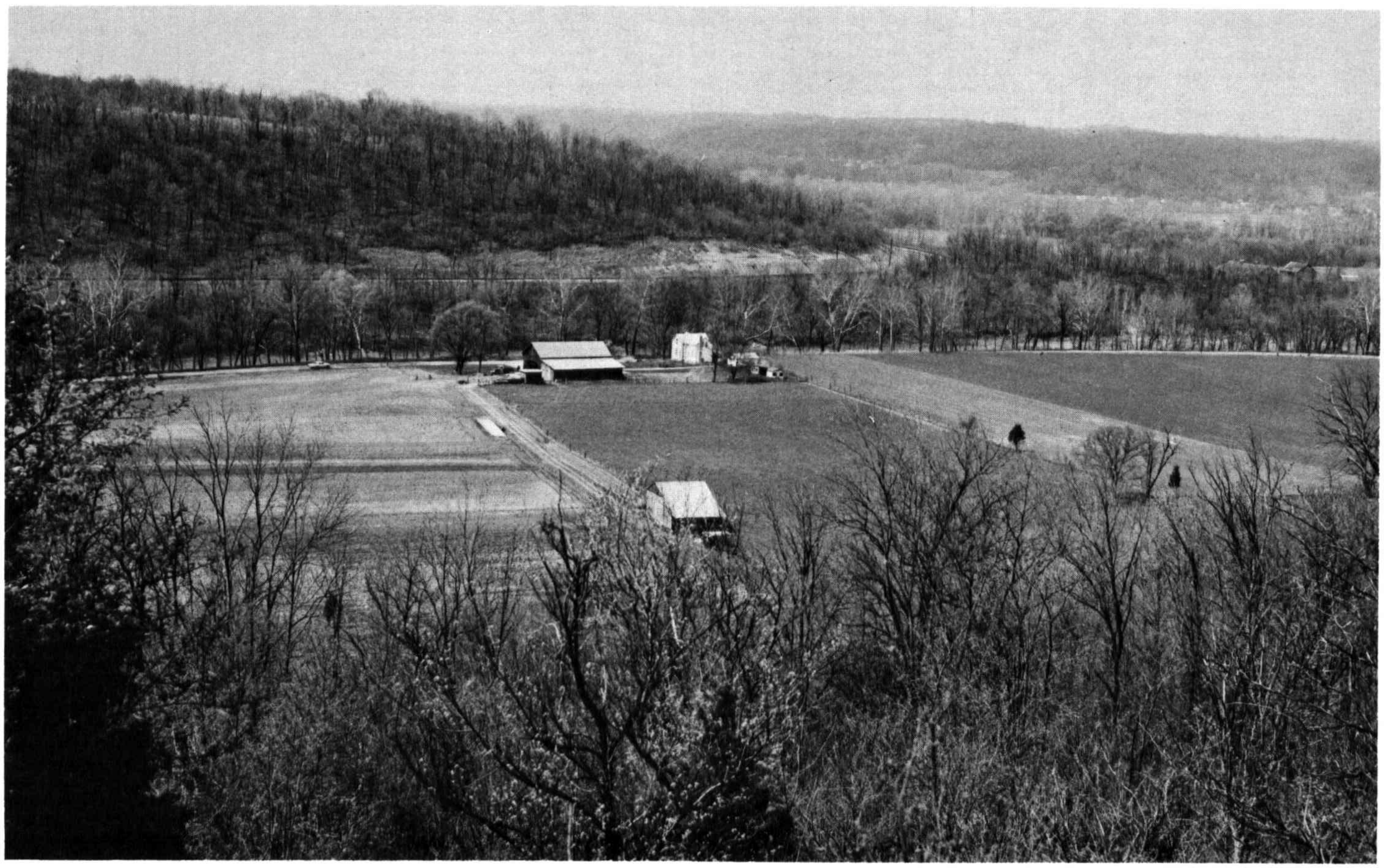
SOIL SURVEY OF

Clermont County, Ohio



United States Department of Agriculture
Soil Conservation Service
In cooperation with
Ohio Department of Natural Resources,
Division of Lands and Soil
and
Ohio Agricultural Research and Development Center

Major fieldwork for this soil survey was done in the period 1964–69. Soil names and descriptions were approved in 1972. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1969. 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 Research and Development Center. It is part of the technical assistance furnished to the Clermont Soil and Water Conservation District.

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

HOW TO USE THIS SOIL SURVEY

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

Locating Soils

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

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. 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. This guide lists all the soils of the county in alphabetic order by map symbol and gives the capability classification and woodland suitability group of each. It also shows the page where each soil is described and the page for the capability unit in which the soil has been placed.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

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

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

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

Community planners and others can read about soil properties that affect the choice of sites for dwellings, industrial buildings, and recreation areas in the section "Town and Country Planning."

Engineers and builders can find, under "Engineering Uses of the Soils," tables that contain test data, estimates of soil properties, and information about soil features that affect engineering practices.

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

Newcomers in Clermont 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 information about the county given at the beginning of the publication and in the section "General Nature of the County."

Cover: **Landscape in Clermont County showing steep Eden soils on the valley walls and nearly level Ockley silt loam on the valley floor.**

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SOIL SURVEY OF CLERMONT COUNTY, OHIO

BY NORBERT K. LERCH, WILLIAM F. HALE, AND E. LARRY MILLIRON, SOIL CONSERVATION SERVICE

FIELDWORK BY NORBERT K. LERCH, WILLIAM F. HALE, AND E. LARRY MILLIRON, SOIL CONSERVATION SERVICE AND BY DALE E. GARNER AND JAMES W. KERR, OHIO DEPARTMENT OF NATURAL RESOURCES, DIVISION OF LANDS AND SOIL

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH OHIO DEPARTMENT OF NATURAL RESOURCES, DIVISION OF LANDS AND SOIL, AND OHIO AGRICULTURAL RESEARCH AND DEVELOPMENT CENTER [1]

CLERMONT COUNTY is in the southwestern part of Ohio (fig. 1), immediately north of the Ohio River. It has a total land area of 459 square miles, or 293,760 acres. Batavia, the county seat, but not the largest town, is centrally located in the county. It lies about 90 miles southwest of Columbus, the State capital, and 20 miles east and somewhat south of Cincinnati. In 1970 the population of the county was 95,725; that of Batavia was 1,894. The largest town in Clermont County is Milford, which had a population of 4,776 in 1970.

Most of the acreage in Clermont County is used for farming. Tobacco, corn, soybeans, wheat, and hay are the principal crops. The western part of the county, the part nearest Cincinnati, is urbanizing quite rapidly, and considerable acreage has gone out of farming use into residential, shopping, and school use (*9*).[2]

The county lies entirely in the glaciated region of Ohio. All of the county is covered by old, deeply leached glacial drift of Illinoian age. Where erosion has dissected the Illinoian till plain, the larger streams have cut valleys that are 200 to 400 feet deep. The drainage waters of the southern third of Clermont County flow directly into the Ohio River, while the rest of the county drains into the Little Miami River, a tributary of the Ohio River.

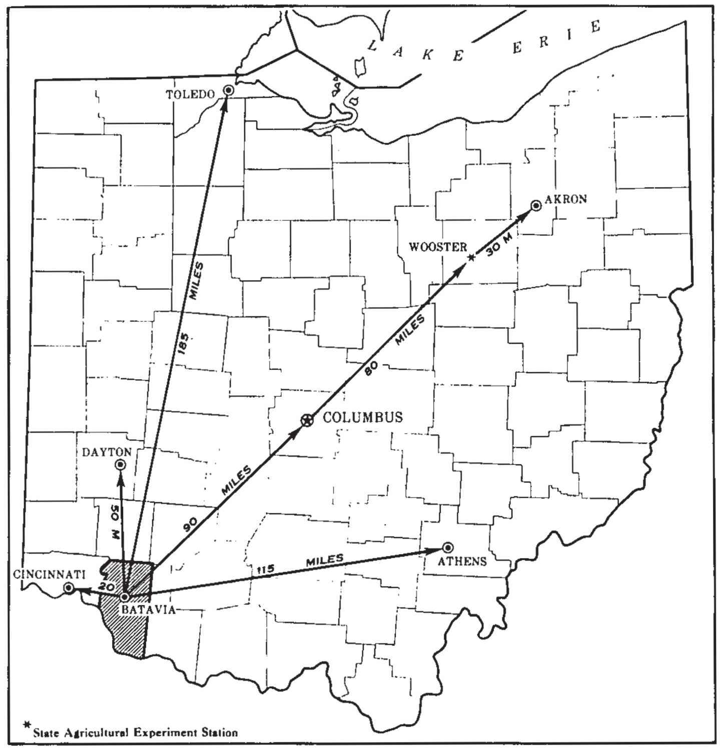

***Figure 1.*—Location of Clermont County in Ohio.**

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Clermont County, where they are located, and how they can be used. The soil scientists went into the county knowing they likely would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes, the size and gradient of streams, the kinds of native plants or crops, the 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 the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey.

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

[1] The completion of this survey was financially aided through a Federal grant from the Urban Renewal Administration of the Housing and Home Finance Agency under the Urban Planning Assistance Program authorized by section 701 of the Housing Act of 1954, as amended, and by funds provided by the Clermont County Commissioners through the Clermont County Planning Commission.

[2] Italic numbers in parentheses refer to Literature Cited, p. 95.

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. Rossmoyne and Blanchester, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface layer and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Edenton loam, 6 to 12 percent slopes, moderately eroded, is one of several phases within the Edenton series.

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 help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

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

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

A soil complex consists of areas of two or more soils, so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. Generally, the name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Fox-Urban land complex, gently sloping, is an example.

An undifferentiated group is made up of two or more soils that could be delineated individually but are shown as one unit because, for the purpose of the soil survey, there is little value in separating them. The pattern and proportion of soils are not uniform. An area shown on the map may be made up of only one of the dominant soils, or of two or more. If there are two or more dominant series represented in the group, the name of the group ordinarily consists of the names of the dominant soils, joined by "and." Edenton and Fairmount soils, 25 to 50 percent slopes, severely eroded, is an example.

In most areas surveyed there are places where the soil material is so rocky, so shallow, so severely eroded, or so variable that it has not been classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Gravel pits is an example.

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

Soil scientists observe how soils behave when used as a growing place for native and cultivated plants, and as material for structures, foundations for structures, or covering for structures. They relate this behavior to properties of the soils. For example, they observe that filter fields for onsite disposal of sewage fail on a given kind of soil, and they relate this to the slow permeability of the soil or its high water table. They see that streets, road pavements, and foundations for houses are cracked on a named kind of soil and they relate this failure to the high shrink-swell potential of the soil material. Thus, they use observation and knowledge of soil properties, together with available research data, to predict limitations or suitability of soils for present and potential uses.

After data have been collected and tested for the key, or benchmark, soils in a survey area, the soil scientists set up trial groups of soils. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others. They then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under current 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 Clermont County. A soil association is a landscape that has a distinctive 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 land use. Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area, or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field, or for selecting the exact location of a road, building, or similar structure, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect their management.

The seven soil associations in Clermont County are discussed in the following pages.

1. Huntington Association

Deep, nearly level, well-drained soils on the Ohio River flood plains

This association consists of nearly level soils on flood plains of the Ohio River and its tributaries. These soils are in relatively narrow bands between the stream and the adjacent, steep valley walls. They formed in sediment deposited by seasonal flooding of the Ohio River.

This association makes up about 1 percent of the county. Huntington soils make up about 55 percent of the association. The remaining 45 percent is made up of Newark, Lindside, and Genesee soils and the land type Alluvial land, sloping.

Huntington soils are level, dark colored, and well drained. They occupy the highest positions on the flood plain.

Newark soils are level and somewhat poorly drained and are lighter in color than Huntington soils. They generally are in old high-water flood channels, sloughs of the river, or low areas where surface water is frequently ponded.

Lindside soils are similar to Huntington soils, but they are moderately well drained. They show characteristics of wetness (mottling) in the subsoil and typically occupy positions intermediate between Huntington and Newark soils and the steep valley walls.

Sloping to very steep Alluvial land is on banks along the Ohio River and its tributaries. Although the texture of this land type varies considerably, the subsoil and underlying material in most places are similar to those of the Huntington soils.

Genesee soils are well drained and occur to a very minor extent in this association.

Seasonal flooding is the dominant limitation to use of the soils in this association, and poor drainage is an additional limitation on Newark soils. Nearly level topography, high potential productivity, and good crop response to applications of lime and fertilizer make the Huntington soils among the best for farming in the county. They are well suited to the production of truck crops, and they can be irrigated. The principal crops grown on soils in this association are corn, tobacco, soybeans, and hay. The hazard of seasonal flooding severely limits use of the soils in this association for most nonfarm uses.

2. Genesee-Williamsburg Association

Deep, nearly level to moderately steep, well-drained soils on stream flood plains and terraces

This association consists of level soils on flood plains and level to moderately steep soils on bench terraces along all stream valleys except those of the Ohio River. The largest areas are along the East Fork of the Little Miami River from the Brown County line to Milford. Extensive areas are also adjacent to the Little Miami River.

This association makes up about 8 percent of the county. Genesee soils make up about 33 percent of the association, and Williamsburg soils about 10 percent. The remaining 57 percent is made up of inextensive Shoals, Eel, Lanier, Medway, and Ross soils on flood plains and, to a minor extent, Ockley, Sardinia, Fox, Glenford, Mahalasville, McGary, and Markland soils on terraces.

Genesee soils are level, light colored, and well drained. They formed in loamy stream sediment on flood plains.

Williamsburg soils are also light colored and well drained but are on the highest terraces. They formed in as much as 24 inches of silty material and poorly sorted loamy material that contains a considerable amount of clay.

Seasonal flooding is the dominant limitation to use of the Genesee soils and the inextensive soils on flood plains in this association. Because they are silty, the sloping Williamsburg soils are susceptible to sheet and gully erosion. Many gentle slopes, moderately high to high potential productivity, and good crop response to applications of lime and fertilizer make the soils in this association among the best for farming in the county. The principal crops grown are corn, tobacco, soybeans, wheat, and hay. These soils can be irrigated and are suited to the production of truck crops.

The hazard of flooding on Genesee soils and on the inextensive soils on flood plains is a severe limitation to most nonfarm uses. Except in the few areas where the soils are moderately steep, Williamsburg soils have slight limitations for most nonfarm land uses.

3. Edenton-Eden Association

Moderately deep, moderately steep to very steep, well-drained soils on walls of upland valleys

This association consists of moderately steep to very steep soils on hillsides and valley walls of deep drainageways in scattered parts of the county. These soils are in areas between the flood plains and stream terraces and the gently sloping uplands. The steep slopes along the Little Miami River and East Fork of the Little Miami River and their tributaries and the Ohio River are typical of the association.

This association makes up about 15 percent of the county. Edenton soils make up about 54 percent of the association and Eden soils about 38 percent. The remaining 8 percent is made up of Fairmount, Hickory, and Sees soils.

Edenton soils are well drained. They formed in a moderately deep deposit of limy, mostly clay loam glacial till that overlies shale and limestone bedrock. These soils typically occur near the top of steeply sloping areas where the glacial till has feathered from the uplands downslope, although in places entire areas are Edenton soils.

Eden soils are also well drained. These soils formed in material derived from shale and limestone bedrock. They are moderately steep to very steep and are stony. They are on valley walls, particularly in the southern part of the county. Numerous bedrock fragments are on the surface and in the subsoil of Eden soils. Depth to bedrock in both Edenton and Eden soils ranges from 20 to 40 inches.

Flaggy Fairmount soils occur to a limited extent in the association. They are shallow, droughty, and mostly very steep. These soils are less than 20 inches thick over bedrock and formed in material similar to that in which Eden soils formed. Fairmount soils commonly occur as irregularly shaped, roughly horizontal bands on very steep hillsides where the bedrock almost crops out. The well-drained Hickory soils and the moderately well drained Sees soils occur to a minor extent in this association.

Steepness of slope and shallowness to bedrock are the dominant limitations to many uses of the soils in this association. Erosion is a serious hazard, particularly on Edenton soils, if a good vegetative cover is not maintained. Because of steepness of slope, shallowness to bedrock, and droughtiness, the soils in this association have severe limitations to use for cultivated crops. They have severe limitations to use for permanent pasture and woodland (fig. 2). Steepness of slope, shallowness to bedrock, and inaccessibility are severe limitations to most nonfarm uses. Poor soil stability, which results in slips, is a hazard to road and highway construction. This is particularly so on Edenton soils where the overlying soil material is able to slip

***Figure 2.*—Volunteer redcedar trees in a pastured area of steep Edenton soils in an area of the Edenton-Eden association.**

from the wet, slippery surface of the underlying shale bedrock and slump downslope.

4. *Hickory-Cincinnati-Edenton Association*

Deep and moderately deep, mostly moderately steep to very steep, well-drained soils on valley sides and tops of narrow ridges

This association consists of mostly light-colored, well-drained, moderately steep to very steep soils on uplands on valley sides and on narrow ridgetops adjacent to deep drainageways. It is in scattered areas throughout the county.

This association makes up about 8 percent of the county. Hickory soils make up about 44 percent of the association, Cincinnati soils about 35 percent, and Edenton soils about 18 percent. The remaining 3 percent is made up of the less extensive, moderately well drained Rossmoyne soils and well-drained Eden soils.

Hickory, Cincinnati, and Edenton soils formed in limy clay loam glacial till that overlies shale and limestone bedrock. Depth to bedrock is more than 5 feet in Hickory and Cincinnati soils and ranges from 20 to 40 inches in Edenton soils. Cincinnati soils have a silty deposit (loess) up to 40 inches thick that overlies the glacial till. These soils also have a compact, brittle layer (fragipan) in the subsoil at a depth of about 1½ to 3 feet. The fragipan is immediately below or at the contact between the silty deposit and the glacial till and tends to impede root penetration and percolation of water.

Steepness of slope is the dominant limitation to use of the soils in this association for both farm and nonfarm purposes. A moderate to severe erosion hazard where these soils are not protected by a vegetative cover and droughtiness on Edenton soils are also limitations, particularly to farming. If improved soil fertility and conservation management practices that include erosion-control measures are used, areas of moderately steep Hickory and Cincinnati soils are suitable for cultivation in places. Corn, tobacco, soybeans, wheat, and hay are the most commonly grown crops. The steeper soils of the association are better suited to permanent pasture and woods than to other uses. Steep slopes severely limit use for many nonfarm uses, but they provide a potential use for such recreational purposes as hiking and nature trails.

5. *Rossmoyne-Cincinnati Association*

Deep, mostly gently sloping to sloping, moderately well drained and well drained soils near major drainageways and on tops of broad ridges

This association consists of mostly gently sloping to sloping soils on rather broad ridgetops and hillsides of uplands. These soils are in areas adjacent to major drainageways and on the wider ridgetops between these drainageways. Areas are widely scattered throughout the county, but the most extensive areas of the association are in the southern and western parts.

This association makes up about 33 percent of the county. Rossmoyne soils make up about 71 percent of the association and Cincinnati soils about 26 percent. The remaining 3 percent is made up of small areas of well-drained, sloping Edenton soils and somewhat poorly drained, level to gently sloping Avonburg soils.

Rossmoyne and Cincinnati soils are light colored. They formed in as much as 40 inches of windblown silty material (loess) that overlies limy clay loam glacial till. Rossmoyne soils are moderately well drained, and Cincinnati soils are well drained. Both of these soils have a compact, brittle layer (fragipan) in the subsoil that impedes root penetration and percolation of water. This layer is generally at a depth of 1½ to 3 feet, depending upon the severity of erosion, and is at or immediately below the contact between the loess layer and the glacial till.

A moderate to severe erosion hazard in sloping areas is the dominant limitation to use of Rossmoyne and Cincinnati soils. In addition, wet spots on Rossmoyne soils in some areas create a need for artificial drainage in places. Because Rossmoyne and Cincinnati soils are silty, these soils are particularly susceptible to erosion where cultivated. If adequate erosion control and improved soil fertility and management practices are used, these soils have a moderate productivity potential for farming. Crop response to regular applications of lime and fertilizer is good. The principal crops grown are corn, tobacco, soybeans, wheat, and hay. In recent years, grapes have been grown to some extent. Where they are not limited by slope, Rossmoyne and Cincinnati soils have few limitations for most nonfarm uses. Slow permeability because of the fragipan layer, however, severely limits their use for septic-tank filter fields.

6. *Avonburg-Clermont Association*

Deep, nearly level to gently sloping, somewhat poorly drained and poorly drained soils on uplands

This soil association consists of nearly level soils on broad flats and gently sloping soils on uplands, mainly in the northern and eastern parts of the county. Small areas are in the western and southern parts of the county. The major soils of this association are deep and light colored. They formed in as much as 48 inches of windblown silty material (loess) that overlies limy clay loam glacial till.

This association makes up about 33 percent of the county. Avonburg soils make up about 50 percent of the association and Clermont soils about 41 percent. The remaining 9 percent is made up of moderately well drained, level Rossmoyne soils in a few areas and dark-colored, poorly drained Blanchester soils in shallow depressions.

Avonburg soils are somewhat poorly drained, and Clermont soils are poorly drained. Both of these soils have a clayey subsoil at a depth of about 2 feet that tends to inhibit root penetration and percolation of water. Because the surface layers of Avonburg and Clermont soils are white or grayish white when dry, this association is locally referred to as "buttermilk ground." Areas of Clermont soils are known locally as "crawdad land" or "buckshot soil."

Poor soil drainage as a result of very slow permeability, ponding, surface water, and slow runoff are the main limitations to use of Avonburg and Clermont soils. Because they are silty, and despite the relatively level topography, these soils are highly susceptible to sheet erosion and gullying where cultivated. If improved soil fertility and management practices that include artificial drainage and erosion-control measures are used where needed, Avonburg and Clermont soils have a moderate potential productivity for farming. The principal crops grown are corn, soybeans, wheat, and hay. Where adequate drainage is provided, some tobacco is grown on Avonburg soils.

Because of very slow permeability and the relatively level topography, tile drains generally do not function effectively on Avonburg and Clermont soils. Surface drains are, therefore, more commonly used to remove excess water from these soils. Even though they are drained, these soils are slow to dry out and warm up in spring. Although the soils in this association are used mostly for crops, a considerable acreage is wooded or is in wooded pasture. Some areas are no longer used for farming and are becoming wooded. Wetness and very slow permeability in the major soils in this association are limitations to most nonfarm uses.

7. *Blanchester-Clermont Association*

Deep, nearly level, poorly drained soils in slight depressions and swales and on broad flats

This soil association consists of level to slightly depressional soils on uplands, mainly in the northeastern part of the county. A small area is in Tate Township in the southeastern part of the county. The major soils in this association formed in as much as 48 inches of windblown silty material (loess) that overlies limy clay loam glacial till.

This association makes up about 2 percent of the county. Blanchester soils make up about 70 percent of the association and Clermont soils about 18 percent. The remaining 12 percent is made up of less extensive, light-colored, somewhat poorly drained Avonburg soils on slight rises.

Blanchester soils are deep and poorly drained and are darker colored than Clermont soils. Blanchester soils typically are on slightly depressional positions on the landscape where surface water tends to pond, such as at the heads of shallow drainageways or in swales.

Clermont soils are deep, light colored, and poorly drained. They are on broad flats. Clermont soils, which are almost white when dry, are locally called "buttermilk ground" or "buckshot soil" because of many small iron oxide nodules (concretions) that occur on the surface and in the subsoil.

Both Blanchester and Clermont have a clayey subsoil at a depth of about 2 feet. This layer tends to inhibit root penetration and percolation of water. Because of an abundant crayfish population, this association is locally referred to as "crawdad land."

Poor soil drainage as a result of very slow internal water movement, ponding of surface water, and slow runoff are the dominant limitations to use of Blanchester and Clermont soils. Because they are silty, and despite the level topography, sheet erosion is an additional hazard, particularly where these soils are cultivated. If improved soil fertility and management practices that include artificial drainage and control of sheet erosion are used, Blanchester and Clermont soils have a moderate potential productivity for farming. The principal crops grown are corn, soybeans, wheat, and hay.

Because of very slow permeability and the level topography, tile drains generally do not function well on Clermont soils. Surface drains are, therefore, more commonly used to remove excess water from these soils. Even though they are drained, Clermont soils are slow to dry out and warm up in spring. Although the soils in this association are used mostly for crops, a considerable acreage of the association is woodland or wooded pasture. A few areas are no longer used for farming and are becoming wooded. Wetness, ponding of surface water, and slow to very slow permeability are limitations to most nonfarm uses.

Use and Management of the Soils

This section of the survey describes use and management of the soils for farming, woodland, wildlife, engineering, and town and country planning.

The section that describes management of the soils for farming includes information related to special crops, orchards, vineyards, and estimated yields. Properties and soil features that affect engineering practices and limitations that affect land-use planning are presented mainly in tables.

Management for Farming

The use and management of the soils in Clermont County vary widely. Field crops, pasture, and special crops are grown. Information concerning suitable varieties of crops, erosion control, and other management practices can be obtained from the local office of the Soil Conservation Service or from the Cooperative Extension Service.

Management for cultivated crops and pasture

Some principles of management are general enough to apply to all the soils suitable for farm crops and pasture throughout the county, though the individual soils or groups of soils require different kinds of management. These general principles of management are discussed in the following paragraphs.

Many soils in the county need lime or fertilizer or both. The amounts needed depend on the natural content of lime and plant nutrients, which are determined by laboratory analyses of soil samples; on the needs of the crop; and on the level of yield desired. Only general suggestions for applications of lime and fertilizer are given in this survey.

Most of the soils of Clermont County were never high in content of organic matter, and it is not economical to build up the content to a high level. It is important, however, to return organic matter to the soils by adding farm manure, leaving plant residue on the surface, and growing sod crops, cover crops, and green-manure crops.

Tillage tends to break down soil structure. It should be kept to the minimum necessary to prepare a seedbed and control weeds. Maintaining the organic-matter content of the plow layer also helps to protect the structure.

On wet soils, such as Blanchester silt loam, yields of cultivated crops can be increased by open-ditch or tile drainage. Tile drains are costly to install, but they generally provide better drainage than open ditches. Soils that have a fragipan are difficult to drain, but they can generally be drained better by open ditches than by tile. Open-ditch drainage is more effective if the ditches intercept the water as it moves horizontally on top of the fragipan. For drainage by either tile or open ditches, suitable outlets are needed.

All of the gently sloping and steeper soils that are cultivated are subject to erosion. Runoff and erosion occur mostly while a cultivated crop is growing or soon after one has been harvested. On erodible soils, such as Rossmoyne silt loam, 2 to 6 percent slopes, a cropping system that controls runoff and erosion is needed in addition to other erosion-control practices. As used here, "cropping system" refers to the sequence of crops grown in combination with management that includes minimum tillage, mulch planting, use of crop residue, growing of cover and green-manure crops, and use of lime and fertilizer. Other erosion-control practices are contour cultivation, terracing, contour stripcropping, diversion of runoff, and use of grassed waterways. The effectiveness of a particular combination of these measures differs from one soil to another, but different combinations can be equally effective on the same soil. The local representative of the Soil Conservation Service will assist in planning an effective combination of practices.

Pasture is effective in controlling erosion on all but a few of the soils that are subject to erosion, but a high level of pasture management is needed on some soils to provide enough ground cover to keep the soil from eroding. A high level of pasture management provides for fertilization, control of grazing, selection of pasture mixtures, and other practices that help to maintain good ground cover and forage for grazing. Grazing is controlled by rotating the livestock from one pasture to another and providing rest periods for the pasture after each grazing period to allow for regrowth of the plants. It is important on some soils that pasture mixtures be selected that will require the least amount of renovation to maintain good ground cover and forage for grazing.

Management for special crops

Specialized or high-value crops are important to farming in Clermont County. Of these specialized crops, tobacco is the most important (fig. 3). Other specialized crops include such truck crops as sweet corn, cabbage, peppers, tomatoes, potatoes, cucurbits, and melons; such fruits as apples, peaches, pears, and grapes; and nursery stock.

Specialized crops generally require fertile, productive soils. They need a more stable environment than field crops, and this environment should be defined by rather narrow critical limits. For this reason, some soils in Clermont County are particularly well suited to specialized cropping.

Tobacco.—Tobacco, although a minor crop in acreage, ranks first in cash value. About 700 acres in tobacco produced approximately 1.7 million pounds in 1969. Burley type 31 is the variety of tobacco commonly grown in Clermont County.

Tobacco grows best on deep, loamy soils that are moderately well drained or well drained, although it can be raised on somewhat poorly drained soils. Very little, if any, land in the county is naturally fertile enough for producing high yields of quality tobacco without plow down of green cover crops, farm manure, and commercial fertilizers.

In Clermont County tobacco was originally grown in Eden and Fairmont soils, but most tobacco is now grown in soils on terraces and bottom lands and in moderately well drained soils on uplands. In descending order, the soils presently being used for the production of tobacco are: Ross, Genesee, Eel, Ockley, Williamsburg, Rossmoyne, Cincinnati, Huntington, Lindside, Sees, and Avonburg soils.

Truck Crops.—High-value truck crops for markets in the Cincinnati area are grown on several farms in the county. Fox, Ockley, and Rossmoyne are the major soils that are used most successfully for the production of these trucks. To maintain top yields of truck crops, generous amounts of commercial fertilizers and organic matter in the form of manure, crop residue, and green manure are vital.

Yields of vegetables are greatly affected by disease and damaging insects. For information on disease-resistant varieties and for other information about the control of disease and insects, consult the Cooperative Extension Service.

Fruits.—Generally, the soils best suited for orchard trees are deep, well drained, and free from impervious layers that restrict root development. They have high available water capacity and are acid, having a reaction (pH) of 5.5 to 6.5.

Sustained high orchard yields require that good soil fertility is maintained, the soil is permeable, the soil structure is not unduly destroyed despite the traffic of heavy equipment, and that consistent conditions favoring growth and fruitfulness can be continued from decade to decade.

Sloping Cincinnati, Edenton, and Rossmoyne soils on landscapes having suitable air drainage are most preferred for growing orchards, although some orchards are planted on Avonburg and Clermont soils. Adequate sod cover is generally maintained in apple and pear orchards and is

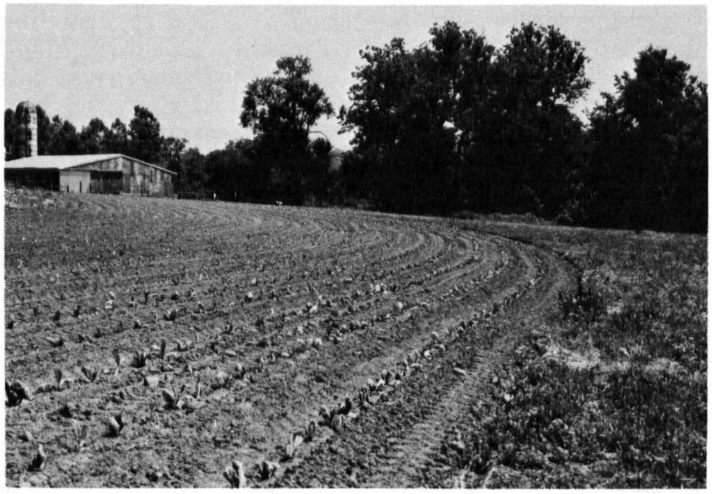

Figure 3.—**Newly transplanted tobacco plants on Genesee silt loam.**

an effective means of controlling soil erosion. If this sod is not adequate, however, other measures of soil and water conservation must be applied as necessary.

Grapes are more drought resistant than most fruits, root deeply, and thrive best on well-aerated soils having a pH of 5 to 8. Air drainage is also an important consideration in selecting vineyard sites. Sloping Cincinnati and Rossmoyne soils are highly preferable for growing grapes, but proper conservation practices, such as contour rows and sodded aisles, are needed to control soil erosion.

Capability Grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The soils are grouped according to their limitations when they are used for field crops, the risk of damage when they are so used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to horticultural crops or to other crops requiring special management.

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

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

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

Class I soils have few limitations that restrict their use.

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

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

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

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife. (None in Clermont County)

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.

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

Class VIII soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife, water supply, or to esthetic purposes. (None in Clermont County)

Capability Subclasses are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold to too dry. (Subclass "c" is not used in Ohio.)

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

Of the soils in the county, the hazard of erosion is the main limitation on about 58 percent of the acreage; wetness is the main limitation on about 40 percent; and droughtiness or shallowness is the main limitation on about 2 percent.

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-3 or IIIe-2. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph; and the Arabic numeral specifically identifies the capability unit within each subclass.

In the following pages the capability units in Clermont County are described and suggestions for the use and management of the soils are given. The descriptions of the capability units give the general characteristics, properties, and qualities of the soils within the unit. The capability unit designation for each soil in the county can be found in the "Guide to Mapping Units" at the end of the survey.

CAPABILITY UNIT I-1

This unit consists of Ockley silt loam, 0 to 2 percent slopes, a well-drained, level and nearly level, slightly eroded soil on terraces. The plow layer is medium textured, and the rooting zone is deep. Permeability is moderate, available water capacity is high, and the capacity for storage and release of plant nutrients is high. Crops grown on this soil are highly responsive to good management.

This soil can be cultivated soon after rains. It is suited to continuous use for row crops, small grains, hay crops, and pasture plants commonly grown in the county, and it is well suited to truck crops and other specialty crops.

CAPABILITY UNIT IIe-1

This unit consists of gently sloping, well drained or moderately well drained, slightly eroded or moderately eroded soils on uplands, commonly ridgetops, and upper-level terraces. The plow layer is medium textured, and the rooting zone is moderately deep. Permeability is slow to moderate, available water capacity is medium, and the capacity to store and release plant nutrients is moderate to high.

The surface of these soils tends to crust because of the lack of good surface-layer structure, which is caused in part by a general deficiency of organic matter. These soils are suited to the row crops, small grains, hay crops, and pasture plants commonly grown in the county, and they are suited to some specialty crops.

CAPABILITY UNIT IIe-2

This unit consists of well drained and moderately well drained, gently sloping, slightly eroded or moderately eroded soils. These soils are on terraces that are mostly along the major drainage systems, particularly along the Little Miami River system. The plow layer is medium textured, and the rooting zone is deep. Permeability is moderately slow, available water capacity is high, and the capacity for storage and release of plant nutrients is moderate to high.

Erosion is the main hazard to use of these soils for farming. Other concerns that require special management are crusting of the surface, wetness caused by seepage, runoff from adjacent soils, and a seasonal high water table.

The soils in this unit are among the more productive and more easily managed in the county. They are well suited to truck crops and to many specialty crops. They are suited to small grains, hay, pasture, and row crops commonly grown in the county.

CAPABILITY UNIT IIe-3

This unit consists of Fox silt loam, 2 to 6 percent slopes. It is a slightly eroded, well-drained, gently sloping soil on stream terraces of the Little Miami River system. The medium-textured plow layer is easily worked without loss of structure. This soil has a root zone moderately deep over sand and gravel. It has moderate permeability, medium available water capacity, and a moderate capacity to store and release plant nutrients for plant growth.

Erosion is the main limitation to use of this soil for farming. This soil tends to be droughty, especially where sand and gravel are within 30 inches of the surface and during prolonged dry periods late in summer.

This soil is suited to row crops, small grains, hay crops, and pasture plants commonly grown in the county, and it is well suited to truck crops and specialty crops commonly grown in the county.

CAPABILITY UNIT IIw-1

This unit consists of nearly level, well drained or moderately well drained soils that are medium textured. These soils are on flood plains. The rooting zone is deep, permeability is moderate, and available water capacity is high.

Occasional flooding, generally in winter or spring, is the main hazard to use of these soils for farming. If management is good, maintenance of soil structure and tilth is seldom a concern.

The soils in this unit can be used continuously for most row crops, small grains, hay crops, and pasture plants commonly grown in the county. They are well suited to specialty crops, particularly those grown in summer.

CAPABILITY UNIT IIw-2

This unit consists of nearly level, moderately well drained, slightly eroded soils that are medium textured. These soils are on uplands and terraces. The rooting zone is moderately deep, permeability is moderate or slow, and available water capacity is medium. The capacity to store and release plant nutrients is moderate.

Moderate wetness is the main limitation to use of these soils, but it is commonly corrected by a random system of artificial drains. Maintenance of good soil structure is another concern of management.

The soils in this unit are suited to row crops, small grains, hay crops, and pasture plants. Generally they are not well suited to specialty crops.

CAPABILITY UNIT IIw-3

This unit consists of nearly level and slightly depressional, poorly drained or very poorly drained soils. These soils are on terraces and uplands. The plow layer is moderately fine textured or medium textured, and the rooting zone is deep. Permeability is slow, available water capacity is high, and the capacity to store and release plant nutrients is very high.

Moderate wetness is the main concern where these soils are cultivated. It is a limitation to use for farming unless the soils are artificially drained. Preparing an adequate seedbed is more difficult, and crop stands are commonly poorer on these soils than on the nearby soils. Grazing pastures when the soils are wet results in damaging compaction.

If the soils in this unit are drained, they can be continuously cultivated to most of the commonly grown field crops, hay crops, and pasture plants that tolerate wet conditions. They are suited to certain specialty crops, such as sweet corn and tomatoes. Continuous row cropping tends to deplete the content of organic matter and to make the surface layer hard and cloddy.

CAPABILITY UNIT IIw-4

This unit consists of nearly level, somewhat poorly drained and moderately well drained soils that are medium textured. These soils are on low-lying flood plains. Permeability is moderate or moderately slow, available water capacity is medium or high, and the root zone is moderately deep or deep. The capacity to store and release plant nutrients is moderate to high.

Wetness is the main limitation to use of these soils. These soils are subject to flooding, generally in winter and spring, have a seasonal high water table, and are commonly ponded. They are late to dry out and warm up in spring. This characteristic commonly contributes to a secondary hazard of poor soil structure, because these soils are often worked or pastured while wet. The resulting compaction and destruction of structure makes these soils more difficult to till.

Flooding limits the choice of crops grown on these soils largely to summer crops. The soils in some small local areas need a continuous vegetative cover because of frequent flooding. If adequately drained, these soils are suited to most commonly grown field crops, hay crops, or pasture plants that tolerate wet conditions. They are poorly suited to most specialty crops.

CAPABILITY UNIT IIw-5

This unit consists of nearly level, well-drained soils on flood plains. The plow layer is moderately coarse textured. The rooting zone is deep to shallow. Available water capacity is medium or low.

Flooding is the primary hazard to use of these soils for farming. Droughtiness is a secondary hazard on the Lanier soils of this unit and greatly limits their suitability for cultivation.

The soils in this unit are easily worked soon after rains. They are suited to most field crops commonly grown in the county and to specialty crops.

CAPABILITY UNIT IIIe-1

This unit consists of sloping, well drained or moderately well drained, moderately eroded soils. These soils are on uplands and terraces. They are medium textured to moderately fine textured. The rooting zone is moderately deep to deep, permeability is slow to moderate, and available water capacity is medium to high. The capacity to store and release plant nutrients is moderate to high.

Severe soil erosion is the main hazard to use of these soils for cultivation. Other concerns are surface crusting of the soils that have more silty plow layers and, in some soils, a seasonal high water table.

The soils in this unit are suited to commonly grown cultivated crops and are well suited to commonly grown hay crops and pasture plants. They are not well suited to most specialty crops.

CAPABILITY UNIT IIIe-2

This unit consists of gently sloping to sloping, moderately well drained and well drained, slightly eroded and moderately eroded soils. These soils are on terraces and foot slopes. They are medium textured. The rooting zone is moderately deep to deep, permeability is slow, and available water capacity is medium. The capacity for storage and release of plant nutrients is moderate.

A severe erosion hazard is the main concern of management. In places an overflow of excess water from adjacent soils is a concern.

The soils in this unit are suited to the commonly grown cultivated crops and are well suited to commonly grown hay crops and pasture plants. They are not well suited to most specialty crops.

CAPABILITY UNIT IIIe-3

This unit consists of Fox silt loam, 6 to 12 percent slopes, moderately eroded. It is a well-drained soil on terraces. The plow lawer is medium textured, and the rooting zone is moderately deep over sand and gravel. Permeability is moderate, available water capacity is medium, and the capacity for storage and release of plant nutrients is moderate.

Erosion is a severe hazard on this soil, and droughtiness is a secondary hazard during dry periods. This soil is moderately well suited to row crops, small grains, hay crops, and pasture plants commonly grown in the county and is suited to truck crops and other specialty crops.

CAPABILITY UNIT IIIw-1

The unit consists of Clermont silt loam, a nearly level, slightly eroded, poorly drained soil. The plow layer is medium textured, and the rooting zone is moderately deep. Permeability is very slow, available water capacity is medium, and the capacity to store and release plant nutrients is moderate.

Wetness is a severe limitation to use of this soil. The water table is high during wet periods. Because this soil dries slowly in spring, spring plowing and planting are delayed, especially if there is prolonged wetness. Surface drainage is needed, but tile drainage systems generally have not been economical. The silt loam surface layer of this soil has very little structure. Regular additions of organic matter help to improve structure in the plow layer, lessening the prevalent problem of surface crusting.

If this soil is drained, it is suited to cultivated crops and pasture plants commonly grown in the county. It is not well suited to specialty crops.

CAPABILITY UNIT IIIw-2

This unit consists mainly of nearly level, somewhat poorly drained soils. These are medium-textured soils on uplands and on terraces along the East Fork of the Little Miami River. They have a seasonal high water table and stay wet until late in spring, unless they are artificially drained. Permeability is slow or very slow, available water capacity is medium, and the rooting zone is moderately deep. The capacity for storage and release of plant nutrients is medium.

Seasonal excess wetness is the major limitation to use of these soils. Surface crusting is a concern, especially in areas where the soils have a very silty plow layer. Soil tilth is a concern where the soil structure has been destroyed or where the soils have been compacted through tillage operations or by pasturing of livestock when the soil was too wet. The seasonal high water table can be lowered by tile drains. Drainage by tile, however, is fairly slow. Surface drains are more commonly used to remove excess water.

If these soils are d.ained, they are suited to row crops, small grains, hay crops, and pasture plants commonly grown in the country. They are poorly suited to specialty crops.

CAPABILITY UNIT IIIw-3

This unit consists of gently sloping, somewhat poorly drained, slightly eroded and moderately eroded soils. These soils are on Illinoian till plains of the uplands. They are medium textured. The rooting zone is moderately deep, permeability is very slow, and available water capacity is medium. The capacity for storage and release of plant nutrients is moderate.

Wetness is a severe hazard to use of these soils. During winter and spring these soils have a high water table and dry out slowly. Spring plowing and seeding are generally delayed, especially in wet years. Maintaining good structure in the surface soil helps to improve drainage. Erosion is also a moderate hazard on these soils.

The soils in this unit are suited to most commonly grown field crops, hay crops, and pasture plants that tolerate wet conditions. They are poorly suited to most specialty crops.

CAPABILITY UNIT IVe-1

This unit consists of moderately steep, well-drained, moderately eroded soils. These soils are on uplands and terraces along drainageways. The plow layer is medium textured, and the rooting zone is moderately deep or deep. Permeability is moderate or moderately slow, available water capacity is medium to high, and the capacity for storage and release of plant nutrients is moderate.

Erosion is a very severe hazard on these soils. Because these soils are moderately eroded, the plow layer is difficult to till and tends to become cloddy because of the finer textured subsoil material that has mixed into it.

The soils in this unit are well suited to pasture plants and hay crops, particularly those that tolerate hot, dry summers. They are not suited to row crops or specialty crops.

CAPABILITY UNIT IVe-2

This unit consists of moderately steep, well drained or moderately well drained, moderately eroded soils. These soils are on valley walls and colluvial foot slopes. They are medium textured to moderately fine textured. The rooting zone is moderately deep, permeability is moderately slow to slow, and available water capacity is medium. The capacity for storage and release of plant nutrients is moderate.

Erosion is a very severe hazard on these soils. The soils are suited to most small grains, hay crops, and pasture crops commonly grown in the county, but they are poorly suited to row crops and specialty crops.

CAPABILITY UNIT IVe-3

This unit consists of Rossmoyne silty clay loam, 6 to 12 percent slopes, severely eroded. It is a moderately well drained, sloping soil on uplands. This plow layer is medium textured, and the rooting zone is moderately deep. Permeability is slow, available water capacity is medium, and the capacity for storage and release of plant nutrients is moderate.

A very severe hazard of erosion is the main limitation to use of this soil for cultivation, but the soil can be cultivated if erosion is controlled. Because of previous erosion, including shallow gullies in places, this soil is difficult to till. It is more droughty than the moderately eroded, sloping Rossmoyne soil, and because of droughtiness it is better suited to crops grown in spring than to crops grown late in summer.

The soil in this unit is well suited to pasture plants and hay crops, particularly those that tolerate hot, dry summers. It is poorly suited to specialty crops.

CAPABILITY UNIT VIe-1

This unit consists of moderately steep to very steep, well-drained, severely eroded and moderately eroded soils. These soils are in areas generally bordering uplands. They are medium textured to moderately fine textured. The rooting zone is moderately deep. Permeability is moderately slow or slow, available water capacity is medium, and the capacity for storage and release of plant nutrients is moderate.

Because the erosion hazard is very severe, the soils in this unit are generally not suited to cultivated crops and specialty crops. Gullies, seep spots, and land slips are common on these soils.

CAPABILITY UNIT VIe-2

This unit consists of moderately steep to very steep, well drained or moderately well drained, moderately eroded or severely eroded soils. These soils are mainly in areas bordering uplands and are on terraces. The surface layer is medium textured, and the rooting zone is moderately deep or deep. Permeability is moderate or moderately slow, and available water capacity is medium to high.

Because the erosion hazard is very severe, the soils in this unit are not suited to cultivated crops and specialty crops. The severely eroded soils in this unit have gullies in places.

CAPABILITY UNIT VIs-1

This unit consists of Rodman and Casco loams, 12 to 18 percent slopes, moderately eroded. These are well-drained, moderately eroded, moderately steep soils on terrace escarpments and valley walls. They have a medium-textured surface layer over sand and gravel. The rooting zone is shallow, available water capacity is low to very low, and permeability is rapid to moderate. Stratified sand and gravel are near the surface of these soils.

The shallow rooting zone is the main limitation, and because of it these soils are unsuitable for cultivated crops. Erosion is also a hazard to use. The soils are suited to woods, pasture plants, hay crops, and wildlife food and cover. They are better suited to permanent pasture than to hay and are best suited to woods or wildlife food and cover.

CAPABILITY UNIT VIIe-1

This unit consists of very steep, well-drained, severely eroded soils. These soils are in areas bordering uplands. The surface layer is medium textured, and the rooting zone is moderately deep or shallow. Permeability is moderate to slow, and available water capacity is medium or low.

The use of soils in this unit is restricted to permanent vegetation because of very steep slopes and a very severe erosion hazard. Gullies are quite common on these soils.

CAPABILITY UNIT VIIs-1

This unit consists of steep to very steep, well-drained, moderately eroded soils. These soils are in areas bordering uplands and terraces. They are stony and are shallow to calcareous shale and limestone bedrock or shallow to sand and gravel. These soils are moderately fine textured to moderately coarse textured. The rooting zone is shallow, permeability is moderately slow to rapid, and available water capacity is low to very low.

Steep and very steep slopes, shallow rooting zones, stones at or near the surface, and a severe erosion hazard limit the use of these soils to permanent vegetation.

Estimated Yields

Table 1 shows, for most of the soils in the county, the estimated average yields per acre of principal crops. The yields are the averages of those expected over a period of several years under two levels of management. Soils and land types that are not suited to the crops rated are not included in table 1.

In table 1 yields in columns A are obtained under improved management, and those in columns B are obtained under optimum management. Under optimum management—

1. Practices that increase the intake of water and the available water capacity of the soils are used. Excess water is disposed of by appropriate means.
2. Practices that help control erosion are used.
3. Suitable methods of plowing, preparing the seedbed, and cultivation are used.
4. Weeds, diseases, and insects are controlled.
5. Fertility is maintained at the highest level. Lime and fertilizer are applied according to needs of the soil and crop as determined by soil tests. The fertilizer contains trace elements (zinc, cobalt, manganese, copper, etc.) if they are needed.
6. Crop varieties that are suited to the soil are selected.
7. All farming operations are done at the proper time and in the proper way.

Under an improved level of management the farmer uses some but not all of the practices listed under optimum management, or the practices used are not adequate for the needs of the crops.

The yields given in table 1 do not apply to a specific field for any particular year, because the soils vary from place to place, management practices vary from farm to farm, and weather conditions vary from year to year.

These yields are intended only as a guide to show relative productivity of the soils, the response of soils to management, and the relationship of soils to each other. Although the general level of crop yields is subject to change as new methods and new crop varieties are developed, the relationship of the soils to each other is not likely to change.

The estimates of yields given in table 1 are based mainly on information obtained from farmers and on observations and field trials made by the county agent and district conservationists of the Soil Conservation Service. They are also based on experiments made by the Ohio Agricultural Research and Development Center and on field observations made by members of the soil survey party.

Irrigation

Clermont County generally receives sufficient rainfall for most crop requirements, but occasionally short periods occur that have less than the optimum amount of rainfall. During these dryer periods, supplemental irrigation would be beneficial to crops and pasture. It is particularly beneficial in years when rainfall is less than normal. At present only a small acreage is irrigated in Clermont County.

Soils that are best suited to sprinkler irrigation are level to gently sloping, have deep rooting zones, have favorable permeabilities and available water capacities, and are easily maintained in good tilth. Soil features influencing suitability include natural drainage, texture of the surface layer, movement of air and water in the subsoil, and inherent fertility. Some soils can be conditioned to increase productivity by use of irrigation. Conditioning includes such practices as leveling to the desired grade and providing artificial drainage before irrigation water is applied to the soils.

The soils in Clermont County vary greatly in suitability for irrigation.

Soils in the Fox, Genesee, Ockley, Ross, Williamsburg, and Martinsville series that have slopes of 6 percent or less are well suited to irrigation.

Other soils that can be irrigated if necessary drainage is provided are the nearly level and gently sloping soils of the Eel, Lindside, Markland, Rossmoyne, Sardinia, and Glenford series.

The other soils in the county are not so well suited to irrigation because of such limitations as excessive slope, slow intake rate, crusting problems, limited available water capacity, and somewhat poor to very poor natural drainage.

Use of the Soils for Woodland [3]

In the early settlement of Clermont County, it was necessary to remove the virgin forest which completely covered the county. Today regrowth forest occupies approximately 91,000 acres, or about 31 percent of the total land area in Clermont County (fig. 4). Much of this acreage has been or is in pasture. Very little regrowth or reforestation is occurring in the pastured woodland. The proximity of metropolitan Cincinnati and Dayton makes the development of outdoor open space a demanding consideration. The use of woodland for many purposes, including recreation, is becoming very important.

The natural beauty of Clermont County is attributed to its woodlands. Native redbud and dogwood blooming in spring present a panorama of natural beauty. The steep hillsides, winding streams, and narrow township roads abound with color in autumn when the sweetgum, maple, dogwood, and sassafras display many hues of red, yellow, and brown.

Clermont County is within the north-central hardwood forest region. Such species as black and red oaks, pin and white oaks, ash, beech, and sugar maple occur throughout the county.

Beech-maple is the dominant forest type and occurs on the better drained soils. Associated species are yellow-poplar, white ash, white oak, red maple, basswood, wild cherry, sweetgum, sassafras, pin oak, and shagbark hickory.

Oak-hickory and beech-maple forests are in the southern and western sections of the county on the well-drained soils on ridgetops, along the river valleys, and on stream

[3] A. N. Quam, woodland conservationist, Soil Conservation Service, assisted in the preparation of this section.

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

[Yields in columns A are those obtained under improved management; yields in columns B are those obtained under optimum management. Absence of a yield figure indicates that the crop is not commonly grown at the level of management indicated or that the soil is not suited to the crop. Only arable soils are listed]

Soil	Corn		Soybeans		Tobacco	Wheat		Legume-grass hay	
	A	B	A	B	B	A	B	A	B
	Bu	*Bu*	*Bu*	*Bu*	*Lbs*	*Bu*	*Bu*	*Tons*	*Tons*
Avonburg silt loam, 0 to 2 percent slopes	75	110	25	35	3, 200	25	45	2. 0	4. 0
Avonburg silt loam, 2 to 6 percent slopes	70	110	20	35	3, 400	20	40	2. 0	4. 0
Avonburg silt loam, 2 to 6 percent slopes, moderately eroded	60	100	15	25	2, 600	15	30	1. 5	4. 0
Blanchester silt loam	90	115	30	40	--------	25	45	3. 0	5. 0
Cincinnati silt loam, 2 to 6 percent slopes	80	110	25	35	3, 800	30	50	2. 5	4. 5
Cincinnati silt loam, 2 to 6 percent slopes, moderately eroded	75	110	20	35	3, 700	25	45	2. 5	4. 5
Cincinnati silt loam, 6 to 12 percent slopes, moderately eroded	65	100	15	30	3, 400	20	40	2. 0	4. 5
Cincinnati silt loam, 12 to 18 percent slopes, moderately eroded	------	------	------	------	--------	------	------	1. 5	3. 5
Cincinnati and Hickory soils, 12 to 25 percent slopes, severely eroded	------	------	------	------	--------	------	------	1. 0	2. 5
Clermont silt loam	70	110	20	35	2, 700	20	35	2. 0	4. 0
Eden flaggy silty clay loam, 12 to 18 percent slopes, moderately eroded	35	60	10	20	--------	15	25	1. 5	3. 0
Edenton loam, 6 to 12 percent slopes, moderately eroded	60	90	20	30	3, 400	25	40	2. 5	4. 5
Edenton loam, 12 to 18 percent slopes, moderately eroded	45	70	------	------	--------	15	35	1. 5	3. 5
Edenton clay loam, 12 to 25 percent slopes, severely eroded	------	------	------	------	--------	------	------	1. 0	2. 0
Eel silt loam	85	130	35	50	3, 800	30	50	4. 0	6. 0
Fox silt loam, 2 to 6 percent slopes	70	120	25	35	3, 000	30	45	3. 0	5. 0
Fox silt loam, 6 to 12 percent slopes, moderately eroded	50	75	20	30	2, 600	25	40	2. 5	5. 0
Genesee silt loam	90	130	35	50	3, 900	35	55	4. 0	6. 0
Glenford silt loam, 2 to 6 percent slopes	80	120	30	40	3, 700	35	50	3. 5	5. 0
Glenford silt loam, 6 to 12 percent slopes, moderately eroded	65	115	25	35	3, 300	25	40	3. 0	5. 0
Hickory loam, 12 to 18 percent slopes, moderately eroded	50	80	------	------	--------	25	35	2. 0	3. 5
Huntington silt loam	80	125	30	45	3, 500	30	45	3. 0	5. 5
Lanier sandy loam	70	120	30	45	2, 700	30	45	3. 5	5. 5
Lindside silt loam	75	125	30	45	3, 450	30	40	2. 5	5. 0
Mahalasville silty clay loam	95	130	35	50	--------	30	50	4. 0	6. 0
Markland silt loam, 2 to 6 percent slopes	75	110	30	35	3, 500	30	50	3. 0	4. 5
McGary silt loam, 0 to 2 percent slopes	65	100	25	35	3, 000	25	45	2. 5	4. 5
Medway silt loam, overwash	95	130	35	50	--------	35	55	4. 0	6. 0
Newark silt loam	70	110	30	40	2, 800	25	35	2. 5	4. 5
Ockley silt loam, 0 to 2 percent slopes	90	115	30	45	3, 800	35	50	3. 0	5. 0
Ockley silt loam, 2 to 6 percent slopes	85	115	30	45	3, 750	35	50	3. 0	5. 0
Rodman and Casco loams, 12 to 18 percent slopes, moderately eroded	25	55	------		--------	15	25	2. 5	3. 5
Ross silt loam	95	130	40	50	4, 000	35	55	4. 0	6. 0
Rossmoyne silt loam, 0 to 2 percent slopes	75	110	25	35	3, 700	30	40	2. 5	4. 5
Rossmoyne silt loam, 2 to 6 percent slopes	80	110	30	40	3, 850	30	45	3. 0	4. 5
Rossmoyne silt loam, 2 to 6 percent slopes, moderately eroded	70	110	25	35	3, 650	25	40	2. 5	4. 5
Rossmoyne silt loam, 6 to 12 percent slopes, moderately eroded	60	105	20	30	3, 100	25	40	2. 0	4. 0
Rossmoyne silty clay loam, 6 to 12 percent slopes, severely eroded	50	75	------	------	--------	20	30	1. 5	3. 0
Sardinia silt loam, 0 to 2 percent slopes	75	110	25	40	3, 500	30	50	3. 0	4. 5
Sardinia silt loam, 2 to 6 percent slopes	70	110	20	40	3, 600	25	45	3. 0	4. 5
Sees silty clay loam, 4 to 12 percent slopes, moderately eroded	70	100	20	35	3, 300	25	40	2. 5	4. 0
Sees silty clay loam, 12 to 18 percent slopes, moderately eroded	55	75	------	------	--------	20	35	2. 0	4. 0
Shoals silt loam	75	110	25	40	3, 300	30	45	2. 5	4. 5
Stonelick sandy loam	60	80	15	25	2, 500	20	35	2. 0	3. 5
Williamsburg and Martinsville silt loams, 2 to 6 percent slopes	80	115	30	40	3, 700	30	45	3. 0	4. 5
Williamsburg and Martinsville silt loams, 6 to 12 percent slopes, moderately eroded	70	115	20	30	3, 300	25	40	2. 0	4. 5
Williamsburg and Martinsville silt loams, 12 to 18 percent slopes, moderately eroded	55	90	15	25	--------	20	30	1. 5	3. 5

terraces. The virtual elimination of American chestnut by the blight has left the oaks as the dominant type in the original chestnut-oak forest areas. Dominant species are white oak, red oak, hickory, and sugar maple.

The flat, wet areas of the Illinoian glacial till plain are occupied by several species of swamp forest, mainly pin oak, sweetgum, white elm, and red maple. Dutch elm disease is slowly eliminating the elm. Other species include sassafras, beech, and red oak. Most of the farm woodlots on the wet soils are pastured (fig. 5). Some fields that were formerly cultivated have been abandoned and are reverting to woodland. These wet areas have a thick, even-aged volunteer growth of young red maple, pin oak, and sweetgum trees.

Redcedars grow on eroded, steep soils on hillsides that are shallow to limy glacial till or shale and limestone bedrock. In places they are in thick stands. They have little competition from trees of other species. They also are in the flat, wet, acid, till plain areas.

A second growth of black locust has covered many

***Figure 4.*—Typical second-growth woodland on Hickory loam, 18 to 35 percent slopes, moderately eroded.**

***Figure 5.*—A typical pastured beech-maple-hickory farm woodlot on Clermont silt loam.**

acres on the less eroded soils on sides of valleys. Numerous old beech trees are scattered in woodlots all over the county, because they are left uncut when the more desirable species are harvested.

The soils of Clermont County have been placed in woodland suitability groups to assist owners in planning the use of their soils for woodland. Each group is made up of soils that are suited to the same kinds of trees, that need about the same management where the vegetation on them is similar, and that have the same potential production.

Each woodland group is identified by a three-part symbol, such as 1o1, 2w1, or 3c2. The potential productivity of the soils in the group is indicated by the first number in the symbol: 1 and 2 indicate good, 3 indicates fair, and 4 and 5 indicate poor. These ratings are based on field measurements of an average tree site index for principal soils within each group (*4*, *6*, *7*, *11*). Site index of a given soil is the height, in feet, that the dominant and codominant trees of a given species reach in a natural, undisturbed stand in 50 years.

The second part of the symbol identifying a woodland group is a small letter. In this survey w, c, r, d, f, and o are used. Except for the o, the small letter indicates an important soil property that imposes a hazard or limitation in managing the soils of the group for trees. The letter o shows that the soils have few limitations that restrict their use for trees. The letter w indicates excessive wetness, either seasonal or all year. The soils have restricted drainage, have high water tables, or are subject to flooding. The letter c stands for clayey soils. These soils are moderately to severely restricted for woodland use. The letter r shows that the main limitation is steep slopes and that there is hazard of erosion and possibly limitations to use of equipment. The letter d shows that the main limitation is restricted rooting depth. In these soils bedrock or a fragipan occurs within 1 to 2 feet of the surface. The letter f shows that the soils have a limitation of available water capacity because of large amounts of coarse fragments within the soil profile. The fragments are more than 2 millimeters and less than 10 inches in size.

The last part of the symbol, another number, differentiates woodland suitability groups that have identical first and second parts in their identifying symbol. Soils in woodland group 2w1, for example, require somewhat different management than soils in group 2w2.

In table 2 each woodland suitability group in the county is rated for potential productivity and for various management hazards or limitations. These ratings are *slight*, *moderate*, or *severe*, and they are described in the following paragraphs.

Erosion hazard refers to the potential hazard of soil loss in well-managed woodland. The hazard is slight if expected soil losses are small, moderate if some soil losses are expected and care is needed during logging and construction to reduce losses, and severe if special methods of operation are necessary to prevent excessive soil losses.

Equipment limitations depend on soil characteristics that restrict or prohibit the use of mechanical equipment, either seasonally or continually. Slight means no restrictions in the kind of equipment or time of year it is used; moderate means that use of equipment is restricted for 3 months of the year or less; severe means that special equipment is neded and that its use is severely restricted for more than 3 months of the year.

TABLE 2.—*Interpretations of the soils for*

[The land types Alluvial land (AdC), Cut and Fill land (Cu), Gravel pits (Gr), and Riverwash (Rh) and

Woodland suitability group, series, and map symbols	Potential productivity			
	Rating	Species	Site index [1]	Annual growth
				Board feet per acre
Group 1o1	Good	Yellow-poplar Upland oaks	95+ 85+	488+ 346+
Eel: Ee. Genesee: Gn. Martinsville: WvB, WvC2. Ockley: OcA, OcB. Ross: Rn. Williamsburg: WvB, WvC2.				
Group 1r1	Good	Yellow-poplar Upland oaks	95+ 85+	488+ 346+
Martinsville: WvD2. Williamsburg: WvD2.				
Group 2o1	Good	Yellow-poplar Upland oaks	85–95 75–85	395 309
Fox: FnB, FnC2. Huntington: Hu. Lanier: Lg. Sardinia: SaA, SaB. Stonelick: St.				
Group 2o2	Good	Yellow-poplar Upland oaks	85–95 75–85	395 309
Cincinnati: CcB, CcB2, CcC2. Glenford: GpB, GpC2. Markland: MdB. Rossmoyne: RpA, RpB, RpB2, RpC2.				
Group 2r1	Good	Yellow-poplar Upland oaks	85–95 75–85	395 309
Glenford: GpE2. Hickory: HkD2, HkF2.				
Group 2w1	Good	Yellow-poplar Upland oaks Sugar maple	85–95 75–85 75–85	395 309 ----------
Avonburg: AvA, AvB. Blanchester: Bc. Clermont: Ct. Mahalasville: Mb. Medway: Mh. Shoals: Sh.				
Group 2w2	Good	Yellow-poplar Upland oaks Sugar maple	85–95 75–85 75–85	395 309 ----------
Lindside: Ln. Newark: Ne. Sees: SeC2.				
Group 2w3	Good	Yellow-poplar Upland oaks Sugar maple	85–95 75–85 75–85	395 309 ----------
Sees: SeD2.				
Group 3o1	Fair	Upland oaks Yellow-poplar	65–75 75–85	239 318
Edenton: EbC2. Rossmoyne: RsC3.				
Group 3r1	Fair	Upland oaks Yellow-poplar	65–75 75–85	239 318
Edenton: EbD2, EbE2, EbG2. Hickory: HlG3.				
Group 3c1	Fair	Upland oaks White pine	65–75 75–85	239 997
Eden: EaD2, EaE2.				

See footnote at end of table.

woodland uses by woodland suitability groups

the soils mapped in complex with Urban land (AwA, FuB, OdA, RtB, and RtC) are too variable to rate]

Management concerns						Species—	
Erosion hazard	Equipment limitations	Seedling mortality	Plant competition: Conifers	Plant competition: Hardwoods	Windthrow hazard	To favor in existing stands	Suitable for planting
Slight	Slight	Slight	Severe	Moderate	Slight	Black walnut, yellow-poplar, red oak, white oak, and white ash.	Black walnut, yellow-poplar, and white pine.
Moderate	Moderate	Slight	Severe	Moderate	Slight	Black walnut, yellow-poplar, red oak, white oak, and white ash.	Black walnut, yellow-poplar, and white pine.
Slight	Slight	Slight	Severe	Moderate	Moderate	Yellow-poplar, black walnut, red oak, white oak, and black oak.	Black walnut, yellow-poplar, and white pine.
Slight	Slight	Slight	Severe	Moderate	Slight	Yellow-poplar, black walnut, red oak, white oak, and black oak.	Black walnut, yellow-poplar, and white pine.
Moderate	Moderate	Slight	Severe	Moderate	Slight	Yellow-poplar, black walnut, red oak, white oak, and black oak.	Black walnut, yellow-poplar, and white pine.
Slight	Severe	Severe	Severe	Severe	Severe	Yellow-poplar, upland oaks, red maple, sugar maple, and wetland oaks.	White pine, yellow-poplar, white ash, and red maple.
Slight to moderate.	Moderate	Moderate	Severe	Severe	Moderate	Yellow-poplar, upland oaks, red maple, and wetland oaks.	White pine, yellow-poplar, red maple, and white ash.
Severe	Moderate	Slight	Severe	Severe	Slight	Yellow-poplar, upland oaks, red maple, and wetland oaks.	White pine, yellow-poplar, red maple, and white ash.
Slight	Slight	Slight	Moderate	Slight	Slight	Yellow-poplar, white oak, red oak, and black walnut.	White pine, yellow-poplar, and black walnut.
Moderate	Moderate	Slight	Moderate	Slight	Slight	Yellow-poplar, black walnut, red oak, and white oak.	White pine, yellow-poplar, and black walnut.
Moderate	Moderate	Moderate	Moderate	Slight	Slight	Yellow-poplar, black walnut, red oak, and white oak.	White pine, yellow-poplar, and black walnut.

TABLE 2.—*Interpretations of the soils for*

Woodland suitability group, series, and map symbols	Potential productivity			
	Rating	Species	Site index [1]	Annual growth
				Board feet per feet
Group 3c2 Eden: EaF2.	Fair	Upland oaks White pine	65–75 75–85	239 997
Group 3d1 Cincinnati: CcD2, CkD3.	Fair	Upland oaks	65–75	239
Group 3w1 Avonburg: AvB2. McGary: MgA.	Fair	Upland oaks	65–75	239
Group 4d1 Fairmount: FaE2, FaG2.	Poor	Upland oaks	55–65	178
Group 4f1 Casco: RkD2, RkE2. Rodman: RkD2, RkE2.	Poor	Upland oaks	55–65	178
Group 4r1 Edenton: EcE3, EdG3.	Poor	Upland oaks	55–65	178

[1] Site index estimates are based upon data gathered for individual soils in Ohio and adjoining states. Site index represents the average

Seedling mortality refers to mortality of naturally occurring or planted tree seedlings, as influenced by kinds of soil or topographic conditions when plant competition is assumed not to be a factor. Slight means a loss of 0 to 25 percent; moderate means a loss of 25 to 50 percent; and severe means a loss of more than 50 percent of the seedlings. It is assumed that seed supplies are adequate.

Plant competition is the degree to which undesired plants invade under new openings in the tree canopy. Considered in the ratings are available water capacity, fertility, drainage, and degree of erosion. Conifers and hardwoods are rated separately in table 2. Slight means that plant competition does not prevent adequate natural regeneration and early growth or interfere with seedling development; moderate means that competition delays natural or artificial establishment and growth rate, but it does not prevent the development of fully stocked, normal stands; severe means that competition prevents adequate natural or artificial regeneration unless the site receives extensive preliminary preparation practices and continued early maintenance.

Windthrow hazard depends on the soil characteristics that enable trees to resist being blown down by wind. Slight means that most trees withstand the wind; moderate means that some trees are expected to blow down during excessive wetness and high wind; severe means that many trees are expected to blow down during periods when the soil is wet and winds are moderate or high.

Wildlife

The welfare of a wildlife species depends largely on the amount and distribution of food, shelter, and water (*1*). If any of these elements are missing, inadequate, or inaccessible, the species is absent or scarce. The kinds of wildlife that live in a given area and the number of each kind are closely related to land use, to the resulting kinds and patterns of vegetation, and to the supply and distribution of water. These, in turn, are generally related to the kinds of soil.

Habitat for wildlife normally can be created or improved by planting suitable vegetation, by properly managing the existing plant cover, by fostering the natural establishment of desirable plants, or by using a combination of these measures.

In this section the soils of Clermont County are rated according to their suitability for eight elements of wildlife habitat and three classes of wildlife, and the ratings, elements, and classes are explained. The ratings can be used as an aid in—

1. Planning the broad use of parks, refuges, nature-study areas, and other recreational developments for wildlife.
2. Selecting the better soils for creating, improving, or maintaining specific kinds of wildlife habitat elements.
3. Determining the relative intensity of management needed for individual habitat elements.
4. Eliminating sites that would be difficult or not feasible to manage for specific kinds of wildlife.
5. Determining areas that are suitable for acquisition for use by wildlife.

Table 3 lists the soils in the county and rates their suitability for eight elements of wildlife habitat and for three *woodland uses by woodland suitability groups*—Continued

Management concerns						Species—	
Erosion hazard	Equipment limitations	Seedling mortality	Plant competition		Windthrow hazard	To favor in existing stands	Suitable for planting
			Conifers	Hardwoods			
Severe	Severe	Moderate	Moderate	Slight	Slight	Red oak, white oak, black oak, and white ash.	White pine, red oak, and yellow-poplar.
Moderate	Slight	Slight	Moderate	Slight	Moderate	White oak, white ash, and black oak.	White pine.
Slight	Moderate	Slight	Moderate	Slight	Slight	Yellow-poplar, white ash, and red maple.	White pine, white ash, red maple, and yellow-poplar.
Severe	Moderate	Severe	Slight	Slight	Moderate	White oak, black oak, and eastern redcedar.	Eastern redcedar, Virginia pine, and shortleaf pine.
Moderate	Moderate	Moderate	Slight	Slight	Slight	Red oak, white oak, and chestnut oak.	White pine and Virginia pine.
Moderate	Moderate	Slight	Slight	Slight	Moderate	Red oak, white oak, and chestnut oak.	White pine and Virginia pine.

height in feet that the dominant and codominant trees of a given species will attain in a natural, undisturbed stand at the age of 50 years.

classes, or groups, of wildlife. The ratings are *well suited*, *suited*, *poorly suited*, *and not suited*. Soils that are well suited have few limitations, those that are suited have moderate limitations, and those that are poorly suited have severe limitations. Present land use, including the presence of artificial drainage, the location of a soil in relation to other soils, and the mobility of wildlife, is not considered in the ratings. Areas that are artificially drained are seldom used for development of wildlife habitat. The elements of wildlife habitat are discussed in the following paragraphs.

Elements of wildlife habitat

Each soil is rated in table 3 according to its suitability for various kinds of plants and other elements that make up wildlife habitat. These are discussed in the following paragraphs.

Grain and seed crops.—These crops include such seed-producing annuals as corn, sorghum, wheat, barley, oats, millet, buckwheat, cowpeas, and other plants commonly grown for grain or for seed. The major soil properties affecting this habitat element are effective rooting depth, available water capacity, natural drainage, slope, surface stoniness, hazard of flooding, and texture of the surface layer and subsoil.

Grasses and legumes.—Making up this group are domestic perennial grasses and herbaceous legumes that are established by planting and furnish wildlife cover and food. Among the plants are bluegrass, fescue, brome, timothy, orchardgrass, reed canarygrass, clover, and alfalfa. The major soil properties affecting this habitat element are effective rooting depth, available water capacity, natural drainage, slope, surface stoniness, hazard of flooding, and texture of the surface layer and subsoil.

Wild herbaceous upland plants.—In this group are native or introduced perennial grasses and weeds that generally are established naturally. They include bluestem, quackgrass, panicgrass, goldenrod, wild carrot, nightshade, and dandelion. They provide food and cover principally for upland forms of wildlife. The major soil properties affecting this habitat element are effective rooting depth, available water capacity, natural drainage, surface stoniness, hazard of flooding or ponding, and texture of the surface layer and subsoil.

Hardwood plants.—These plants are nonconiferous trees, shrubs, and woody vines that produce nuts or other fruits, buds, catkins, twigs, or foliage that wildlife eat. They are generally established naturally but in places are planted. Among the native kinds are oak, cherry, maple, poplar, apple, hawthorn, dogwood, persimmon, sumac, sassafras, hazelnut, black walnut, hickory, sweetgum, bayberry, blueberry, huckleberry, blackhaw, virburnum, grape, and briers. The major soil properties affecting this habitat element are effective rooting depth, available water capacity, natural drainage, and surface stoniness or rockiness.

Also in this group are several varieties of fruiting shrubs that are raised commercially for planting. Autumn-olive, Amur honeysuckle, Tatarian honeysuckle, crabapple, multiflora rose, highbush cranberry, and silky dogwood are some of the shrubs that generally are available and can be planted on soils that are rated well suited. Hardwoods that are not available commercially can commonly be transplanted successfully.

TABLE 3.—*Limitations of the soils for elements*

[All ratings are for soils in their

Soil series and map symbols	Elements of wildlife habitat			
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood plants
Alluvial land, sloping: AdC. Too variable to be rated.				
Avonburg:				
AvA	Suited	Suited	Well suited	Well suited
AvB, AvB2	Suited	Suited	Well suited	Well suited
AwA. Too variable to be rated.				
Blanchester: Bc	Poorly suited	Suited	Suited	Well suited
Cincinnati:				
CcB, CcB2	Well suited	Well suited	Well suited	Well suited
CcC2	Suited	Well suited	Well suited	Well suited
CcD2, CkD3	Poorly suited	Suited	Well suited	Well suited
Clermont: Ct	Poorly suited	Suited	Suited	Well suited
Cut and fill land: Cu. Too variable to be rated.				
Eden:				
EaD2	Poorly suited	Suited	Well suited	Well suited
EaE2, EaF2	Not suited	Poorly suited	Well suited	Well suited
Edenton:				
EbC2	Suited	Well suited	Well suited	Well suited
EbD2	Poorly suited	Suited	Well suited	Well suited
EbE2, EcE3	Not suited	Suited	Well suited	Well suited
EbG2, EdG3	Not suited	Poorly suited	Well suited	Well suited
Eel: Ee	Well suited	Well suited	Well suited	Well suited
Fairmount:				
FaE2	Poorly suited	Poorly suited	Well suited	Suited
FaG2	Not suited	Poorly suited	Well suited	Suited
Fox:				
FnB	Well suited	Well suited	Well suited	Well suited
FnC2	Suited	Well suited	Well suited	Well suited
FuB. Too variable to be rated.				
Genesee: Gn	Well suited	Well suited	Well suited	Well suited
Glenford:				
GpB	Well suited	Well suited	Well suited	Well suited
GpC2	Suited	Well suited	Well suited	Well suited
GpE2	Not suited	Suited	Well suited	Well suited
Gravel pits: Gr. Too variable to be rated.				
Hickory:				
HkD2	Poorly suited	Suited	Well suited	Well suited
HkF2	Not suited	Suited	Well suited	Well suited
HlG3	Not suited	Poorly suited	Well suited	Suited

See footnote at end of table.

of wildlife habitat and for kinds of wildlife

natural drainage condition]

Elements of wildlife habitat—Continued				Kinds of wildlife		
Coniferous woody plants	Wetland food and cover plants	Shallow-water developments	Excavated ponds	Open land	Woodland	Wetland
Poorly suited	Suited	Suited	Suited	Well suited	Suited	Suited.
Poorly suited	Poorly suited	Not suited	Not suited	Well suited	Suited	Not suited.
Suited	Well suited	Well suited	Well suited	Suited	Well suited	Well suited.
Poorly suited	Not suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Poorly suited	Not suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Poorly suited	Not suited	Not suited	Not suited	Suited	Suited	Not suited.
Suited	Well suited	Well suited	Well suited	Suited	Well suited	Well suited.
Poorly suited	Not suited	Not suited	Not suited	Suited	Suited	Not suited.
Poorly suited	Not suited	Not suited	Not suited	Poorly suited	Suited	Not suited.
Poorly suited	Not suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Poorly suited	Not suited	Not suited	Not suited	Suited	Suited	Not suited.
Poorly suited	Not suited	Not suited	Not suited	Suited	Suited	Not suited.
Poorly suited	Not suited	Not suited	Not suited	Poorly suited	Suited	Not suited.
Poorly suited	Poorly suited	Poorly suited	Poorly suited	Well suited	Well suited	Poorly suited.
Suited	Not suited	Not suited	Not suited	Poorly suited	Poorly suited	Not suited.
Suited	Not suited	Not suited	Not suited	Not suited	Poorly suited	Not suited.
Poorly suited	Not suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Poorly suited	Not suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Poorly suited	Not suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Poorly suited	Poorly suited	Poorly suited	Poorly suited	Well suited	Well suited	Poorly suited.
Poorly suited	Not suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Poorly suited	Not suited	Not suited	Not suited	Suited	Suited	Not suited.
Poorly suited	Not suited	Not suited	Not suited	Suited	Suited	Not suited.
Poorly suited	Not suited	Not suited	Not suited	Suited	Suited	Not suited.
Poorly suited	Not suited	Not suited	Not suited	Poorly suited	Poorly suited	Not suited.

TABLE 3.—*Limitations of the soils for elements of*

Soil series and map symbols	Elements of wildlife habitat			
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood plants
Huntington: Hu	Well suited	Well suited	Well suited	Well suited
Lanier: Lg	Well suited	Well suited	Well suited	Well suited
Lindside: Ln	Well suited	Well suited	Well suited	Well suited
Mahalasville: Mb	Not suited	Poorly suited	Poorly suited	Well suited
Markland: MdB	Well suited	Well suited	Well suited	Well suited
McGary: MgA	Suited	Suited	Well suited	Well suited
Medway: Mh	Suited	Suited	Well suited	Well suited
Newark: Ne	Suited	Suited	Well suited	Well suited
Ockley:				
OcA, OcB	Well suited	Well suited	Well suited	Well suited
OdA. Too variable to be rated.				
Riverwash: Rh Too variable to be rated.				
Rodman and Casco:				
RkD2	Poorly suited	Suited	Well suited	Suited
RkE2	Not suited	Suited	Well suited	Suited
Ross: Rn	Well suited	Well suited	Well suited	Well suited
Rossmoyne:				
RpA	Well suited	Well suited	Well suited	Well suited
RpB, RpB2	Well suited	Well suited	Well suited	Well suited
RpC2, RsC3	Suited	Well suited	Well suited	Well suited
RtB, RtC. Too variable to be rated.				
Sardinia:				
SaA	Well suited	Well suited	Well suited	Well suited
SaB	Well suited	Well suited	Well suited	Well suited
Sees:				
SeC2	Suited	Suited	Well suited	Well suited
SeD2	Poorly suited	Suited	Well suited	Well suited
Shoals: Sh	Suited	Suited	Well suited	Well suited
Stonelick: St	Well suited	Well suited	Well suited	Well suited
Williamsburg: [1]				
WvB, WvC2	Well suited	Well suited	Well suited	Well suited
WvD2	Poorly suited	Suited	Well suited	Well suited

[1] Ratings for Martinsville soils in these units are the same as those for Williamsburg soils.

wildlife habitat and for kinds of wildlife—Continued

Elements of wildlife habitat—Continued				Kinds of wildlife		
Coniferous woody plants	Wetland food and cover plants	Shallow-water developments	Excavated ponds	Open land	Woodland	Wetland
Poorly suited	Not suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Poorly suited	Not suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Poorly suited	Poorly suited	Poorly suited	Poorly suited	Well suited	Well suited	Poorly suited.
Poorly suited	Well suited	Well suited	Well suited	Poorly suited	Suited	Well suited.
Poorly suited	Not suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Poorly suited	Suited	Suited	Suited	Well suited	Suited	Suited.
Poorly suited	Suited	Suited	Suited	Well suited	Suited	Suited.
Poorly suited	Poorly suited	Poorly suited	Poorly suited	Well suited	Suited	Poorly suited.
Poorly suited	Not suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Suited	Not suited	Not suited	Not suited	Suited	Well suited	Not suited.
Suited	Not suited	Not suited	Not suited	Suited	Suited	Not suited.
Poorly suited	Not suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Poorly suited	Poorly suited	Poorly suited	Poorly suited	Well suited	Well suited	Poorly suited.
Poorly suited	Not suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Poorly suited	Not suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Poorly suited	Poorly suited	Poorly suited	Poorly suited	Well suited	Well suited	Poorly suited.
Poorly suited	Not suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Poorly suited	Not suited	Not suited	Not suited	Well suited	Suited	Not suited.
Poorly suited	Not suited	Not suited	Not suited	Suited	Suited	Not suited.
Poorly suited	Suited	Suited	Poorly suited	Well suited	Suited	Suited.
Poorly suited	Not suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Poorly suited	Not suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Poorly suited	Not suited	Not suited	Not suited	Suited	Suited	Not suited.

Coniferous woody plants.—This element consists of cone-bearing evergreen trees and shrubs that are used by wildlife primarily as cover, though they also provide browse and seeds or fruitlike cones. Among these are Norway spruce, Virginia pine, loblolly pine, shortleaf pine, pond pine, Scotch pine, redcedar, and northern white cedar or arborvitae. The plants generally are established naturally in areas where cover of weeds and sod is thin, but in places they are planted. The major soil properties affecting this habitat element are effective rooting depth, available water capacity, natural drainage, surface stoniness or rockiness, and texture of the surface layer and subsoil. Well-suited soils are those on which plants grow slowly and delay closing the canopy. It is important to retain branches that are close to the ground so food and cover are readily available to rabbits, pheasants, and other small animals. If the trees quickly form a dense canopy that shuts out the light, the lower branches will die.

On soils poorly suited to coniferous wildlife habitat, widely spaced conifers grow faster in places but only temporarily produce the desired growth. Maintaining these plants is difficult because the soils are well suited to hardwood plants. Unless the stand is carefully managed, hardwoods invade and commonly overtop the conifers.

Wetland food and cover plants.—Making up this group are wild, herbaceous, annual and perennial plants, except for submerged or floating aquatics, that grow on moist to wet sites. These plants produce food and cover extensively used mainly by wetland forms of wildlife. They include smartweed, wild millet, bulrush, sedges, barnyard grass, pondweed, duckweed, duckmillet, arrowarum, pickerelweed, waterwillow, wetland grasses, wildrice, and cattails. The major soil properties affecting this habitat element are natural drainage, surface stoniness, frequency of flooding or ponding, slope, and texture of the surface layer and subsoil.

Shallow-water developments.—These are impoundments or excavations that provide areas of shallow water, generally not exceeding 5 feet in depth, near food and cover for wetland wildlife. Examples of such developments are shallow dugouts, level ditches, blasted potholes, and devices that keep the water 6 to 24 inches deep in marshes. The major soil properties affecting this habitat element are depth to bedrock, natural drainage, slope, hazard of flooding, and surface stoniness.

Excavated ponds.—Excavated ponds are dug-out areas that generally receive their water from a permanently high water table rather than from runoff. They provide water for many kinds of wildlife, particularly for migratory or overwintering waterfowl. The major soil properties affecting this habitat element are depth to bedrock, natural drainage, surface stoniness, slope, and hazard of flooding.

Farm ponds of the impounded type are not considered in this habitat element; however, they can be important for such recreational activities as fishing and in places can also be a source of water for wildlife. If stocked with fish, such impoundments should be at least 6 feet deep throughout a large part of the excavated area.

Kinds of wildlife

In table 3 the soils are rated according to their suitability for three classes of wildlife in the county—open land, woodland, and wetland.

Open-land wildlife.—Examples of open-land wildlife are quail, pheasant, meadowlark, field sparrow, dove, cottontail rabbit, red fox, and woodchuck. These birds and mammals normally make their home in areas of cropland, pasture, and meadow; in residential areas; and in areas overgrown with grasses, herbs, and shrubs.

Woodland wildlife.—Among the birds and mammals that prefer woodland are woodcock, thrust, vireo, scarlet tanager, gray and fox squirrels, gray fox, white-tailed deer, raccoon, and opossum. They obtain food and cover in stands of hardwoods, coniferous trees, shrubs, or a mixture of these plants.

Wetland wildlife.—Ducks, geese, rails, herons, shore birds, mink, and muskrat are familiar examples of birds and mammals that normally inhabit wet areas, such as ponds, marshes, and swamps.

Each rating under "Kinds of wildlife" in table 3 is based on the ratings listed for the habitat elements in the first part of the table. The rating for open-land wildlife is based on the ratings shown for grain and seed crops, grasses and legumes, wild herbaceous upland plants, hardwood plants, and coniferous woody plants. The rating for woodland wildlife is based on the ratings listed for grasses and legumes, wild herbaceous upland plants, hardwood plants, and coniferous woody plants. The rating for wetland wildlife is based on the ratings shown for wetland food and cover plants, shallow-water developments, and excavated ponds.

Engineering Uses of the Soils [4]

This section is useful to those who need information about soils used as structural material or as foundations upon which structures are built. Among those who can benefit from this section are planning commissions, town and city managers, land developers, engineers, contractors, and farmers.

Among the properties of soils highly important in engineering are permeability, strength, compaction characteristics, drainage condition, shrink-swell potential, grain size, plasticity, and reaction. Also important are depth to the water table, depth to bedrock, and soil slope. These properties, in various degrees and combinations, affect construction and maintenance of roads, airports, pipelines, foundations for small buildings, irrigation systems, ponds and small dams, and systems for disposal of sewage and refuse (fig. 6).

Information in this section of the soil survey can be helpful to those who—

1. Select potential residential, industrial, commercial, and recreational areas.
2. Evaluate alternate routes for roads, highways, pipelines, and underground cables.
3. Seek sources of gravel, sand, or clay.
4. Plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for controlling water and conserving soil.
5. Correlate performance of structures already built with properties of the kinds of soil on which they are built in order to predict performance of struc-

[4] LLOYD GILLOGLY, construction engineer, Soil Conservation Service, reviewed this section prior to publication.

Figure 6.—**Soil slip or slump in an area of Edenton silt loam, 25 to 50 percent slopes.**

tures on the same or similar kinds of soil in other locations.

6. Predict the trafficability of soils for cross-country movement of vehicles and construction equipment.
7. Develop preliminary estimates pertinent to construction in a particular area.

Most of the information in this section is presented in tables 4, 5, and 6. These tables show, respectively, the results of engineering laboratory tests on soil samples, several estimated soil properties significant to engineering, and interpretations for various engineering uses.

This information, along with the soil map and other parts of this publication, can be used to make interpretations in addition to those given in tables 5 and 6, and it also can be used to make other useful maps.

This information, however, does not eliminate the need for further investigations at sites selected for engineering works, especially works that involve heavy loads or that require excavations to depths greater than those shown in the tables, generally depths greater than 6 feet. Also, inspection of sites, especially the small ones, is needed because many delineated areas of a given soil mapping unit contain small areas of other kinds of soil that have strongly contrasting properties and different suitabilities or limitations for soil engineering.

Some of the terms used in this soil survey have different meanings to soil scientists than to engineers. The Glossary defines many of the terms commonly used in soil science

Engineering classification systems

The two systems most commonly used in classifying samples of soils for engineering are the Unified system used by the SCS engineers, Department of Defense, and others, and the AASHO system adopted by the American Association of State Highway Officials.

In the Unified system (*18*) soils are classified according to particle-size distribution, plasticity, liquid limit, and organic matter. Soils are grouped in 15 classes as follows: eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between the two classes are designated by symbols for both classes; for example, ML-CL.

The AASHO system (*2*) is used to classify soils according to those properties that affect use in highway construction and maintenance. In this system, a soil is placed in one of seven basic groups ranging from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. In group A-1 are gravelly soils of high bearing strength, or the best soils for subgrade (foundation). At the other extreme, in group A-7, are clay soils that have low strength when wet and are the poorest soils for subgrade. Where laboratory data are available to justify a further breakdown, the A-1, A-2, and A-7 groups are divided as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, and A-7-6. An additional refinement, the engineering value of a soil material can be indicated by a group index number. Group indexes range from 0 for the best material to 20 or more for the poorest. The AASHO classification for tested soils, with group index numbers in parentheses, is shown in table 4; the estimated classification, without group index numbers, is given in table 5 for all soils mapped in the survey area.

USDA texture is determined by the relative proportions of sand, silt, and clay in soil material that is less than 2.0 millimeters in diameter. "Sand," "silt," "clay," and some of the other terms used in the USDA textural classification are defined in the Glossary.

Engineering test data

Samples of four Clermont County soils were tested according to standard AASHO procedures to help evaluate the soils for engineering purposes. Only selected layers of each soil were sampled. The results of these tests are shown in table 4. The following paragraphs discuss the columns listed in table 4.

Table 4 gives moisture-density data for the tested soils. If a soil material is compacted at increasing moisture content, assuming that the compaction effort 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. "Maximum dry density" is the highest dry density obtained in the compaction test. Moisture-density data are important in earthwork, for as a rule maximum stability is obtained if the soil is compacted to the maximum dry density when it is at approximately the optimum moisture content.

The mechanical analyses, or grain-size analyses, were made by using a combination of the sieve and hydrometer methods. Percentages of clay obtained by the hydrometer method should not be used in naming the textural class for soil classification.

Tests for plastic limit and liquid limit measure the effect of water on the consistence of the soil material. As the moisture content of a soil increases from a very dry

TABLE 4.—

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

Soil name and location	Parent material	Ohio report No.	Depth	Moisture-density data [1]	
				Maximum dry density	Optimum moisture
		SO—	In	Lb/ft [3]	Pct
Blanchester silt loam: CL–13, 1½ miles southeast of Owensville, 1,700 feet north of Jackson Pike, and 1¼ miles west of Monterey-Maple Grove Road, Stonelick Township. Modal.	Loess over glacial till.	36075	0–7	102	20
		36076	39–49	102	20
		36077	68–74	105	19
Cincinnati silt loam: CL–8, 2 miles north of Milford and 150 feet west of Milford-Loveland Road, Miami Township. Modal.	Loess over glacial till.	36070	0–8	107	18
		36071	27–36	102	20
		36072	60–70	124	11
Ockley silt loam: CL–7, 1½ miles southeast of Milford, 300 feet north of Roundbottom Road, and 200 feet west of farm lane underneath CG&E power line. Modal.	Loess over outwash sand and gravel.	36067	0–7	107	18
		36068	25–33	110	17
		36069	49–60	134	8
Sardinia silt loam: CL–10, ¼ mile south of Williamsburg and ⅜ mile east of Williamsburg-Bantam Road, Williamsburg Township. Modal.	Loess over loamy glacial outwash.	36073	0–7	102	20
		36074	26–34	117	14

[1] Based on the Moisture-density Relations of Soils Using 5.5-lb. Rammer and 12-in. Drop, AASHO Designation T 99–57, Method A (*2*).

[2] Based on Classification of Soils, Ohio State Testing Laboratory, Ohio Department of Highways, February 1, 1955.

[3] Mechanical analyses according to the AASHO Designation T 88(2). Results by this procedure frequently may differ somewhat from results that would have been 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-sized 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

state, the material changes from a semisolid to a plastic state. As the moisture is further increased, the material changes from a plastic state to a liquid state. 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 liquid limit and the plastic limit. It indicates the range of moisture content within which the soil material is in a plastic condition. Some silty and sandy soils are nonplastic. They do not become plastic at any moisture content.

The engineering soil classification shown in table 4 is based on data obtained by grain-size analysis and by tests to determine liquid limit and plastic limit.

Soil properties significant to engineering

Several estimated soil properties significant in engineering are given in table 5. These estimates are made for typical soil profiles, by layers sufficiently different to have different significance for soil engineering. The estimates are based on field observations made in the course of mapping, on test data for these and similar soils, and on experience with the same kinds of soil in other countries. The following explanations are for some of the columns in table 5.

Depth to the seasonal high water table is the distance from the surface of the soil to the highest level that ground water reaches in the soil in most years.

Depth to bedrock is the distance from the surface of the soil to the upper surface of the rock layer.

Soil texture is described in table 5 in the standard terms used by the Department of Agriculture. These terms take into account relative percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that contains 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the soil contains gravel or other particles coarser than sand, an appropriate modifier is added, as for example, "gravelly loamy sand."

Permeability is that quality of a soil that enables it to transmit water or air. It is estimated on the basis of those soil characteristics observed in the field, particularly structure and texture. The estimates in table 5 do not take into account lateral seepage or such transient soil features as plowpans and surface crusts.

Available water capacity is the ability of soils to hold water for use by most plants. It is commonly defined as the difference between the amount of water in the soil at field capacity and the amount at the wilting point of most crop plants.

Reaction is the degree of acidity or alkalinity of a soil, expressed in pH values. The pH value and terms used to describe soil reaction are explained in the Glossary.

Shrink-swell potential is the relative change in volume to be expected of soil material with changes in moisture content; that is, the extent to which the soil shrinks as it dries out or swells when it gets wet. Extent of shrinking

Engineering test data

procedures of the American Association of State Highway Officials (AASHO) (*2*)]

Ohio modified AASHO [2]	Mechanical analyses [3]					Liquid limit	Plasticity index	Classification	
	Percentage passing sieve—				Percentage smaller than 0.005 mm			AASHO [4]	Unified [5]
	No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)		*Pct*			
A-6a	99	91	89	84	41	34	11	A-6(9)	ML-CL
A-7-6	96	86	81	73	44	51	26	A-7-6(16)	CH
A-7-6	100	98	92	73	54	49	26	A-7-6(16)	CL
A-4b	98	86	84	75	25	30	5	A-4(8)	ML
A-6a	95	88	85	70	54	40	15	A-6(9)	ML-CL
A-4a	96	89	81	62	29	23	8	A-4(6)	CL
A-6a	100	100	98	78	29	32	11	A-6(8)	CL
A-6a	95	88	86	69	38	33	13	A-6(8)	CL
A-1a	39	26	10	5	0	[6] NP	[6] NP	A-1a(0)	GW-GM
A-4b	100	100	96	85	31	30	9	A-4(9)	ML-CL
A-4a	100	100	96	71	35	23	8	A-4(8)	CL

material coaser than 2 millimeters in diameter is excluded from calculations of grain-sized fractions. The mechanical analyses used in this table are not suitable for use in naming textural classes for soil.

[4] Based on Standard Specifications for Highway Materials and Methods of Sampling and Testing (Pt. 1, Ed. 8): The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes, AASHO Designation M 145-49 (*2*).

[5] Based on classification of Soils for Engineering Purposes ASTM D-2487.

[6] NP=Nonplastic.

and swelling is influenced by the amount and kind of clay in the soil. Shrinking and swelling of soils cause much damage to building foundations, roads, and other structures. A *high* shrink-swell potential indicates a hazard to maintenance of structures built in, on, or with material having this rating.

Corrosivity, as used in table 5, pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. Rate of corrosion of uncoated steel is related to such soil properties as drainage, texture, total acidity, and electrical conductivity of the soil material. Ratings of soils for corrosivity for concrete are based mainly on soil texture and acidity. Installations that intersect soil boundaries or soil horizons are more susceptible to corrosion than installations entirely in one kind of soil or in one soil horizon. A corrosivity rating of *low* means that there is a low probability of soil-induced corrosion damage. A rating of *high* means that the probability of corrosion damage is high and that protective measures for steel and more resistant concrete should be used to avoid or minimize damage.

Interpretations of engineering properties of the soils

Interpretations of engineering properties of the soils in the county are shown in table 6. Interpretations for uses in town and country planning involving engineering procedures are shown in table 7.

Table 6 lists all soil series and land types in the county. It describes and rates selected characteristics of the soils that might affect their engineering usage. The interpretations shown in table 6 are based on actual and estimated soil test data from tables 4 and 5 and on field experience.

Explanations of the column headings in table 6 follow:

Suitability for winter grading.—Suitability of soils for winter grading depends on the ease with which the soil material can be excavated and compacted by ordinary construction equipment in winter. Features having the greatest effect on suitability are soil texture, moisture content, depth to water table during winter, and natural drainage. Because of wetness, plasticity, or susceptibility to frost action, many of the soils are not adapted to grading during winter. Such soils are rated poor.

Susceptibility to frost action.—Silty and fine sandy soils that are wet or saturated most of the winter are most susceptible to damaging frost action. Such soils are rated high.

Suitability as source of topsoil.—The thickness, texture, structure, inherent fertility, and organic-matter content of the surface layer of soil determines its suitability for use in landscaping or in topdressing road banks and embankments to promote the growth of vegetation. Only the surface layer of the soil is considered in this rating, except as noted otherwise. Where appropriate, other features to consider are given, such as the seasonal high water table and hazards when excavating.

Suitability as source of sand and gravel.—This column gives information about the soils as a possible source of sand and gravel for construction purposes. It should not

TABLE 5.—*Estimated soil properties*

[An asterisk in the first column of this table indicates that at least one mapping unit in this series is made up of two or more kinds of soil, other series in the first column of this table. The

Soil series and map symbols	Depth to—		Depth from surface (typical profile)	Coarse fraction greater than 3 inches	Percentage passing sieve—			
	Seasonal high water table	Bedrock			No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)
	Feet	*Feet*	*Inches*	*Percent*				
Alluvial land, sloping: AdC. Too variable for valid estimates.								
Avonburg: AvA, AvB, AvB2, AwA. Urban land part of AwA is too variable for valid estimates.	½-1½	>5	0-15	----------	100	95-100	90-100	75-90
			15-36	----------	100	95-100	90-100	85-95
			36-85	----------	95-100	90-100	75-90	65-80
Blanchester: Bc	0-½	>5	0-20	----------	95-100	90-100	85-100	80-95
			20-68	----------	95-100	85-100	80-95	70-90
			68-100	----------	95-100	90-100	85-95	70-90
Casco. Mapped only with Rodman soils.	>4	>5	0-4	----------	90-100	85-100	75-90	60-70
			4-19	----------	90-100	85-95	75-90	65-75
			19-60	0-5	60-80	40-60	20-40	5-10
*Cincinnati: CcB, CcB2, CcC2, CcD2, CkD3. For Hickory part of CkD3, see Hickory series.	>3	>5	0-14	----------	95-100	85-100	80-100	70-95
			14-60	----------	95-100	85-100	80-95	70-80
			60-80	----------	95-100	85-100	75-90	60-75
Clermont: Ct	0-½	>5	0-12	----------	95-100	95-100	85-95	75-90
			12-40	----------	95-100	95-100	90-100	85-95
			40-97	----------	95-100	85-100	75-95	65-90
Cut and fill land: Cu. Too variable for valid estimates.								
Eden: EaD2, EaE2, EaF2	>3	2-3	0-9	0-5	95-100	90-100	85-100	80-95
			9-27	0-20	95-100	90-100	85-100	80-95
			27	----------	--------	--------	--------	--------
*Edenton: EbC2, EbD2, EbE2, EbG2, EcE3, EdG3. For Fairmount part of EdG3, see Fairmount series.	>3	2-3	0-5	0-5	95-100	90-100	85-95	60-80
			5-27	0-10	95-100	95-100	85-95	70-90
			27	----------	--------	--------	--------	--------
Eel: Ee	[2] 1½-2½	>5	0-27	----------	95-100	90-100	85-100	75-95
			27-60	----------	95-100	90-100	85-100	70-90

See footnotes at end of table.

significant to engineering

which may have different properties and limitations. For this reason the reader should follow carefully the instructions for referring to symbol > means more than; the symbol < means less than]

Classification			Perme-ability	Available water capacity	Reaction [1]	Shrink-swell potential	Corrosion potential	
USDA texture	Unified	AASHO					Steel	Concrete
			Inches per hour	*Inches per inch of soil*	*pH*			
Silt loam	ML or CL	A-4 or A-6	0. 2-0. 6	0. 17-0. 19	5. 1-6. 5	Low		
Silty clay loam (fragipan).	CL	A-6 or A-7	<0. 06	0. 15-0. 17	4. 5-5. 5	Moderate	High	High.
Clay loam or silty clay loam (fragipan).	CL	A-6 or A-7	<0. 06	0. 12-0. 15	5. 0-7. 5	Moderate	High	Moderate.
Silt loam	ML or CL	A-4 or A-6	0. 6-2. 0	0. 18-0. 20	4. 5-6. 0	Low		
Clay loam, silty clay loam.	CL or CH	A-6 or A-7	0. 06-0. 2	0. 16-0. 18	4. 5-6. 0	Moderate	High	Moderate.
Clay loam, clay	CL or MH	A-7	0. 2-0. 6	0. 15-0. 17	6. 6-7. 8	Moderate	High	Low.
Loam	ML	A-4	0. 6-2. 0	0. 14-0. 16	6. 6-7. 3	Low		
Clay loam	CL	A-6	0. 6-2. 0	0. 15-0. 17	6. 1-6. 5	Moderate	Moderate	Low.
Gravel and sand	SM, GM, or GW	A-1 or A-2	6. 0-12. 0	0. 03-0. 06	7. 0-7. 8	Low	Low	Low.
Silt loam	ML	A-4	0. 6-2. 0	0. 17-0. 19	4. 5-5. 5	Low		
Loam, clay loam, clay (fragipan).	ML-CL or CL	A-6	0. 2-0. 6	0. 14-0. 17	4. 5-6. 0	Moderate	Moderate	High.
Loam	CL	A-4 or A-6	0. 2-0. 6	0. 10-0. 14	7. 4-8. 0	Moderate	Moderate	Low.
Silt loam	ML or CL	A-4 or A-6	0. 2-0. 6	0. 17-0. 19	4. 5-5. 5	Low		
Silty clay loam, silt loam.	CL or ML-CL	A-6 or A-7	<0. 06	0. 15-0. 17	4. 5-5. 5	Moderate	High	High.
Clay loam, silty clay loam.	CL	A-6 or A-7	<0. 06	0. 12-0. 15	5. 0-7. 3	Moderate	High	Moderate.
Silty clay loam	CL	A-6 or A-7	0. 2-0. 6	0. 15-0. 17	5. 0-6. 0	Moderate		
Silty clay or clay	CH or MH	A-7	0. 06-0. 2	0. 14-0. 16	5. 5-7. 5	Moderate to high.	High	Moderate.
Interbedded limestone and calcareous shale bedrock.								
Loam	ML or CL	A-4 or A-6	0. 6-2. 0	0. 17-0. 19	5. 5-6. 5	Low		
Clay loam or silty clay loam.	CL	A-6 of A-7	0. 2-0. 6	0. 16-0. 18	5. 0-7. 2	Moderate	Moderate	Moderate to low.
Interbedded limestone and calcareous shale bedrock.								
Silt loam or loam	ML or CL	A-4 or A-6	0. 6-2. 0	0. 17-0. 19	6. 1-7. 3	Low		
Loam, silty clay loam.	CL or ML	A-6 or A-4	0. 6-2. 0	0. 14-0. 16	6. 6-7. 8	Low to moderate.	Moderate	Moderate.

TABLE 5.—*Estimated soil properties*

Soil series and map symbols	Depth to— Seasonal high water table	Depth to— Bedrock	Depth from surface (typical profile)	Coarse fraction greater than 3 inches	Percentage passing sieve— No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)
Fairmount: FaE2, FaG2	>3	1–2	0–7	5–30	90–100	85–95	80–95	70–85
			7–17	10–40	90–100	85–95	80–95	75–90
			17					
Fox: FnB, FnC2, FuB. Urban land part of FuB is too variable for estimates.	>3	>5	0–15		90–100	80–95	70–90	60–80
			15–35		90–100	80–95	70–90	60–85
			35–60	0–5	25–55	20–40	5–15	4–12
Genesee: Gn	[2] >3	>5	0–34		95–100	95–100	90–100	70–90
			34–60		95–100	95–100	90–100	45–75
Glenford: GpB, GpC2, GpE2	1½–2½	>5	0–10		100	95–100	90–100	85–100
			10–100		100	95–100	90–100	85–100
Gravel pits: Gr. Too variable for valid estimates.								
Hickory: HkD2, HkF2, HlG3	>3	>5	0–5		95–100	90–100	85–100	70–90
			5–31		95–100	90–100	85–100	70–80
			31–60		90–100	90–100	85–100	60–80
Huntington: Hu	[2] >3	>5	0–8		100	95–100	90–100	70–95
			8–80		100	95–100	90–100	70–95
Lanier: Lg	[2] >3	>5	0–16		85–100	80–100	60–80	30–70
			16–60		30–60	20–40	10–30	5–20
Lindside: Ln	[2] 1½–2½	>5	0–8		100	95–100	90–100	70–95
			8–90		100	95–100	90–100	70–95
Mahalasville: Mb	0	>5	0–13		100	100	95–100	80–95
			13–44		100	95–100	90–100	85–95
			44–75		100	90–100	85–100	70–80
Markland: MdB	2–3	>5	0–12		100	95–100	90–100	70–90
			12–28		100	95–100	90–100	85–95
			28–80		100	95–100	90–100	80–95
Martinsville. Mapped only with Williamsburg soils.	>3	>5	0–15		100	95–100	90–100	70–90
			15–42		100	95–100	90–100	70–95
			42–80	0–5	85–100	70–90	60–80	35–50
McGary: MgA	½–1½	>5	0–8		100	95–100	90–100	70–90
			8–53		100	95–100	90–100	85–95
			53–65		100	95–100	90–100	80–95

See footnotes at end of table.

significant to engineering—Continued

Classification			Permeability	Available water capacity	Reaction[1]	Shrink-swell potential	Corrosion potential	
USDA texture	Unified	AASHO					Steel	Concrete
Silty clay loam	CL	A–6 or A–7	0. 2–0. 6	0. 15–0. 17	6. 6–7. 5	Moderate		
Silty clay loam or clay.	CH or MH	A–7	0. 06–0. 2	0. 14–0. 16	7. 4–8. 4	Moderate to to high.	Moderate	Low.
Interbedded limestone and calcareous shale bedrock.								
S lt loam	ML or CL	A–4	0. 6–2. 0	0. 15–0. 18	5. 0–6. 0	Low		
Clay loam, clay, or loam.	CL	A–7 or A–6	0. 6–2. 0	0. 16–0. 18	5. 0–7. 3	Moderate	Moderate	Moderate.
Gravel and sand	GW, GM, or SM	A–1	6. 0–12. 0	0. 03–0. 06	7. 4–7. 8	Low	Low	Low.
Silt loam or loam	ML	A–4	0. 6–2. 0	0. 17–0. 19	6. 5–7. 5	Low		
Sandy loam or loam.	ML or SM	A–4 or A–6	0. 6–2. 0	0. 14–0. 16	7. 4–8. 0	Low	Low	Low.
Silt loam	ML or CL	A–4 or A–6	0. 6–2. 0	0. 17–0. 19	5. 6–6. 0	Low		
Silty clay loam	CL	A–6 or A–7	0. 2–0. 6	0. 15–0. 17	5. 1–7. 0	Moderate	Moderate	Moderate.
Loam or silt loam	ML or CL	A–4 or A–6	0. 6–2. 0	0. 17–0. 20	5. 0–6. 0	Low		
Clay loam	CL	A–6 or A–7	0. 6–2. 0	0. 13–0. 16	5. 0–7. 2	Moderate	Moderate	Moderate.
Loam	CL or ML	A–6	0. 6–2. 0	0. 12–0. 15	7. 4–7. 8	Moderate	Moderate	Low.
Silt loam	ML or CL	A–4 or A–6	0. 6–2. 0	0. 17–0. 19	6. 6–7. 3	Low		
Silty clay loam or clay loam.	CL	A–6 or A–7	0. 6–2. 0	0. 15–0. 17	6. 1–7. 3	Moderate	Moderate	Moderate
Sandy loam or loam.	SM or ML	A–4 or A–2	6. 0–12. 0	0. 12–0. 16	6. 6–7. 8	Low		
Sandy loam and loamy sand.	GW, GP–GM, or SW	A–1	6. 0–12. 0	0. 02–0. 05	7. 4–8. 0	Low	Low	Low.
Silt loam	ML or CL	A–4 or A–6	0. 6–2. 0	0. 17–0. 19	6. 6–7. 3	Low		
Silty clay loam or clay loam.	CL	A–7 or A–6	0. 6–2. 0	0. 15–0. 17	5. 5–7. 2	Moderate	Moderate	Moderate.
Silty clay loam	CL	A–6	0. 6–2. 0	0. 15–0. 17	6. 1–7. 3	Moderate		
Silty clay loam	CL or CH	A–6 or A–7	0. 06–0. 2	0. 15–0. 17	6. 6–7. 8	Moderate	High	Low.
Clay loam	CL	A–6 or A–7	0. 2–0. 6	0. 16–0. 18	7. 4–7. 8	Moderate	High	Low.
Silt loam	ML or CL	A–4 or A–6	0. 6–2. 0	0. 17–0. 18	6. 1–7. 2	Low		
Silty clay loam or silty clay.	CL	A–6 or A–7	0. 2–0. 6	0. 12–0. 15	5. 1–6. 0	Moderate	Moderate	Moderate.
Silty clay, clay, or silty clay loam.	CH or CL	A–7	0. 06–0. 2	0. 11–0. 14	5. 5–7. 8	High	High	Low to Moderate.
Silt loam	ML	A–4	2. 0–6. 0	0. 17–0. 19	5. 5–6. 0	Low		
Silt loam, silty clay loam, or clay loam.	ML or CL	A–4 or A–6	0. 6–2. 0	0. 16–0. 18	5. 0–6. 0	Moderate	Moderate	Moderate.
Gravelly clay loam or sandy loam.	SM or SC	A–4	6. 0–12. 0	0. 09–0. 11	5. 6–7. 3	Moderate	Low	Moderate.
Silt loam	ML or CL	A–4 or A–6	0. 6–2. 0	0. 17–0. 19	6. 6–7. 3	Low		
Silty clay loam or silty clay.	CL or CH	A–7	0. 06–0. 2	0. 14–0. 16	5. 1–7. 5	Moderate to high.	High	Moderate.
Silty clay loam	CH or CL	A–7 or A–6	0. 06–0. 2	0. 13–0. 15	7. 4–7. 8	Moderate to high.	High	Low.

TABLE 5.—*Estimated soil properties*

Soil series and map symbols	Depth to— Seasonal high water table	Depth to— Bedrock	Depth from surface (typical profile)	Coarse fraction greater than 3 inches	Percentage passing sieve— No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)
Medway: Mh	[2] ½–1½	>5	0–16	----------	95–100	95–100	90–100	70–90
			16–44	----------	95–100	95–100	90–100	75–90
			44–60	----------	95–100	95–100	90–100	75–90
Newark: Ne	[2] ½–1½	>5	0–14	----------	100	95–100	90–100	70–90
			14–80	----------	100	95–100	90–100	85–95
Ockley: OcA, OcB, OdA. Urban land part of OdA is too variable for valid estimates.	>3	>5	0–25	----------	100	95–100	90–100	70–95
			25–49	----------	95–100	85–100	80–100	65–95
			49–60	----------	30–55	20–40	5–20	4–12
Riverwash: Rh. Too variable for valid estimates.								
*Rodman: RkD2, RkE2. For Casco parts, see Casco series.	>3	>5	0–10	----------	80–95	80–90	50–70	25–35
			10–60	0–5	40–60	20–40	10–20	5–10
Ross: Rn	[2] >3	>5	0–22	----------	100	95–100	90–100	70–90
			22–40	----------	100	95–100	90–100	70–90
Rossmoyne: RpA, RpB, RpB2, RpC2, RsC3, RtB, RtC. Urban land parts of RtB and RtC are too variable for valid estimates.	1½–2½	>5	0–9	----------	95–100	90–100	85–100	70–90
			9–39	----------	95–100	90–100	85–100	75–95
			39–86	----------	95–100	85–95	75–90	60–75
Sardinia: SaA, SaB	1½–2½	>5	0–10	----------	100	95–100	90–100	70–90
			10–43	----------	100	95–100	90–100	65–95
			43–76	----------	65–90	60–80	50–70	35–60
Sees: SeC2, SeD2	1½–2½	>4	0–9	0–5	95–100	90–100	85–100	80–90
			9–43	5–15	95–100	90–100	85–100	80–90
			43–60	5–15	95–100	90–100	85–100	80–90
Shoals: Sh	[2] ½–1½	>5	0–14	----------	100	95–100	90–100	70–90
			14–38	----------	100	95–100	90–100	75–90
			38–75	----------	100	95–100	90–100	85–95
Stonelick: St	>3	>5	0–12	----------	90–100	85–100	50–70	30–50
			12–70	----------	90–100	85–100	40–60	15–40
*Williamsburg: WvB, WvC2, WvD2. For Martinsville parts, see Martinsville series.	>3	>5	0–12	----------	100	95–100	90–100	70–90
			12–44	----------	100	95–100	90–100	70–95
			44–70	0–5	85–100	70–90	50–70	35–50

[1] Reaction of the surface layer represents the average pH of that layer at the time of mapping. In many cases, it is high because of liming practices.

significant to engineering—Continued

Classification			Permeability	Available water capacity	Reaction [1]	Shrink-swell potential	Corrosion potential	
USDA texture	Unified	AASHO					Steel	Concrete
Silty loam	ML or CL	A-4	0.6-2.0	0.17-0.19	6.1-7.3	Low		
Silty clay loam or sandy clay loam.	CL	A-6	0.6-2.0	0.16-0.18	6.6-7.3	Moderate	High	Low.
Clay loam	CL	A-6	0.6-2.0	0.16-0.18	7.4-7.8	Moderate	High	Low.
Silt loam	ML or CL	A-4 or A-6	0.6-2.0	0.17-0.19	6.1-7.3	Low		
Silty clay loam	CL	A-6 or A-7	0.6-2.0	0.13-0.16	6.6-7.8	Moderate	Moderate	Low.
Silt loam	ML or CL	A-4 or A-6	0.6-2.0	0.17-0.19	5.1-7.0	Low		
Loam, clay loam, or clay.	CL	A-6 or A-7	0.6-2.0	0.16-0.18	5.1-6.0	Moderate	Moderate	Moderate.
Gravelly loam	GW-GM, GW, or SW	A-1	6.0-12.0	0.07-0.10	6.6-7.3	Low	Low	Low.
Gravelly loam or loam.	SM	A-2	6.0-12.0	0.08-0.12	6.6-7.8	Low		
Gravel and sand	GW-GM or SM	A-1	6.0-12.0	0.02-0.05	7.4-7.8	Low	Low	Low.
Silt loam	ML-CL or ML	A-4	0.6-2.0	0.17-0.19	6.6-7.3	Low		
Silty clay loam or loam.	CL	A-6	0.6-2.0	0.16-0.18	6.6-7.8	Moderate	Moderate	Low.
Silt loam	ML or CL	A-4 or A-6	0.6-2.0	0.17-0.19	4.5-5.5	Low		
Silty clay loam or clay loam (fragipan).	CL	A-6	0.06-0.2	0.13-0.16	4.5-6.0	Moderate	Moderate	Moderate.
Clay loam	CL	A-6	0.06-0.2	0.12-0.16	4.5-6.0	Moderate	Moderate	Moderate.
Silt loam	ML-CL or ML	A-4	0.6-2.0	0.18-0.23	5.6-6.5	Low		
Silt loam or loam	CL or ML	A-4 or A-6	0.6-2.0	0.15-0.19	4.5-6.0	Moderate	Moderate	Moderate.
Sandy clay loam or loam.	SM or ML	A-4	6.0-12.0	0.12-0.16	6.1-7.3	Moderate	Moderate	Low.
Silty clay loam	CL	A-6 or A-7	0.2-0.6	0.15-0.17	6.6-7.3	Moderate		
Silty clay loam or silty clay.	CL or CH	A-7	0.06-0.2	0.15-0.17	6.6-7.8	High	High	Low.
Silty clay	CH or CL	A-7	0.06-0.2	0.14-0.17	7.4-7.8	Moderate to high.	High	Low.
Silt loam	CL or ML	A-6 or A-4	0.6-2.0	0.17-0.19	6.6-7.3	Low		
Silty clay loam	CL	A-6	0.6-2.0	0.15-0.18	6.1-6.5	Moderate	Moderate	Moderate.
Silty clay loam	CL	A-6 or A-7	2.0-6.0	0.13-0.16	7.4-7.8	Moderate	Moderate	Low.
Sandy loam	SM or SC	A-4 or A-2	2.0-6.0	0.14-0.18	6.6-7.8	Low	Low	Low.
Loamy sand or sandy loam.	SM or SP	A-2 or A-4	2.0-6.0	0.07-0.10	6.6-7.8	Low	Low	Low.
Silt loam	ML	A-4	0.6-2.0	0.17-0.19	5.6-6.5	Low		
Silty clay loam, loam, or clay loam.	ML or CL	A-4 or A-6	0.6-2.0	0.16-0.18	4.5-6.0	Moderate	Low to moderate.	Moderate.
Gravelly clay loam	SM or SC	A-4	6.0-12.0	0.09-0.13	5.0-6.0	Moderate to low.	Low	Moderate.

[2] Subject to flooding.

TABLE 6.—*Interpretations of engineering*

[An asterisk in the first column of this table indicates that at least one mapping unit in this series is made up of two or more kinds of soil, series in the first

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of— Topsoil	Sand and gravel	Road fill	Highway location
Alluvial land, sloping: AdC. Too variable for valid interpretation.						
Avonburg: AvA, AvB, AvB2, AwA. Urban land part of AwA is too variable for valid interpretation.	Poor: somewhat poorly drained; silty clay loam subsoil.	Moderate	Fair: less than 16 inches of suitable material.	Not suitable	Fair: somewhat poorly drained.	Seasonal high water table; very slow permeability.
Blanchester: Bc	Poor: seasonal high water table.	High	Poor: poorly drained.	Not suitable	Poor: poorly drained.	Seasonal high water table; clay loam and silty clay loam subsoil; slow permeability.
Casco. Mapped only with Rodman soils.	Good	Low	Poor: slope	Poor to depth of 21 inches; good below that depth.	Fair: good below depth of 3½ feet.	Moderately steep to steep.
*Cincinnati: CcB, CcB2, CcC2, CcD2, CkD3. For Hickory part of CkD3, see Hickory series.	Poor: clay and clay loam subsoil.	Moderate	Fair: less than 16 inches of suitable material; poor where slopes are more than 12 percent.	Not suitable	Fair: clay and clay loam.	Steep in places
Clermont: Ct	Poor: seasonal high water table.	Moderate	Fair: less than 16 inches of suitable material.	Not suitable	Poor: poorly drained.	Restricted internal drainage; seasonal high water table; soft and unstable when wet.
Cut and fill land: Cu. Too variable for valid interpretation.						
Eden: EaD2, EaE2, EaF2	Poor: poor stability when thawing; erodible; steep to very steep.	Moderate to high.	Poor: slope	Not suitable	Fair: silty clay loam, silty clay, or clay; bedrock at depth of 2 to 3 feet.	Limestone and shale bedrock at depth of 2 to 3 feet; steep natural slopes are unstable.

properties of the soils

which may have different properties and limitations. For this reason the reader should follow carefully the instructions for referring to other column of this table]

Soil features affecting—Continued						
Pipeline construction and maintenance	Ponds		Drainage for crops and pasture	Irrigation	Terraces or diversions	Waterways
	Reservoir area	Embankment				
Somewhat poorly drained.	Very slow permeability.	Poor to fair stability and compaction characteristics; slow permeability when compacted.	Very slow permeability; seasonal high water table.	Medium intake rate; low fertility; somewhat poorly drained; seasonal high water table.	Not needed where slopes are 0 to 2 percent; silty clay loam subsoil.	Mostly nearly level; somewhat poorly drained.
Seasonal high water table.	Seasonal high water table; low rate of seepage.	Poor to fair stability and compaction characteristics; slow permeability when compacted.	Slow permeability; subject to ponding; poor availability of outlets.	Seasonal high water table; medium intake rate; poorly drained.	Generally not needed; nearly level; seasonal high water table.	Nearly level; seasonal high water table.
Unstable trench walls.	Excessive rate of seepage in substratum.	Good stability and compaction characteristics; rapid permeability when compacted.	Not needed	Rapid intake rate if runoff is controlled; low available water capacity.	Steep; erodible; shallow to sand and gravel; rapid permeability.	Sandy material; steep.
Deep and well drained; steep in places.	Moderately slow permeability; storage potential limited where slopes are more than 12 percent.	Fair stability and compaction characteristics; slow permeability when compacted.	Not needed	Medium available water capacity; weak fragipan; medium to slow intake rate.	Suitable, except where slopes are 12 to 35 percent.	No adverse features, except generally not feasible where slopes are more than 12 percent.
Seasonal high water table; silty clay loam and clay loam.	Very slow permeability.	Poor to fair stability and compaction characteristics; slow permeability when compacted.	Very slow permeability; seasonal high water table; poor availability of outlets.	Low intake rate; crusts easily; low fertility; poorly drained; seasonal high water table.	Not needed; nearly level; seasonal high water table.	Nearly level; seasonal high water table.
Bedrock at depth of 2 to 3 feet.	Bedrock at depth of 2 to 3 feet; steep.	Limited amounts of material; fair to poor compaction characteristics; bedrock at depth of 2 to 3 feet.	Not needed	Steep; generally not irrigated.	Not suitable; steep; erodible; bedrock at depth of 2 to 3 feet.	Steep; erodible.

TABLE 6.—*Interpretations of engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of— Topsoil	Sand and gravel	Road fill	Highway location
*Edenton: EbC2, EbD2, EbE2, EbG2, EcE3, EdG3. For Fairmount part of EdG3, see Fairmount series.	Poor: clay loam or silty clay loam subsoil.	Moderate	Poor: slope	Not suitable	Fair: clay loam or silty clay loam; bedrock at depth of 2 to 3 feet.	Steep in places; bedrock at depth of 2 to 3 feet.
Eel: Ee	Fair: subject to flooding.	Moderate	Good	Not suitable	Fair: loam or silty clay loam.	Subject to flooding.
Fairmount: FaE2, FaG2	Poor: poor stability when thawing; erodible; steep to very steep.	Moderate to high.	Poor: slope	Not suitable	Poor: silty clay loam or clay; bedrock at depth of 1 to 2 feet.	Limestone and shale bedrock at depth of 1 to 2 feet; steep natural slopes are unstable.
Fox: FnB, FnC2, FuB. Urban land part of FuB is too variable for valid interpretation.	Fair: good below depth of 24 to 42 inches.	Low	Fair: less than 16 inches of suitable material.	Good below depth of 2 to 3½ feet: generally well graded sand and gravel mixture.	Fair: good below depth of 2 to 3½ feet.	Deep; well drained.
Genesee: Gn	Fair: subject to flooding.	Moderate	Good	Poor to depth of 4 feet; fair below that depth.	Fair: silt loam or loam.	Subject to flooding.
Glenford: GpB, GpC2, GpE2.	Poor: silty clay loam subsoil.	Moderate	Fair: less than 16 inches of suitable material; poor where slopes are more than 12 percent.	Not suitable	Poor: silty clay loam.	Moderately slow permeability; moderately steep in places.
Gravel pits: Gr. Too variable for valid interpretation.						

properties of the soils—Continued

Soil features affecting—Continued							
Pipeline construction and maintenance	Ponds		Drainage for crops and pasture	Irrigation	Terraces or diversions	Waterways
	Reservoir area	Embankment				
Bedrock at depth of 2 to 3 feet.	Bedrock at depth of 2 to 3 feet; steep.	Fair stability and compaction characteristics; bedrock at depth of 2 to 3 feet.	Not needed	Medium available water capacity; medium to slow intake rate; bedrock at depth of 2 to 3 feet.	Not suitable; bedrock at depth of 2 to 3 feet.	No adverse features, except generally not feasible where slopes are more than 12 percent.
Subject to flooding.	Possible seepage; subject to flooding.	Fair stability and compaction characteristics; moderate permeability when compacted.	Subject to flooding; moderate permeability.	Medium intake rate; subject to flooding.	Nearly level; subject to flooding.	Nearly level; subject to flooding.
Bedrock at depth of 1 to 2 feet; steep.	Bedrock at depth of 1 to 2 feet; steep.	Limited amounts of material; fair to poor compaction characteristics; bedrock at depth of 1 to 2 feet.	Not needed	Steep; bedrock at depth of 1 to 2 feet.	Not suitable; steep; erodible; bedrock at depth of 1 to 2 feet.	Steep; erodible.
Unstable trench walls.	Gravelly and sandy; excessive rate of seepage.	Gravelly and sandy; very stable; good compaction characteristics; rapid permeability when compacted.	Not needed	Medium intake rate; medium available water capacity.	Soil features generally favorable; seepage through berm in places.	Sand and gravel at depth of 24 to 42 inches.
Subject to flooding.	Possible seepage; subject to flooding.	Fair stability and compaction characteristics; moderate permeability when compacted.	Not needed; subject to flooding.	Medium intake rate; subject to flooding; moderate permeability.	Nearly level; subject to flooding.	Nearly level; subject to flooding.
Deep; moderately well drained; silty clay loam subsoil.	Moderately slow permeability; limited storage potential where slopes are more than 12 percent.	Fair to good stability and compaction characteristics; slow permeability when compacted.	Moderately slow permeability; generally not needed.	Medium intake rate; high available water capacity.	No adverse features, except terraces generally not feasible where slopes are more than 12 percent.	No adverse features, except waterways generally not feasible where slopes are more than 12 percent.

TABLE 6.—*Interpretations of engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of— Topsoil	Sand and gravel	Road fill	Highway location
Hickory: HkD2, HkF2, HlG3.	Poor: erodible; steep; clay loam subsoil.	Moderate	Poor: slope	Not suitable	Fair: clay loam; poor where slopes are more than 25 percent.	Steep
Huntington: Hu	Poor: silty clay loam or clay loam subsoil.	Moderate	Fair: less than 16 inches of suitable material.	Not suitable	Poor: silty clay loam or clay loam.	Subject to flooding.
Lanier: Lg	Fair: subject to flooding.	Moderate	Good	Generally good for sand and gravel; very rubbly in places.	Good	Subject to flooding.
Lindside: Ln	Poor: silty clay loam or clay loam subsoil.	Moderate	Fair: less than 16 inches of suitable material.	Not suitable	Poor: silty clay loam or clay loam.	Subject to flooding.
Mahalasville: Mb	Poor: seasonal high water table.	High	Poor: very poorly drained.	Not suitable	Poor: very poorly drained.	Seasonal high water table; slow permeability.
Markland: MdB	Poor: silty clay loam or silty clay subsoil.	Moderate	Fair: less than 16 inches of suitable material.	Not suitable	Poor: silty clay loam or silty clay.	Highly erodible if exposed on embankments; silty clay loam, or silty clay.
Martinsville. Mapped only with Williamsburg soils.	Poor: silty clay loam or clay loam subsoil.	Moderate	Good: fair where slopes are 6 to 12 percent; poor where slopes are more than 12 percent.	Not suitable	Fair: silty clay loam or clay loam.	Moderately steep in places.

properties of the soils—Continued

Soil features affecting—Continued						
Pipeline construction and maintenance	Ponds		Drainage for crops and pasture	Irrigation	Terraces or diversions	Waterways
	Reservoir area	Embankment				
Moderately steep and very steep.	Limited storage potential; steep.	Poor to fair stability and compaction characteristics; slow permeability when compacted.	Not needed	Medium intake rate; low fertility; medium available water capacity; generally steep.	Generally not feasible; steep.	Generally not feasible; steep.
Subject to flooding.	Slow rate of seepage; subject to flooding.	Fair stability and compaction characteristics; slow to moderate permeability when compacted.	Not needed; subject to flooding.	High available water capacity; medium intake rate; subject to flooding.	Nearly level; subject to flooding.	Nearly level; subject to flooding.
Subject to flooding.	Subject to flooding; permeable subsoil.	Fair stability and compaction characteristics; rapid permeability when compacted.	Not needed; subject to flooding.	Low available water capacity; subject to flooding.	Nearly level; subject to flooding.	Nearly level; subject to flooding.
Subject to flooding.	Slow rate of seepage; subject to flooding.	Fair stability and compaction characteristics; slow to moderate permeability when compacted.	Not needed; subject to flooding.	High available water capacity; medium intake rate; subject to flooding.	Nearly level; subject to flooding.	Nearly level; subject to flooding.
Seasonal high water table.	Slow permeability.	Fair to good stability and compaction characteristics; slow permeability when compacted.	Seasonal high water table; slow permeability.	High available water capacity; slow permeability.	Nearly level; seasonal high water table.	Nearly level; seasonal high water table.
Silty clay or clay below depth of 3 feet.	Slow permeability.	Poor to fair stability; slow permeability when compacted.	Not needed	Slow intake rate; medium available water capacity.	Slow permeability; silty clay loam or silty clay subsoil.	Silty clay loam or silty clay subsoil.
Deep; well drained; steep in places.	Permeable layers; moderately steep in places.	Fair to good stability and compaction characteristics; moderate to slow permeability when compacted.	Not needed	Medium intake rate; high available water capacity; not suitable where slopes are moderately steep.	No adverse features, except generally not feasible where slopes are more than 12 percent.	No adverse features, except where slopes are 12 to 18 percent.

TABLE 6.—*Interpretations of engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of—			
			Topsoil	Sand and gravel	Road fill	Highway location
McGary: MgA	Poor: silty clay loam or silty clay subsoil.	Moderate	Fair: less than 16 inches of suitable material.	Not suitable	Poor: silty clay loam or silty clay.	Restricted drainage; highly erodible if exposed on embankments; silty clay loam or silty clay.
Medway: Mh	Poor: seasonal high water table; subject to flooding.	High	Good	Not suitable	Fair: moderately well drained.	Seasonal high water table; subject to flooding.
Newark: Ne	Poor: silty clay loam subsoil.	Moderate to high.	Good	Not suitable	Poor: silty clay loam.	Subject to flooding.
Ockley: OcA, OcB, OdA. Urban land part of OdA is too variable for valid interpretation.	Fair: good below depth of 42 inches.	Moderate	Good	Good below depth of 3½ feet; generally well graded sand and gravel mixture.	Fair to depth of 3½ feet; good below that depth.	Deep; well drained.
Riverwash: Rh. Too variable for valid interpretation.						
*Rodman: RkD2, RkE2. For Casco parts, see Casco series.	Good	Low	Poor: sandy and gravelly; slope.	Fair to depth of 10 inches; good below that depth.	Good	Moderately steep to steep.
Ross: Rn	Fair: subject to flooding.	Moderate	Good	Not suitable	Poor: silty clay loam.	Subject to flooding.
Rossmoyne: RpA, RpB, RpB2, RpC2, RsC3, RtB, RtC. Urban land parts of RtB and RtC are too variable for valid interpretation.	Poor: silty clay loam or clay loam subsoil.	Moderate	Fair: less than 16 inches of suitable material.	Not suitable	Fair: silty clay loam or clay loam.	Restricted drainage; soft and unstable when wet.

properties of the soils—Continued

Soil features affecting—Continued						
Pipeline construction and maintenance	Ponds		Drainage for crops and pasture	Irrigation	Terraces or diversions	Waterways
	Reservoir area	Embankment				
Silty clay or clay below depth of 3 feet.	Slow permeability.	Poor to fair stability; slow permeability when compacted.	Slow permeability; seasonal high water table.	Slow intake rate; seasonal high water table.	Slow permeability; silty clay loam or silty clay subsoil.	Silty clay loam or silty clay subsoil.
Subject to flooding; seasonal high water table.	Possible seepage if excavated below depth of 5 feet.	Fair stability and compaction characteristics; slow permeability when compacted.	Subject to flooding; moderate permeability.	Medium intake rate; seasonal high water table; subject to flooding.	Nearly level; subject to flooding.	Seasonal high water table; subject to flooding.
Subject to flooding.	Slow rate of seepage; subject to flooding.	Fair stability and compaction characteristics; slow to moderate permeability when compacted.	Seasonal high water table; subject to flooding.	Medium intake rate; subject to flooding.	Nearly level; subject to flooding.	Nearly level; subject to flooding.
Unstable trench walls.	Gravelly; excessive rate of seepage.	Fair stability; good compaction characteristics; moderate to slow permeability when compacted.	Not needed------	Medium intake rate; moderate permeability.	Soil features generally favorable; seepage through berm in places.	Soil features generally favorable.
Unstable trench walls.	Excessive rate of seepage in substratum.	Good stability and compaction characteristics; rapid permeability when compacted.	Not needed------	Rapid intake rate if runoff is controlled; low available water capacity.	Steep; erodible; shallow to sand and gravel; rapid permeability.	Sandy; steep.
Subject to flooding.	Possible seepage; subject to flooding.	Fair stability and compaction characteristics; moderate permeability when compacted.	Not needed; subject to flooding.	Medium intake rate; subject to flooding; moderate permeability.	Nearly level; subject to flooding.	Nearly level; subject to flooding.
Deep; well drained.	Slow permeability.	Poor to fair stability and compaction characteristics; slow permeability when compacted.	Slow permeability; generally not needed.	Medium intake rate; fragipan restricts permeability; medium available water capacity.	Generally no adverse features.	Generally no adverse features.

TABLE 6.—*Interpretations of engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of— Topsoil	Sand and gravel	Road fill	Highway location
Sardinia: SaA, SaB	Poor: silt loam, loam or sandy clay loam subsoil.	Moderate	Good	Not suitable	Fair: silt loam, loam, or sandy clay loam.	Restricted drainage; silt loam, loam, or sandy clay loam.
Sees: SeC2, SeD2	Poor: silty clay loam or silty clay subsoil.	Moderate to high.	Fair: silty clay loam; poor where slopes are more than 12 percent.	Not suitable	Poor: silty clay loam or silty clay.	Moderately steep in places.
Shoals: Sh	Poor: somewhat poorly drained.	High	Good	Not suitable	Poor: silty clay loam.	Seasonal high water table; subject to flooding.
Stonelick: St	Fair: subject to flooding.	Moderate	Fair: less than 16 inches of suitable material.	Fair for sand: generally fairly high content of fines.	Good	Subject to flooding.
*Williamsburg: WvB, WvC2, WvD2. For Martinsville parts, see Martinsville series.	Poor: silty clay loam, loam, or clay loam subsoil.	Moderate	Good: fair where slopes are 6 to 12 percent; poor where slopes are more than 12 percent.	Not suitable	Fair: silty clay loam, loam, or clay loam.	Moderately steep in places.

properties of the soils—Continued

	Soil features affecting—Continued					
Pipeline construction and maintenance	Ponds: Reservoir area	Ponds: Embankment	Drainage for crops and pasture	Irrigation	Terraces or diversions	Waterways
Deep; moderately well drained.	Moderate permeability.	Fair stability and compaction characteristics; slow permeability when compacted.	Moderate permeability; generally not needed.	Medium intake rate and available water capacity.	Soil features generally favorable.	Soil features favorable.
Silty clay loam or silty clay subsoil and substratum.	Bedrock at depth of 4 feet or more.	Fair stability and compaction characteristics above depth of 3 to 5 feet; bedrock at depth of 4 feet or more.	Slow permeability; generally not needed.	Slow intake rate; medium available water capacity; bedrock at depth of 4 feet or more.	Silty clay loam or silty clay subsoil; bedrock at depth of 4 feet or more; generally not feasible where slopes are more than 12 percent.	Silty clay loam or silty clay subsoil; difficult to construct; stony.
Subject to flooding.	Subject to flooding; seasonal high water table; permeable layers in substratum.	Fair stability and compaction characteristics; slow or moderate permeability when compacted.	Moderate permeability; seasonal high water table; subject to flooding.	Seasonal high water table; subject to flooding.	Not needed; nearly level; subject to flooding.	Subject to flooding.
Subject to flooding.	Subject to flooding; moderately rapid permeability.	Good stability and compaction characteristics; moderate to rapid permeability when compacted.	Not needed; subject to flooding.	Rapid intake rate; subject to flooding.	Nearly level; subject to flooding.	Subject to flooding.
Deep; well drained; modately steep in places.	Permeable layers; moderately steep in places.	Fair to good stability and compaction characteristics; moderate to slow permeability when compacted.	Not needed	Medium available water capacity; medium intake rate; not suitable where slopes are modately steep.	No adverse features, except terraces or diversions generally not feasible where slopes are more than 12 percent.	No adverse features, except where slopes are 12 to 18 percent.

be assumed that where a soil is rated *good*, that all areas of that soil can be profitably developed as a commercial source for sand or gravel. A soil rated *good* has better possibilities for sand and gravel than soils rated *fair* or *poor*.

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

Highway location.—Soil features that affect highway location include depth to bedrock, depth to water table, slope, slippage, and flood hazard. The features considered detrimental are: high water table; flooding; seepage; plasticity of soil material; presence of muck, peat, or rock; unstable slopes; and susceptibility to frost action.

Pipeline construction and maintenance.—Soil features that affect pipelines are depth to hard bedrock, soil stability, and natural drainage. Corrosion potential is rated in table 5.

Ponds: reservoir areas and embankments.—Consideration is given primarily to the sealing potential of the reservoir as determined by permeability, depth to water table, depth to fractured bedrock or other unfavorable material that would allow seepage, and soil texture. In addition, susceptibility to overflow in flood plains is also noted. For embankments, soils are rated according to stability and permeability as determined by texture, shrink-swell behavior, depth to water table, content of coarse fragments greater than 1 inch in size, and susceptibility to piping. The permeability noted in this column is for the soil material when compacted under optimum moisture conditions.

Drainage for crops and pasture.—The soil features are described relative to their natural drainage, their onsite permeability, and the presence of a seasonal high water table.

Irrigation.—The features noted, along with others, are the relative ease with which water normally infiltrates into, percolates through, and drains from each of the soils and the available water capacity of the soils.

Terraces and diversions.—The main soil features that affect construction of terraces and diversions are slope and the relative erodibility of the soil material. Other soil features considered are depth to bedrock and the presence of seasonal high water tables. Nearly level soils need no terracing, and steep soils are not well suited to terracing. Highly erodible soils require special care in the construction of diversions.

Waterways.—The chief soil features affecting waterways are slope and erodibility of the soil material. Depth to rock and to the high water table are noted where applicable.

Town and Country Planning

Clermont County lies directly east of the large metropolitan area of Cincinnati, Ohio. The suburbs of Cincinnati are rapidly expanding and greatly influence the land-use pattern in the western part of Clermont County. This situation creates intensive competition for use of the land. In Clermont County cropland has been the dominant use. In the townships nearest to Cincinnati, however, a decrease of farmland in favor of nonfarm use is already evident. The farming areas in the western part of the county are rapidly being converted to residential, industrial, transportational, and recreational areas.

This section of the soil survey provides information on the properties of the soils and the effect of these properties on selected nonfarm uses. It will be of help to community planners and industrialists who generally look for areas that are the least costly to develop and maintain. Development and maintenance costs are related to soil limitations. Land-use planners will find other useful information on the soil maps and in other parts of this survey. Table 7 gives the estimated degree and kinds of limitation of soils for some selected uses. From this information, alternative uses can be considered in long-range planning and zoning. Because extensive manipulation of the soil alters some of its natural properties, the ratings for some uses will no longer apply to areas that have undergone extensive cutting and filling.

The estimated degree of limitations of the soils for a specified land use are indicated as *slight*, *moderate*, and *severe*. A rating of slight indicates that the soil has no important limitation to the specified use, and a rating of moderate indicates that the soil has some limitations to the specified use. These limitations need to be recognized, but they can be overcome or corrected. A rating of severe indicates that the soil has serious limitations that are costly and difficult to overcome. Explanations of the uses rated in table 7 are given in the following paragraphs.

Farming.—The soils have been rated according to their limitations to use for cultivated crops only. The degree of limitation is based on slope and hazard of erosion or on the ease or difficulty of obtaining artificial drainage. Farming is rated in this table in a comparative manner to aid land-use planners in determining whether or not farming is a wise land use.

Sewage effluent disposal.—Most of the soils in the county have some limitations for disposing of effluent from septic tanks. Such limitations include excessive slope, a seasonal high water table, restricted permeability, poor natural drainage, flooding, and limited depth to bedrock.

Flooding and seasonal high water tables prevent proper functioning of disposal fields for variable periods of time. All soils subject to flooding have been rated severe, but local flooding frequencies can be such that some of the soils could be rated moderate or slight if other soil properties are not limiting.

Many of the soils in the county have been rated severe because of moderately slow or slower permeability. The permeability of each soil in the county has been estimated and is shown in table 5. A severe limitation is imposed by a restrictive layer, such as shale or rock, or a dense compact layer, such as the fragipan in Rossmoyne soils that interferes with adequate filtration and the movement of effluent. Some soils, even though rated severe, are better than others similarly rated. The least permeable layer in Rossmoyne soils, for example, is generally deeper, thus affording a thicker zone for absorption of effluent.

If filter beds for septic tanks are located where slope is more than 12 percent, erosion and seepage downslope can be a problem, or the soil can become unstable when saturated.

Some soils in the county have a gravelly and sandy substratum through which effluent that is inadequately filtered can contaminate ground water or nearby springs, lakes, or streams. Even though the soils dispose of the effluent quickly, a distinct hazard of polluting underground water supplies exists.

Before a septic tank system is installed, an investigation should be made at the proposed site to determine suitable design or alternative solutions to the soil limitations. Improperly functioning filter fields are a health hazard and a major source of pollution to water supplies.

Sewage lagoons.—Sewage lagoons are shallow ponds built to dispose of sewage through oxidation. They may be needed where septic tanks or a central sewage system is not feasible or practical. It is assumed that the natural soil will be used for both the reservoir site and as a source of embankment material. Among the features that control the degree of limitations are the hazard of flooding, degree of slope, depth of bedrock, permeability, content of coarse fragments, and content of organic matter.

Homesite locations.—Major soil features that limit the use of soils as homesites are limited depth to bedrock, flooding, poor natural drainage, and excessive slope. Not considered is a method for disposing of sewage. (This is rated separately in this table.) The ratings in table 7 are for houses of 3 stories or less that have a basement, but the ratings also apply to sites for small industrial, commercial, and institutional buildings.

Soils subject to flooding have severe limitations for permanently used structures. Although flooding is infrequent in most places, it is costly and damaging when it does occur. Homes constructed on naturally wet soils are likely to have wet basements if adequate drainage is not provided. Such soils as Avonburg, Blanchester, Clermont, and McGary are among the soils in this county having this wetness hazard. In some areas of the county, systems of open-ditch drains have been installed for farm uses. Excavations in these areas for such structures as homes can disrupt the established drainage system, leaving the soils in their natural wet condition.

Some of the soils, such as Avonburg or Clermont, have a high silt content. These soils are not as suitable for supporting structural foundations as soils that are coarser textured, such as Fox and Ockley. Soils having high shrink-swell properties are likely to heave and crack foundations unless precautions are observed. Also, high shrink-swell properties affect the alinement of sidewalks, patios, floors, and rock walls. To minimize this effect, a subgrade or layers of sandy or gravelly material can be placed directly below the structure.

Excavating for basements and installing underground utility lines are difficult and expensive in soils that have limited depth to bedrock. Soils having slopes of more than 12 percent have an erosion hazard and are difficult to excavate and level.

Lawns, landscaping, and golf fairways.—In most areas developed for homes and golf courses, the natural surface soil, or topsoil, can be used for lawns, flowers, shrubs, and trees. It can be 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 golf fairway can be established are natural drainage, degree of slope, depth to bedrock, texture of the surface soil, stoniness and rockiness, and hazard of flooding.

Streets and parking lots.—The ratings in table 7 are for soils used for streets and parking lots in residential areas where traffic is not heavy. Considered in estimating the ratings were the hazard of flooding, slope, depth to and kind of bedrock, depth to the water table, and the degree of stoniness. The estimated soil properties and soil features that are important in designing, constructing, and maintaining highways are given in the section "Engineering Uses of the Soils."

Athletic fields.—Properties to consider when selecting sites to be used as athletic fields and other intensive play areas include natural drainage, slope, depth to the water table, depth to and kind of bedrock, permeability, degree of stoniness, hazard of flooding, and texture of the surface layer. In table 7 the use of fill material from other areas was not considered in the ratings. Soils on flood plains can be used as ball diamonds, picnic areas, and other intensive play areas that are not subject to costly damage by floodwater and that are not used during normal periods of flooding. The ratings given in table 7 for streets and parking lots are also important when considering the use of soils for tennis courts.

Parks and play areas.—Parks and other extensive play areas can be located on many kinds of soils that have severe limitations for most other uses. Flood plains, for example, can be safely developed as extensive play areas. Many areas along streams are scenic and, because of their linear shape, can be used by a relatively large number of people. Considered in rating the soils for parks and other extensive play areas were hazard of flooding, degree of stoniness and rockiness, degree of slope, texture of the surface layer, and depth to the water table.

Campsites.—Sites suitable for for tents and trailers should be located in areas suitable as unsurfaced parking lots for cars and camping trailers. Properties to consider when selecting campsites are hazard of flooding, depth to water table, permeability, degree of slope, and soil texture. Wetness is the major factor that affects the degree of limitation for campsites. Soils that have slopes of less than 12 percent are the most desirable for use as tent campsites, but trailers require less sloping soils than tents. Soils that have a medium-textured surface layer have fewer limitations to use as campsites than very clayey or very sandy soils.

Sanitary land fills.—Among the properties affecting the use of soils for trench type sanitary land fills are depth to rock, seasonable wetness, permeability, slope, texture of the soil material, and hazard of flooding. Deep, nearly level, well-drained soils that have slow permeability generally have the fewest limitations for sanitary land fills. This combination of properties, however, exists in very few soils. Excessive wetness in the form of ponding or a high water table increases the difficulty of excavation and proper covering. Clayey textures are less desirable for cover than coarser textures, because they are hard to grade properly and are subject to cracking when dry. All of the

TABLE 7.—*Limitations of the soils that*

Soil series and map symbols	Farming (cultivated crops only)	Sewage effluent disposal (onsite)	Sewage lagoons	Homesite location [1] (3 stories or less)	Lawns, landscaping, and golf fairways
Alluvial land, sloping: AdC. Too variable to be rated.					
Avonburg:					
AvA, AwA. Urban land part of AwA is too variable to be rated.	Moderate: wetness.	Severe: very slow permeability.	Slight	Moderate: seasonal high water table.	Moderate: seasonal high water table.
AvB, AvB2	Moderate: wetness.	Severe: very slow permeability.	Moderate: slope	Moderate: seasonal high water table.	Moderate: seasonal high water table.
Blanchester: Bc	Slight	Severe: slow permeability; seasonal high water table.	Moderate: organic content.	Severe: seasonal high water table.	Severe: seasonal high water table.
Casco: Mapped only with Rodman soils and has the same limitations.					
Cincinnati:					
CcB, CcB2	Slight	Severe: moderately slow permeability.	Moderate: slope	Slight	Slight
CcC2	Moderate: slope	Severe: moderately slow permeability.	Severe: slope	Moderate: slope	Moderate: slope
CcD2, CkD3	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope
Clermont: Ct	Moderate: wetness.	Severe: seasonal high water table; very slow permeability.	Slight	Severe: seasonal high water table.	Severe: seasonal high water table.
Cut and fill land: Cu. Too variable to be rated.					
Eden: EaD2, EaE2, EaF2	Severe: slope; erodible.	Severe: moderate depth to bedrock; slope.	Severe: moderate depth to bedrock; slope.	Severe: slope	Severe: slope
Edenton:					
EbC2	Moderate: slope.	Severe: limited depth to bedrock.	Severe: slope; limited depth to bedrock.	Moderate: slope; limited depth to bedrock.	Moderate: slope; limited depth to bedrock.
EbD2	Severe: slope; erodible.	Severe: slope	Severe: slope	Severe: slope	Severe: slope
EbE2, EbG2, EcE3, EdG3	Severe: slope; erodible.	Severe: slope	Severe: slope	Severe: slope	Severe: slope
Eel: Ee	Slight: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.

See footnotes at end of table.

affect town and country planning

Streets and parking lots	Athletic fields (intensive use)	Parks and play areas	Campsites		Sanitary land fills [2]	Cemeteries
			Tents	Trailers		
Moderate: seasonal high water table.	Severe: very slow permeability.	Moderate: seasonal high water table.	Severe: very slow permeability.	Severe: very slow permeability.	Moderate: seasonal high water table.	Severe: very slow permeability.
Moderate: slope; seasonal high water table.	Severe: very slow permeability.	Moderate: seasonal high water table.	Severe: very slow permeability.	Severe: very slow permeability.	Moderate: seasonal high water table.	Severe: very slow permeability.
Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.
Moderate: slope.	Moderate: slope.	Slight	Moderate: moderately slow permeability.	Moderate: moderately slow permeability; slope.	Moderate: clayey subsoil.	Moderate: moderately slow permeability.
Severe: slope	Severe: slope	Moderate: slope.	Moderate: slope.	Severe: slope	Moderate: slope; clayey subsoil.	Moderate: slope; moderately slow permeability.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: seasonal high water table.	Severe: seasonal high water table; very slow permeability.	Severe: seasonal high water table.	Severe: seasonal high water table; very slow permeability.	Severe: seasonal high water table; very slow permeability.	Severe: seasonal high water table.	Severe: seasonal high water table; very slow permeability.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: moderate depth to bedrock; slope.	Severe: moderate depth to bedrock; slope.
Severe: slope	Severe: slope	Moderate: slope.	Moderate: slope.	Severe: slope	Severe: limited depth to bedrock.	Severe: limited depth to bedrock.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope; limited depth to bedrock.	Severe: slope; limited depth to bedrock.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope; limited depth to bedrock.	Severe: slope; limited depth to bedrock.
Severe: subject to flooding.	Moderate: subject to flooding.	Moderate: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.

TABLE 7.—*Limitations of the soils that*

Soil series and map symbols	Farming (cultivated crops only)	Sewage effluent disposal (onsite)	Sewage lagoons	Homesite location [1] (3 stories or less)	Lawns, landscaping, and golf fairways
Fairmount: FaE2, FaG2	Severe: slope; shallow to rock; very stony surface layer.	Severe: slope; shallow to rock; very stony surface layer.	Severe: slope; shallow to rock; very stony surface layer.	Severe: slope; shallow to rock; very stony surface layer.	Severe: slope; shallow to rock; very stony surface layer.
Fox:					
FnB, FuB. Urban land part of FuB is too variable to be rated.	Slight	Slight [3]	Severe: rapid permeability in substratum.[3]	Slight	Slight
FnC2	Moderate: slope.	Moderate: slope.[3]	Severe: slope [3]	Moderate: slope.	Moderate: slope.
Genesee: Gn	Slight: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Moderate: subject to flooding.
Glenford:					
GpB	Slight	Severe: moderately slow permeability.	Moderate: slope	Slight	Slight
GpC2	Moderate: slope.	Severe: moderately slow permeability.	Severe: slope	Moderate: slope	Moderate: slope
GpE2	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope
Gravel pits: Gr. Too variable to be rated.					
Hickory:					
HkD2	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope
HkF2, HlG3	Severe: steep and very steep; erodible.	Severe: slope	Severe: slope	Severe: slope	Severe: slope
Huntington: Hu	Slight: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
Lanier: Lg	Slight: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
Lindside: Ln	Slight: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
Mahalasville: Mb	Slight	Severe: seasonal high water table.	Moderate: organic content.	Severe: seasonal high water table.	Severe: seasonal high water table.
Markland: MdB	Moderate: hazard of erosion.	Severe: slow permeability.	Moderate: slope	Slight	Slight
Martinsville. Mapped only with Williamsburg soils and has the same limitations.					

See footnotes at end of table.

affect town and country planning—Continued

Streets and parking lots	Athletic fields (intensive use)	Parks and play areas	Campsites		Sanitary land fills [2]	Cemeteries
			Tents	Trailers		
Severe: slope; shallow to rock; very stony surface layer.	Severe: slope; shallow to rock; very stony surface layer.	Severe: slope; shallow to rock; very stony surface layer.	Severe: slope; shallow to rock; very stony surface layer.	Severe: slope; shallow to rock; very stony surface layer.	Severe; slope; shallow to rock; very stony surface layer.	Severe: slope; shallow to rock; very stony surface layer.
Moderate: slope.	Moderate: slope.	Slight	Slight	Moderate: slope.	Severe: permeable substratum.[3]	Slight.[3]
Severe: slope	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope	Severe: permeable substratum.[3]	Moderate: slope.[3]
Severe: subject to flooding.	Moderate: subject to flooding.	Moderate: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
Moderate: slope.	Moderate: slope.	Slight	Moderate: moderately slow permeability.	Moderate: moderately slow permeability; slope.	Moderate: silty clay loam subsoil.	Moderate: moderately slow permeability.
Severe: slope	Severe: slope	Moderate: slope.	Moderate: slope.	Severe: slope	Moderate: slope; silty clay loam subsoil.	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: slope	Severe: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: subject to flooding.	Moderate: subject to flooding.	Moderate: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
Severe: subject to flooding.	Moderate: sandy loam surface layer; subject to flooding.	Moderate: sandy loam surface layer; subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
Severe: subject to flooding.	Moderate: subject to flooding.	Moderate: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.
Moderate: slope.	Severe: slow permeability.	Slight	Severe: slow permeability.	Severe: slow permeability.	Severe: very clayey subsoil and substratum.	Severe: slow permeability.

TABLE 7.—*Limitations of the soils that*

Soil series and map symbols	Farming (cultivated crops only)	Sewage effluent disposal (onsite)	Sewage lagoons	Homesite location [1] (3 stories or less)	Lawns, landscaping, and golf fairways
McGary: MgA	Moderate: wetness.	Severe: slow permeability.	Slight	Moderate: seasonal high water table.	Moderate: seasonal high water table.
Medway: Mh	Slight: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
Newark: Ne	Slight	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
Ockley:					
OcA, OdA. Urban land part of OdA is too variable to be rated.	Slight	Slight [3]	Moderate: moderate permeability in upper part.[3]	Slight	Slight
OcB	Slight	Slight [3]	Moderate: moderate permeability in upper part; slope.[3]	Slight	Slight
Riverwash: Rh. Too variable to be rated.					
Rodman: RkD2, RkE2. Ratings apply to both Rodman and Casco soils.	Severe: slope; droughty.	Severe: slope [3]	Severe: slope [3]	Severe: slope	Severe: slope; droughty.
Ross: Rn	Slight: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
Rossmoyne:					
RpA	Slight	Severe: slow permeability.	Slight	Slight	Slight
RpB, RpB2, RtB. Urban land part of RtB is too variable to be rated.	Slight	Severe: slow permeability.	Moderate: slope	Slight	Slight
RpC2, RsC3, RtC. Urban land part of RtC is too variable to be rated.	Moderate: slope	Severe: slow permeability.	Severe: slope	Moderate: slope	Moderate: slope

See footnotes at end of table.

affect town and country planning—Continued

Streets and parking lots	Athletic fields (intensive use)	Parks and play areas	Campsites		Sanitary land fills [2]	Cemeteries
			Tents	Trailers		
Moderate: seasonal high water table.	Severe: slow permeability.	Moderate: seasonal high water table.	Severe: slow permeability.	Severe: slow permeability.	Severe: clayey subsoil and substratum.	Severe: seasonal high water table; slow permeability.
Severe: subject to flooding.	Moderate: subject to flooding; seasonal wetness.	Moderate: subject to flooding; seasonal wetness.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding; seasonal high water table.
Severe: subject to flooding.	Moderate: subject to flooding.	Moderate: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
Slight	Slight	Slight	Slight	Slight	Severe: permeable substratum.[3]	Slight.[3]
Moderate: slope.	Moderate: slope.	Slight	Slight	Moderate: slope.	Severe: permeable substratum.[3]	Slight.[3]
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope; rapid permeability in substratum.	Severe: slope.[3]
Severe: subject to flooding.	Moderate: subject to flooding.	Moderate: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
Slight	Severe: slow permeability.	Severe: slow permeability.	Severe: slow permeability.	Severe: slow permeability.	Moderate: seasonal wetness; silty clay loam or clay loam subsoil.	Severe: slow permeability.
Moderate: slope.	Severe: slow permeability; slope.	Severe: slow permeability.	Severe: slow permeability.	Severe: slow permeability.	Moderate: seasonal wetness; silty clay loam or clay loam subsoil.	Severe: slow permeability.
Severe: slope	Severe: slope	Severe: slow permeability.	Severe: slow permeability.	Severe: slope; slow permeability.	Moderate: slope; seasonal wetness; silty clay loam or clay loam subsoil.	Severe: slow permeability; slope.

TABLE 7.—*Limitations of the soils that*

Soil series and map symbols	Farming (cultivated crops only)	Sewage effluent disposal (onsite)	Sewage lagoons	Homesite location [1] (3 stories or less)	Lawns, landscaping, and golf fairways
Sardinia: SaA	Slight	Moderate: moderate permeability.	Moderate: moderate permeability.[3]	Slight	Slight
SaB	Slight	Moderate: moderate permeability.	Moderate: moderate permeability.[3]	Slight	Slight
Sees: SeC2	Moderate: slope	Severe: slow permeability.	Severe: slope	Moderate: slope	Moderate: slope
SeD2	Severe: slope	Severe: slow permeability; slope.	Severe: slope	Severe: slope	Severe: slope
Shoals: Sh	Slight	Severe: subject to flooding.	Severe: subject to flooding.	Severe subject to flooding.	Severe: subject to flooding.
Stonelick: St	Slight: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Moderate: subject to flooding.
Williamsburg: WvB. Ratings apply to both Martinsville and Williamsburg soils.	Slight	Slight [3]	Moderate: moderate permeability.[3]	Slight	Slight
WvC2. Ratings apply to both Martinsville and Williamsburg soils.	Moderate: slope	Moderate: slope [3]	Severe: slope [3]	Moderate: slope	Moderate: slope
WvD2. Ratings apply to both Martinsville and Williamsburg soils.	Severe: slope; erosion.	Severe: slope [3]	Severe: slope [3]	Severe: slope	Severe: slope

[1] The rating in this column also applies to light industrial, institutional, and commercial locations.
[2] Onsite deep studies of the underlying strata, water tables, and hazards of aquifer pollution and drainage into ground water need to be made for land fills deeper than 5 or 6 feet.

affect town and country planning—Continued

Streets and parking lots	Athletic fields (intensive use)	Parks and play areas	Campsites		Sanitary land fills [2]	Cemeteries
			Tents	Trailers		
Slight	Slight	Slight	Slight	Slight	Severe: permeable substratum.[3]	Moderate: moderate permeability.[3]
Moderate: slope.	Moderate: slope.	Slight	Moderate: slope.	Moderate: slope.	Severe: permeable substratum.[3]	Moderate: moderate permeability.[3]
Severe: slope	Severe: slope	Moderate: slope	Severe: slow permeability.	Severe: slow permeability; slope.	Severe: silty clay loam or silty clay subsoil and substratum.	Severe: slow permeability.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: silty clay loam or silty clay subsoil and substratum; slope.	Severe: slope.
Severe: subject to flooding.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
Severe: subject to flooding.	Moderate: subject to flooding.	Moderate: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
Moderate: slope.	Moderate: slope.	Slight	Slight	Moderate: slope.	Severe: permeable substratum.[3]	Slight.[3]
Severe: slope	Severe: slope	Moderate: slope	Moderate: slope	Severe: slope	Severe: permeable substratum.[3]	Moderate: slope.[3]
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope; permeable substratum.[3]	Severe: slope.[3]

[3] Possible pollution hazard to streams, lakes, springs, or shallow wells where permeability is rapid in the substratum.

soils that have bedrock within a depth of 60 inches are rated severe.

Cemeteries.—For use as cemeteries, soils have few limitations if they are deep, well drained, and permeable. Depth to rock and natural drainage are especially important. Other features that affect use as cemeteries are the hazard of flooding, slope, permeability, depth to the water table, and texture of the soil material.

Descriptions of the Soils

This section describes the soil series and mapping units in Clermont County. Each soil series is described in detail, and then, briefly, each mapping unit in that series. Unless it is specifically mentioned otherwise, it is to be assumed that what is stated about the soil series holds true for the mapping units in that series. Thus, to get full information about any one mapping unit, it is necessary to read both the description of the mapping unit and the description of the soil series to which it belongs.

An important part of the description of each soil series is the soil profile; that is, the sequence of layers from the surface downward to rock or to other underlying material. Each series contains two descriptions of this profile. The first is brief and in terms familiar to the layman. The second is much more detailed and is for those who need to make thorough and precise studies of soils. Color terms are for moist soil unless otherwise stated. The profile described in the series is representative for mapping units in that series. If the profile of a given mapping unit is different from the one described for the series, these differences are stated in describing the mapping unit, or they are differences that are apparent in the name of the mapping unit.

As mentioned in the section "How This Survey Was Made," not all mapping units are members of a soil series. Gravel pits, for example, is a land type and does not belong to a soil series, but nevertheless it is listed in alphabetic order along with the soil series.

Following the name of each mapping unit 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 is the capability unit and woodland suitability group in which the mapping unit has been placed. The page for the description of each capability unit and woodland suitability group can be learned by referring to the "Guide to Mapping Units" at the back of this survey.

The acreage and proportionate extent of each mapping unit are shown in Table 8. Many of the terms used in describing soils can be found in the Glossary, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (*15*).

Alluvial Land, Sloping

Alluvial land, sloping (AdC) is a sloping to very steep land type in riverbank areas along the Ohio River and its tributaries. In most places the subsoil of this land type is similar to that of Huntington silt loam. Because of the variable speed of the current of the Ohio River during floods, soil horizons vary greatly in thickness, and they range from silty clay loam to sandy loam in texture.

Included with this soil in mapping are some nearly level and gently sloping areas, less than 150 feet wide, that are between the riverbank and the river.

This soil has a severe limitation for most uses because of the hazard of flooding. Capability unit not assigned; woodland suitability group not assigned.

Avonburg Series

The Avonburg series consists of nearly level to gently sloping, somewhat poorly drained soils. They formed in a silt mantle 18 to 40 inches thick and in the underlying Illinoian age weathered glacial till. These soils are on uplands mostly in the northern and eastern two-thirds of the county.

In a representative profile in a cultivated area, the surface layer is dark grayish-brown silt loam 8 inches thick. The subsurface layer, extending to a depth of 15 inches, is brown silt loam that has light brownish-gray and yellowish-brown mottles. In sequence, the subsoil, to a depth of 26 inches, is grayish-brown silty clay loam that has yellowish-brown mottles; to a depth of 36 inches, it is a light brownish-gray, firm, brittle silty clay loam fragipan that has yellowish-brown mottles; to a depth of 45 inches, it is a gray, firm, brittle clay loam fragipan that has yellowish-brown and strong-brown mottles; and to a depth of 68 inches, it is dark yellowish-brown clay loam that has gray mottles. Below this, to a depth of 85 inches, is yellowish-brown clay loam that has gray mottles.

Permeability in Avonburg soils is very slow, and the rooting zone is moderately deep. Runoff is slow to medium, the water table is high during winter and spring, and the soils dry out slowly after rains. Available water capacity is medium, and content of organic matter in the plow layer is low to medium. Avonburg soils are commonly strongly acid to very strongly acid in the root zone.

Avonburg soils are used mostly to grow such cultivated crops as corn, wheat, and soybeans; however, some areas are in woods or pasture. If the soils are cultivated, they need drainage, which is commonly accomplished with surface ditches and bedding.

Representative profile of Avonburg silt loam, 0 to 2 percent slopes, in a cultivated field in Union Township, 60 feet west of centerline of Bennett Road and 800 feet south of the intersection of State Route No. 125 and Bennett Road, near twin oak trees:

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

A2—8 to 15 inches, brown (10YR 5/3) silt loam; common, fine, distinct, light brownish-gray (2.5Y 6/2) and yellowish-brown (10YR 5/8) mottles; weak, medium, platy structure; friable; common small roots; few, fine, very dark brown (10YR 2/2) iron-manganese concretions; medium acid; clear, smooth boundary.

B2tg—15 to 26 inches, grayish-brown (10YR 5/2) light silty clay loam; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure; firm; few, thin, patchy, light brownish-gray (10YR 6/2) clay films and silt films on some ped faces and in a few voids; common, fine, very dark brown (10YR 2/2) concretions; strongly acid; clear, irregular boundary.

Bx1—26 to 36 inches, light brownish-gray (10YR 6/2) light silty clay loam; many, medium, distinct, yellowish-brown (10YR 5/6) and strong-brown (7.5YR 5/6) mottles; moderate, very coarse, prismatic structure parting to moderate, medium, subangular blocky;

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

Soil	Acres	Percent
Alluvial land, sloping	864	0.3
Avonburg silt loam, 0 to 2 percent slopes	42,887	14.5
Avonburg silt loam, 2 to 6 percent slopes	4,782	1.6
Avonburg silt loam, 2 to 6 percent slopes, moderately eroded	2,513	.9
Avonburg-Urban land complex, nearly level	1,375	.5
Blanchester silt loam	4,773	1.6
Cincinnati silt loam, 2 to 6 percent slopes	1,389	.5
Cincinnati silt loam, 2 to 6 percent slopes, moderately eroded	2,194	.7
Cincinnati silt loam, 6 to 12 percent slopes, moderately eroded	22,590	7.7
Cincinnati silt loam, 12 to 18 percent slopes, moderately eroded	4,125	1.4
Cincinnati and Hickory soils, 12 to 25 percent slopes, severely eroded	3,862	1.3
Clermont silt loam	41,204	14.0
Cut and fillland	304	.1
Eden flaggy silty clay loam, 12 to 18 percent slopes, moderately eroded	639	.2
Eden flaggy silty clay loam, 18 to 25 percent slopes, moderately eroded	2,205	.8
Eden flaggy silty clay loam, 25 to 50 percent slopes, moderately eroded	14,228	4.8
Edenton loam, 6 to 12 percent slopes, moderately eroded	1,188	.4
Edenton loam, 12 to 18 percent slopes, moderately eroded	4,125	1.4
Edenton loam, 18 to 25 percent slopes, moderately eroded	10,731	3.7
Edenton loam, 25 to 50 percent slopes, moderately eroded	11,025	3.8
Edenton clay loam, 12 to 25 percent slopes, severely eroded	1,193	.4
Edenton and Fairmount soils, 25 to 50 percent slopes, severely eroded	1,186	.4
Eel silt loam	2,124	.7
Fairmount very flaggy silty clay loam, 18 to 25 percent slopes, moderately eroded	109	(1)
Fairmount very flaggy silty clay loam, 25 to 50 percent slopes, moderately eroded	2,127	.7
Fox silt loam, 2 to 6 percent slopes	702	.2
Fox silt loam, 6 to 12 percent slopes, moderately eroded	350	.1
Fox-Urban land complex, gently sloping	580	.2
Genesee silt loam	8,144	2.8
Glenford silt loam, 2 to 6 percent slopes	273	.1
Glenford silt loam, 6 to 12 percent slopes, moderately eroded	75	(1)
Glenford silt loam, 18 to 25 percent slopes, moderately eroded	198	.1
Gravel pits	193	.1
Hickory loam, 12 to 18 percent slopes, moderately eroded	1,442	0.5
Hickory loam, 18 to 35 percent slopes, moderately eroded	7,602	1.3
Hickory clay loam, 25 to 50 percent slopes, severely eroded	1,423	.5
Huntington silt loam	2,019	.7
Lanier sandy loam	1,362	.5
Lindside silt loam	789	.3
Mahalasville silty clay loam	227	.1
Markland silt loam, 2 to 6 percent slopes	68	(1)
McGary silt loam, 0 to 2 percent slopes	80	(1)
Medway silt loam, overwash	356	.1
Newark silt loam	813	.3
Ockley silt loam, 0 to 2 percent slopes	1,364	.5
Ockley silt loam, 2 to 6 percent slopes	1,029	.4
Ockley-Urban land complex, nearly level	205	.1
Riverwash	63	(1)
Rodman and Casco loams, 12 to 18 percent slopes, moderately eroded	97	(1)
Rodman and Casco loams, 18 to 25 percent slopes, moderately eroded	125	(1)
Ross silt loam	162	.1
Rossmoyne silt loam, 0 to 2 percent slopes	6,610	2.3
Rossmoyne silt loam, 2 to 6 percent slopes	33,100	11.3
Rossmoyne silt loam, 2 to 6 percent slopes, moderately eroded	18,235	6.2
Rossmoyne silt loam, 6 to 12 percent slopes, moderately eroded	10,918	3.7
Rossmoyne silty clay loam, 6 to 12 percent slopes, severely eroded	3,123	1.1
Rossmoyne-Urban land complex, gently sloping	1,970	.7
Rossmoyne-Urban land complex, sloping	218	.1
Sardinia silt loam, 0 to 2 percent slopes	324	.1
Sardinia silt loam, 2 to 6 percent slopes	558	.2
Sees silty clay loam, 4 to 12 percent slopes, moderately eroded	340	.1
Sees silty clay loam, 12 to 18 percent slopes, moderately eroded	475	.2
Shoals silt loam	932	.4
Stonelick sandy loam	796	.3
Williamsburg and Martinsville silt loams, 2 to 6 percent slopes	1,529	.5
Williamsburg and Martinsville silt loams, 6 to 12 percent slopes, moderately eroded	843	.3
Williamsburg and Martinsville silt loams, 12 to 18 percent slopes, moderately eroded	166	.1
Ponds and streams	140	(1)
Total extent of mapping units comprising less than 0.05 percent of the county		1.0
Total	293,760	100.0

[1] Less than 0.05 percent.

firm, brittle; thin to medium thick light-gray (10YR 7/1) silt coatings on tops and most faces of prisms; many gray (10YR 5/1) silt fillings in old root and crayfish channels; distinct, gray (10YR 6/1) clay films on ped faces and lining voids; many, fine and medium, very dark brown (10YR 2/2) concretions; strongly acid; gradual, wavy boundary.

IIBx2—36 to 45 inches, gray (10YR 6/1) clay loam; many, coarse, distinct, yellowish-brown (10YR 5/6 and 5/8) and strong-brown (7.5YR 5/6) mottles; moderate, very coarse, prismatic structure parting to weak, thick, platy; firm, brittle; light-gray (10YR 7/1) thin silt coatings on ped faces; distinct, gray (10YR 6/1) clay films on most ped faces and lining some voids; common, fine, very dark brown (10YR 2/2) or black (10YR 2/1) concretions and staining on ped faces that lack clay films; few, hard, angular till pebbles; strongly acid; gradual, diffuse boundary.

IIB3—45 to 68 inches, dark yellowish-brown (10YR 4/4) clay loam; common, coarse, distinct, gray (10YR 5/1) mottles; weak, coarse, prismatic structure parting to weak, medium, subangular blocky; firm; faint, gray (10YR 5/1) clay films on some ped faces and lining voids; few pebbles; few very dark brown (10YR 2/2) concretions; strongly acid in the upper part and slightly acid in the lower part; gradual, wavy boundary.

IIC—68 to 85 inches, yellowish-brown (10YR 5/4) light clay loam; many, coarse, distinct, gray (10YR 6/1) mottles and streaks; massive; friable; common angular till pebbles, few hard chert fragments; silty weathered remnants of limestone in places in upper part; mildly alkaline and calcareous at depth of 70 inches; moderately alkaline and calcareous at depth of 85 inches.

The solum ranges from 5 to 8 feet in thickness over stratified layers of Ordovician shale and limestone bedrock or glacial till. Thickness of the silt capping (loess) ranges from 18 to 40 inches.

The A horizon ranges from dark grayish brown (10YR 4/2) to grayish brown (10YR 5/2).

The B horizon is strongly acid or very strongly acid to a depth of about 4 feet. Between depths of 4 and 4½ feet, it is commonly strongly acid, and below a depth of 4½ feet it becomes slightly acid to neutral. The B2 and Bx horizons range from grayish brown (10YR 5/2) to gray (N 5/0). Mottles in these horizons range from strong brown (7.5YR 5/6) to dark brown (10YR 3/3). The B horizon ranges from silty clay loam or clay loam to silty clay.

Weathered Ordovician bedrock materials generally underlie Avonburg soils, commonly below a depth of 5 feet. In places the bedrock is absent, and the underlying Illinoian glacial till extends to a depth of 20 to 30 feet. Where this is so, the lower part of the B horizon is heavy clay loam, and the unweathered till is calcareous light clay loam.

Avonburg soils are in a drainage sequence that includes the well-drained Cincinnati soils, the moderately well drained Rossmoyne soils, the poorly drained Clermont soils, and the very poorly drained Blanchester soils. Avonburg soils have more yellowish and brownish colors in the B horizon than the poorly drained Clermont soils and less yellowish and brownish colors in the B horizon than the moderately well drained Rossmoyne soils.

Avonburg silt loam, 0 to 2 percent slopes (AvA).—This nearly level soil is on uplands, generally on slight rises adjacent to or surrounded by Clermont soils in the more level part of the county. It also is between ravines that are commonly 500 to 1,500 feet apart in the sloping area of the county. This soil is commonly adjacent to sloping Rossmoyne and Cincinnati soils along the ravines, but in places the nearly level and gently sloping Rossmoyne soils are between this soil and the sloping Rossmoyne or Cincinnati soils. Areas of this soil are commonly irregular in shape and less than 60 acres in size. Many crayfish castles are on the surface during spring and summer. This soil has the profile described as representative for the series.

Included with this soil in mapping are areas of poorly drained Clermont silt loam, 0 to 2 percent slopes, and areas of moderately well drained Rossmoyne silt loam, 0 to 2 percent slopes. They occur as islandlike areas or as small areas along the boundary of this Avonburg soil.

Wetness is a severe limitation where this soil is farmed. Seasonal wetness and very slow permeability are limitations to many nonfarm uses. Capability unit IIIw–2; woodland suitability group 2w1.

Avonburg silt loam, 2 to 6 percent slopes (AvB).—This gently sloping soil is on uplands, along and commonly at the heads of small drainageways. Areas are generally irregular in shape or narrow and long, and they are commonly less than 40 acres in size. This soil mainly occurs between the nearly level Avonburg or Clermont soils and the sloping Rossmoyne soils. It has a profile similar to that described as representative for the series, except the surface layer is 5 to 8 inches thick.

Included with this soil in mapping are small areas of Rossmoyne silt loam, 2 to 6 percent slopes; Rossmoyne silt loam, 6 to 12 percent slopes, moderately eroded; and Avonburg silt loam, 0 to 2 percent slopes.

Wetness is a severe limitation where this soil is farmed. Seasonal wetness and very slow permeability are limitations to many nonfarm uses. Capability unit IIIw–3; woodland suitability group 2w1.

Avonburg silt loam, 2 to 6 percent slopes, moderately eroded (AvB2).—This gently sloping soil is on uplands along and commonly at the heads of small drainageways. Areas are generally irregular in shape, or they are narrow and long. They are as large as 20 acres in size. This soil commonly occurs between nearly level Avonburg or Clermont soils and sloping soils lower on the sides of drainageways. It has a profile similar to that described as representative for the series, but this soil has a thinner, lighter colored surface layer and many olive-brown and grayish eroded spots several feet in diameter. This soil has a higher clay content in the surface layer than uneroded Avonburg soils, and consequently, it is in poor tilth, which causes the soil to be cloddy when dry and sticky when wet. Because of this it is more difficult to work, and there are fewer days when optimum moisture conditions are suitable for tillage.

Included with this soil in mapping are small areas of Rossmoyne silt loam, 2 to 6 percent slopes; Rossmoyne silt loam, 6 to 12 percent slopes, moderately eroded; and Avonburg silt loam, 2 to 6 percent slopes.

Wetness is a severe limitation where this soil is farmed. Seasonal wetness and very slow permeability are limitations to many nonfarm uses. Capability unit IIIw–3; woodland suitability group 3w1.

Avonburg-Urban land complex, nearly level (AwA).—This nearly level complex is on uplands. Most of the surface layer of the Urban land part of this mapping unit has been disturbed or buried by earthmoving operations preparatory to basement excavation. Because of this, natural soil characteristics have been obliterated, and precise classification is very difficult. Residential developments occupy variable proportions of the surface area, depending on housing density and lot size. The soil in the undisturbed areas is dominantly Avonburg silt loam that has a profile similar to that described as representative for the series. Included in mapping are small, undisturbed areas of nearly level Rossmoyne soils.

The soils in this mapping unit are mostly somewhat poorly drained. Seasonal wetness and very slow permeability are limitations to most nonfarm uses. They especially limit the use of this complex for homesites that require onsite sewage disposal. Capability unit and woodland suitability group not assigned.

Blanchester Series

The Blanchester series consists of nearly level and slightly depressional soils that are poorly drained. They formed in a silt mantle 18 to 40 inches thick and in the underlying Illinoian age weathered glacial till. These soils are in upland areas of the Illinoian till plain in the northern and eastern parts of the county.

In a representative profile in a cultivated area, the surface layer is dark-gray silt loam 14 inches thick. In sequence, the subsoil, to a depth of 20 inches, is dark grayish-brown silt loam that has brown and grayish-brown mottles; to a depth of 29 inches, it is dark-gray silty clay loam that has dark yellowish-brown mottles; to a depth of 49 inches, it is grayish-brown silty clay loam that has dark yellowish-brown mottles; to a depth of 58 inches, it is mottled gray and black clay loam; and to a depth of 68 inches, it is mottled, gray, dark-gray, and dark reddish-brown clay loam. Below this, to a depth of 74 inches, is gray clay loam glacial till that has brown and very dark gray mottles. Below a depth of 74 inches and extending to a depth of 100 inches is mottled clay and clay loam. It is underlain by limestone bedrock. Crayfish burrows are quite common in this soil to depths of 5 to 8 feet.

Permeability in Blanchester soils is slow, and the rooting zone is deep. Runoff is very slow to ponded. The water table is high during winter and spring, and the soils are saturated for significant periods of time. Available water capacity is high. Blanchester soils are commonly medium acid to very strongly acid in the root zone.

If Blanchester soils are adequately drained, they are commonly used to grow such cultivated crops as corn and soybeans. Many acres of Blanchester soils are not farmed because they are poorly drained or ponded for part of the year.

Representative profile of Blanchester silt loam, in a cultivated field in Stonelick Township, 1,700 feet north of Jackson Pike and 1¼ miles west of Monterey-Maple Grove Road:

Ap—0 to 7 inches, dark-gray (10YR 4/1) silt loam; common, fine, faint, dark yellowish-brown (10YR 4/4) mottles; dark gray (10YR 4/1) rubbed; moderate, medium, granular structure; friable; many roots; strongly acid; abrupt, smooth boundary.

A12—7 to 14 inches, dark-gray (10YR 4/1) silt loam; weak, medium, subangular blocky structure parting to weak, medium, granular; friable; many roots; very strongly acid; abrupt, wavy boundary.

B1tg—14 to 20 inches, dark grayish-brown (10YR 4/2) silt loam; common, medium, distinct, brown (10YR 4/3) and grayish-brown (10YR 5/2) mottles; moderate, medium, subangular blocky structure; friable; many roots; very strongly acid; clear, smooth boundary.

IIB21tg—20 to 29 inches, dark-gray (10YR 4/1) silty clay loam; common, medium, distinct, dark yellowish-brown (10YR 4/4) mottles; moderate, medium, subangular blocky structure; friable; common roots; thin, patchy clay films; large, dusky-red (10R 3/3) concretions; very strongly acid; clear, smooth boundary.

IIB22tg—29 to 49 inches, grayish-brown (10YR 5/2) silty clay loam; many, medium, dark yellowish-brown (10YR 4/4) mottles; strong, coarse, subangular blocky structure; thin, patchy clay films on ped faces; firm; common roots; large dark-brown (7.5YR 4/4) concretions; strongly acid; clear, smooth boundary.

IIB23tg—49 to 58 inches, mottled gray (10YR 5/1) and black (10YR 2/1) clay loam; common, medium, distinct, dark reddish-brown (5YR 2/2) concretions; massive; firm; medium, patchy clay films; few roots; medium acid; gradual, smooth boundary.

IIB3—58 to 68 inches, mottled gray (N 5/0), dark-gray (N 4/0), and dark reddish-brown (5YR 3/3) clay loam; massive; firm; few roots; common, dark reddish-brown (5YR 2/2) concretions; slightly acid; gradual, smooth boundary.

IIC1—68 to 74 inches, gray (N 6/0) clay loam; many, coarse, prominent, brown (7.5YR 4/4) and very dark gray (10YR 3/1) mottles; massive; firm; few roots; neutral; gradual, smooth boundary.

IIC2—74 to 83 inches, yellowish-brown (10YR 5/6) and reddish-brown (5YR 4/4) clay loam; common, fine, distinct, gray (N 5/0) mottles; massive; friable; black (10YR 2/1) krotovinas present; mildly alkaline, calcareous; clear, smooth boundary.

IIIC3—83 to 90 inches, mottled, yellowish-brown (10YR 5/6) and gray (N 5/0) clay; massive; firm; black (10YR 2/1) krotovinas present; laminated horizon; mildly alkaline, calcareous; clear, smooth boundary.

IIIC4—90 to 100 inches, olive-brown (2.5Y 4/4) and dark yellowish-brown (10YR 4/4) clay loam; common, dark grayish-brown (2.5Y 4/2) mottles; massive; firm in place; friable where disturbed; laminated horizon; mildly alkaline, calcareous; clear, wavy boundary.

IIIC5—Below 100 inches, shale and limestone bedrock, Ordovician age.

The solum ranges from 60 to 80 inches in thickness. The A horizon is dark-gray (10YR 4/1) in plowed areas and black (10YR 2/1) in unplowed areas. The black horizon is less than 6 inches thick. The B horizon is very strongly acid in the upper part and slightly acid in the lower part. The color of the B horizon is neutral, or hue ranges to 10YR. The value is 4 or 5, and chroma ranges from 0 to 2. Structure in the upper part of the B horizon ranges from moderate to strong subangular blocky. The lower part of the B horizon is structureless (massive). Weathered Ordovician bedrock material generally underlies Blanchester soils. Where this material is absent, the underlying Illinoian glacial till extends to a depth of 20 to 30 feet. In these areas the lower part of the B horizon is clay loam, and the unweathered till is calcareous clay loam to clay.

Blanchester soils are in a drainage sequence that includes the well-drained Cincinnati soils, moderately well drained Rossmoyne soils, somewhat poorly drained Avonburg soils, and the poorly drained Clermont soils. Blanchester soils are generally next to the lighter colored Clermont soils but in places are next to the Avonburg soils. Blanchester soils have finer textured B and C horizons than Mahalasville soils, which occur on terraces.

Blanchester silt loam (Bc).—This nearly level and depressional soil is in areas in the eastern and northern parts of the county. Areas vary in size and shape. In depressional areas along drainageways, they are generally long and narrow and less than 50 acres in size. In nearly level areas they are broad and irregular in shape and as much as 200 acres in size. Crayfish castles characteristically are on the surface of the soil much of the year because of wetness.

Included with this soil in mapping are a few areas where the surface layer is darker than that of this soil and a few areas where the surface layer is silty clay loam. Also included are small areas of nearly level Clermont soils, particularly in the larger nearly level areas.

Wetness is the main limitation to use of this soil for farming. Seasonal wetness and slow permeability limit many nonfarm uses. Capability unit IIw-3; woodland suitability group 2w1.

Casco Series

The Casco series consists of moderately steep to steep, well-drained soils. The formed in loamy material 10 to 20 inches thick and in the underlying stratified calcareous sand and gravel. These soils are mainly on terraces and on valley walls along the Little Miami River and its tributaries.

In a representative profile in a wooded area, the surface layer is dark-brown loam 4 inches thick. The subsurface layer is brown clay loam 3 inches thick. The subsoil, to a depth of 19 inches, is brown, firm clay loam. Below this, to a depth of 60 inches, is dark yellowish-brown, stratified gravel and sand.

Permeability in Casco soils is moderate, and the rooting zone is shallow. Available water capacity is low. Casco soils are commonly slightly acid or neutral in the root zone.

Most areas of Casco soils are in permanent pasture or woods.

Representative profile of Casco loam in a wooded area of Rodman and Casco loams, 18 to 25 percent slopes, moderately eroded; in Union Township, 1 mile southeast of Milford and 700 feet north of Round Bottom Road, 100 feet west of the powerlines:

A1—0 to 4 inches, dark-brown (10YR 3/3) loam; weak, fine, granular structure; friable; common roots; neutral; abrupt, smooth boundary.

A2—4 to 7 inches, brown (7.5YR 4/2) light clay loam; weak, medium, grannular structure; friable; common roots; slightly acid; clear, smooth boundary.

B21t—7 to 13 inches, brown (7.5YR 4/4) clay loam; weak, medium, subangular blocky structure; firm; common roots; thin, patchy clay films; dark-brown (7.5YR 3/2) coatings on ped faces; slightly acid; gradual, wavy boundary.

B22t—13 to 19 inches, brown (7.5YR 4/4) light clay loam; moderate, medium, subangular blocky structure; firm; thin, patchy clay films on vertical ped faces; dark-brown (7.5YR 3/2) coatings on ped faces; many glacial pebbles in lower part; slightly acid; clear, wavy boundary.

IIC—19 to 60 inches, dark yellowish-brown (10YR 4/4) gravel and some sand; single grained; loose; calcareous, mildly alkaline.

The solum ranges from 12 to 24 inches in thickness. The A horizon ranges from dark brown (7.5YR 3/2) and (10YR 3/3) in wooded areas to brown (7.5YR 4/4) in cultivated areas and from silt loam to sandy loam. The Bt horizon ranges from brown (7.5YR 4/4) to dark reddish-brown (5YR 4/3) and is heavy loam or clay loam. It ranges from medium acid to neutral in reaction. The C horizon is statified, well sorted to poorly sorted, calcareous gravel and sand.

Casco soils are similar to well-drained Rodman soils, but they have a somewhat thicker solum that contains more clay. They have a thinner solum than well-drained Fox or Ockley soils.

Casco soils occur only with the similar Rodman soils in this county, and they are mapped in undifferentiated mapping units with Rodman soils.

Cincinnati Series

The Cincinnati series consists of well-drained, gently sloping to steep soils that have a fragipan. They formed in a silt mantle 18 to 40 inches thick and in the underlying Illinoian age glacial till. These soils are on the till plain in the western and southern parts of the county.

In a representative profile in a cultivated area, the surface layer is dark-brown silt loam 8 inches thick. The subsoil extends to a depth of 60 inches. It is dominantly dark brown but has some brown, strong-brown, and yellowish-brown mottles. The subsoil is dominantly silt loam or loam in the upper part and clay loam or clay in the lower part. Between depths of 19 and 36 inches is a fragipan. Below the subsoil, to a depth of 80 inches, is calcareous brown loam glacial till.

Permeability in Cincinnati soils is moderate above the fragipan and moderately slow in and below the fragipan. The rooting zone is moderately deep, and available water capacity is medium. The content of organic matter in the plow layer is low. Cincinnati soils are commonly very strongly acid in the root zone.

Cincinnati soils are used mostly to grow such cultivated crops as corn and soybeans, especially in the southern and southwestern parts of the county. In the western part some areas of these soils are used as sites for small estates and for subdivision housing.

Representative profile of Cincinnati silt loam, 2 to 6 percent slopes, in a pasture field in Miami Township, 150 feet west of Milford-Loveland Road and 2 miles north of Milford:

Ap—0 to 8 inchces, dark-brown (10YR 4/3) silt loam; weak, fine, granular structure; friable; many roots; very strongly acid; abrupt, smooth boundary.

B1t—8 to 14 inches, dark-brown (7.5YR 4/4) silt loam; moderate, fine and medium, subangular blocky structure; friable; many roots; thin, continuous, dark-brown (7.5YR 4/4) clay films on ped faces; very strongly acid; clear, smooth boundary.

B21t—14 to 19 inches, dark-brown (7.5YR 4/4) loam; moderate, medium, subangular blocky structure; friable; common roots; thin, continuous, dark-brown (7.5YR 4/4) clay films on ped faces; very strongly acid; clear, smooth boundary.

IIBx1—19 to 27 inches, dark-brown (7.5YR 4/4) loam; weak, coarse, subangular blocky structure; firm; brittle; few roots; thin, brown (10YR 5/3) clay films on 60 percent of ped faces; iron-manganese stains occur within peds and on surfaces; very strongly acid; gradual, smooth boundary.

IIBx2—27 to 36 inches, dark-brown (7.5YR 4/4) and strong-brown (7.5YR 5/6) light clay loam; moderate, medium, angular blocky structure; firm, slightly brittle; thin, brown (10YR 4/4) clay films; very strongly acid; gradual, smooth boundary.

IIB22t—36 to 44 inches, dark yellowish-brown (10YR 4/4) and strong-brown (7.5YR 5/6) clay; moderate, medium, angular blocky structure; firm; few dark-brown (7.5YR 4/4) clay films on ped faces; iron-manganese stains occur within peds and on surfaces; few small angular till pebbles present; very strongly acid; gradual, smooth boundary.

IIB23t—44 to 52 inches, dark-brown (7.5YR 4/4) clay; moderate, medium, angular blocky structure; firm; few dark yellowish-brown (10YR 4/4) clay films on ped faces; few small angular till pebbles; very strongly acid; gradual, smooth boundary.

IIB3—52 to 60 inches, brown (10YR 4/3) clay loam; common, medium, distinct, strong-brown (7.5YR 5/6) mottles; weak, coarse, subangular blocky structure; firm; common black manganese stains and small concretions; few small angular till pebbles; medium acid; clear, irregular boundary.

IIC1—60 to 70 inches, brown (10YR 5/3) loam; firm; few angular till pebbles and weathered remnants of limestone; material from IIB3 horizon tongues into this horizon; mildly alkaline, calcareous; gradual, wavy boundary.

IIC2—70 to 80 inches, brown (10YR 4/3) loam; firm; moderately alkaline, calcareous.

The solum ranges from 4 to 8 feet in thickness over glacial till, but in places it is over stratified layers of shale and limestone bedrock. The silt mantle ranges from 18 to 40 inches in thickness. The Illinoian till underlying the solum is dominantly clay loam but ranges from loam to clay. Depth to the fragipan ranges from 1½ to 3 feet, and thickness of the fragipan ranges from 1 to 2½ feet. The B horizon is very strongly acid to a depth of 30 to 50 inches. In the B2 horizon the matrix color ranges from dark yellowish-brown (10YR 4/4) to strong brown (7.5YR 5/6). The fragipan ranges from dark brown (7.5YR 4/4) to strong brown (7.5YR 5/6). Dark concretions and stains are common in the fragipan and B3 horizon. Reaction is very strongly acid or strongly acid below the Ap horizon and in the fragipan, and in places it is very strongly acid or strongly acid in the lower part of the B2 horizon. As depth increases, the acidity decreases to medium acid or slightly acid in the upper part of the B3 horizon and neutral in the lower part of the B3 horizon. The till is clay where the content of Ordovician shale is high.

Cincinnati soils are in a drainage sequence that includes the moderately well drained Rossmoyne soils, the somewhat poorly drained Avonburg soils, the poorly drained Clermont soils, and the poorly drained, dark-colored Blanchester soils. Cincinnati soils are generally next to Hickory, Edenton, or Rossmoyne soils. They have mottling at a greater depth than Rossmoyne soils and have a thicker profile than the Hickory and Edenton soils, neither of which have a fragipan. Cincinnati soils differ from the Ockley and Williamsburg soils in having a fragipan and in being underlain with glacial till instead of glacial outwash.

Cincinnati silt loam, 2 to 6 percent slopes (CcB).—This gently sloping soil is on relatively high ridgetops on uplands between the deeply entrenched tributaries of the major drainage systems in the county. Areas are long, narrow, or irregular in shape and are 50 acres or less in size. This soil has short slopes and is only slightly eroded. It is generally next to gently sloping Rossmoyne soils, sloping Cincinnati soils, and steep Cincinnati, Edenton, or Hickory soils. This soil has the profile described as representative for the series.

Included with this soil in mapping in some of the broader areas are small areas of moderately well drained Rossmoyne soils.

Erosion is a moderate hazard where this soil is farmed. Moderately slow permeability is a limitation to some nonfarm uses. Capability unit IIe–1; woodland suitability group 2o2.

Cincinnati silt loam, 2 to 6 percent slopes, moderately eroded (CcB2).—This gently sloping soil is on uplands bordering the entrenched tributaries of the major drainage systems in the county. Areas are long and narrow or irregular in shape, generally less than 50 acres in size, and commonly less than 200 feet wide. Steep soils, where adjacent to this soil, permit lateral movement of subsurface water. This soil is generally next to gently sloping Rossmoyne soils, sloping Cincinnati soils, and steep Cincinnati, Edenton, or Hickory soils.

The profile of this soil differs from that described as representative for the series in having a surface layer that is about 4 inches thinner and is a mixture of the original surface layer and the underlying subsoil. Because this soil has more clay in the surface layer than the soil described as representative for the series, it has poorer tilth and is cloddy when dry and sticky when wet. Because of this, this soil is more difficult to work than the representative uneroded soil, and there are fewer days when moisture conditions are suitable for tillage.

Included with this soil in mapping are small areas of moderately eroded Rossmoyne soils and a few small areas of severely eroded soils.

Erosion is a moderate hazard where this soil is farmed. Moderately slow permeability is a limitation to some nonfarm uses. Capability unit IIe–1; woodland suitability group 2o2.

Cincinnati silt loam, 6 to 12 percent slopes, moderately eroded (CcC2).—This sloping soil is on sides of smaller waterways and in irregularly shaped and narrow areas near the heads of drainageways and adjacent to the steeper upland soils on valley walls. Areas are as large as 50 acres. In plowed or cultivated fields areas of yellowish-brown or dark-brown eroded soil are present. This soil is generally next to gently sloping Rossmoyne or Cincinnati soils and steep Cincinnati, Edenton, or Hickory soils. It has a profile similar to that described as representative for the series, except the surface layer is thinner and is a mixture of the original surface layer and subsoil.

Included with this soil in mapping are small areas of slightly eroded soils and areas of severely eroded soils. Also included are small areas of Edenton soils, generally less than 2 acres in size, which occur at the terminal ends of spurs of ridgetops and along sloping areas near drainageways.

Runoff on this soil is rapid, and the hazard of further erosion is severe where this soil is cultivated. Slope and moderately slow permeability are limitations to most nonfarm uses. Capability unit IIIe–1; woodland suitability group 2o2.

Cincinnati silt loam, 12 to 18 percent slopes, moderately eroded (CcD2).—This moderately steep soil is on side slopes of smaller waterways and in narrow and irregularly shaped areas between gently sloping or sloping Cincinnati soils and adjacent to steeper soils on valley walls in upland areas. Areas are as much as 50 acres in size. This soil is generally next to sloping Cincinnati soils and steep or very steep Edenton or Hickory soils. This soil is similar to that described as representative for the series, except it has many eroded spots and the surface layer averages 3 or 4 inches in thickness rather than 8 inches. In places many areas of yellowish-brown or dark-brown eroded soil are present, especially after this soil has been plowed or cultivated.

Included with this soil in mapping are areas of Edenton soils, generally less than 2 acres in size, which are adjacent to the small drainageways.

Runoff on this soil is rapid, and further erosion is a very severe hazard where this soil is cultivated. Slope is a limitation to most nonfarm uses. Capability unit IVe–1; woodland suitability group 3d1.

Cincinnati and Hickory soils, 12 to 25 percent slopes, severely eroded (CkD3).—These moderately steep to steep soils are on valley walls of entrenched streams and in narrow and irregularly shaped areas between areas of less sloping Cincinnati soils. In places they are in areas between flood plains and gently sloping upland areas. Areas of these soils are commonly less than 50 acres in size. All of the original surface layer of these soils has been lost through erosion; the present one is the former subsoil. In many areas these soils have numerous gullies and scoured areas, which are several feet deep in places and 10 feet or more wide. Both Cincinnati and Hickory soils are within most of the areas mapped as this undifferentiated unit, but Cincinnati soils are dominant in some areas and Hickory soils in others.

Included with these soils in mapping are small areas of slightly eroded and moderately eroded soils.

Runoff on these soils is very rapid. If they are cultivated, the hazard of erosion is severe. Slope is a limitation to most nonfarm uses. Capability unit VIe–2; woodland suitability group 3d1.

Clermont Series

The Clermont series consists of nearly level, poorly drained soils that formed in a silt mantle and in the underlying weathered glacial till of the Illinoian age. These soils are mostly in broad areas on uplands, mainly in the northern two-thirds of the county.

In a representative profile in a cultivated area, the surface layer is grayish-brown silt loam 8 inches thick. The subsurface layer is light brownish-gray silt loam 4 inches thick. In sequence, the subsoil, to a depth of 17 inches, is light brownish-gray silt loam that has yellowish-brown and yellowish-red mottles; to a depth of 40 inches, it is gray silty clay loam that has brown and yellowish-brown mottles; to a depth of 60 inches, it is dark-brown and dark yellowish-brown clay loam that has gray mottles; to a depth of 86 inches, it is dark yellowish-brown clay loam that has gray mottles; and to a depth of 97 inches, it is yellowish-brown clay loam that has gray mottles. Below this, to a depth of 110 inches, is mottled, yellowish-brown, light olive-brown, and gray clay loam glacial till. This glacial till is compact, calcareous, and limy. It contains numerous angular fragments of limestone.

Permeability in Clermont soils is very slow, and the rooting zone is moderately deep. Runoff is slow. The soils are seasonally saturated with free water for a sustained period that generally extends from winter to late in spring. They are slow to dry out in spring. Available water capacity is medium. Clermont soils are commonly very strongly acid in the root zone.

Clermont soils are used mostly for crops or pasture. In areas that are drained, corn, soybeans, and small grain are commonly grown. A considerable acreage is wooded, mainly in scattered farm woodlots 5 to 60 acres in size. Some areas that are not now farmed are reverting to wooded areas. These areas have a thick volunteer growth of red maple, pin oak, and sweetgum trees (fig. 7).

Representative profile of Clermont silt loam in a cultivated field in Jackson Township, about 1 mile south of intersection of Sharps Cutoff Road and Jackson Pike and 620 feet west of Sharps Cutoff Road:

Ap—0 to 8 inches, grayish-brown (10YR 5/2) silt loam; common, fine, distinct, yellowish-brown (10YR 5/4) mottles; weak, fine, granular structure; friable; many fine black concretions; very strongly acid; abrupt, smooth boundary.

A2g—8 to 12 inches, light brownish-gray (10YR 6/2) silt loam; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium, platy structure; friable; vesicular pores; common roots; many fine black concretions; very strongly acid; abrupt, wavy boundary.

A&Bg—12 to 17 inches, light brownish-gray (2.5Y 6/2) heavy silt loam; many, medium, prominent, yellowish-brown (10YR 5/6) and common, medium, prominent, yellowish-red (5YR 4/6) mottles; moderate, coarse, subangular blocky structure parting to moderate, medium, platy; friable; common roots; material from A2 horizon is more than 60 percent, by volume, of this horizon; A2 material is in krotovinas; common, fine, distinct black stains; very strongly acid; gradual, irregular boundary.

Bt&Ag—17 to 22 inches, gray (10YR 5/1) light silty clay loam; many, medium, prominent, strong-brown (7.5YR 5/6) and common, medium, prominent, yellowish-brown (10YR 5/4) mottles; moderate, medium, prismatic structure parting to moderate, medium, subangular blocky; firm; common roots; light brownish-gray (2.5Y 6/2) coatings make up 25 percent of matrix, mostly 3 to 10 millimeters thick on faces of prisms and as round particles 1 to 2 millimeters in diameter speckled throughout ped interiors; few strong-brown (7.5YR 4/6) concretions in Bt part; few thin clay films, mostly in pores; common krotovinas and crayfish casts; very strongly acid; gradual, irregular boundary.

B21tg—22 to 29 inches, gray (10YR 5/1) silty clay loam; many, medium, prominent, dark-brown (7.5YR 4/4) and dark yellowish-brown (10YR 4/4) mottles; moderate, medium and coarse, prismatic structure parting to weak, coarse, subangular blocky; firm; few roots; gray (5Y 5/1) clayey coatings on 80 percent of vertical surfaces of peds and light brownish-gray (2.5Y 6/2) silty coatings on 20 percent; common irregular specks of material from the A2 horizon in interiors of peds make up 5 to 10 percent of matrix; few black concretions; common krotovinas and crayfish casts; very strongly acid; gradual, irregular boundary.

B22tg—29 to 34 inches, gray (5Y 5/1) silty clay loam; many, coarse, prominent, dark-brown (7.5YR 4/4) and dark yellowish-brown (10YR 4/4) mottles; weak, medium and coarse, prismatic structure parting to weak, coarse, angular blocky; firm; few roots; gray (5Y 5/1) clayey coatings on 80 percent of prism faces and light brownish-gray (2.5Y 6/2) silty coatings on 20 percent; common black concretions; common krotovinas and crayfish casts; very strongly acid; gradual, wavy boundary.

B23tg—34 to 40 inches, gray (5Y 5/1) silty clay loam; many, coarse, prominent, dark-brown (7.5YR 4/4) and strong-brown (7.5YR 5/6) mottles; weak, coarse, prismatic structure parting to weak, coarse, angular blocky; firm; gray (5Y 5/1) clayey coatings on 80 percent prism faces and light brownish-gray (2.5Y 6/2) silty coatings on 20 percent; common black concretions 5 to 10 millimeters in diameter make up 3 to 4 percent, by volume, of horizon; common krotovinas and crayfish casts; strongly acid; gradual, wavy boundary.

IIB24tg—40 to 60 inches, dark-brown (7.5YR 4/4) and dark yellowish-brown (10YR 4/4) clay loam; many, coarse, prominent, gray (5Y 5/1) mottles; weak, coarse, prismatic structure parting to weak, coarse, angular blocky; firm; thin, patchy, gray (10YR 5/1) clay films; 2 percent angular pebbles; common black stains; common krotovinas; strongly acid; gradual, wavy boundary.

IIB31—60 to 86 inches, dark yellowish-brown (10YR 4/4) clay loam; many, coarse, prominent, gray (N 5/0) mottles; weak, coarse, prismatic structure; firm; many distinct black stains; 2 percent small angular pebbles; medium acid grading to neutral at lower boundary; gradual, wavy boundary.

IIB32—86 to 97 inches, yellowish-brown (10YR 5/4) light clay loam; common, fine, distinct, gray (10YR 6/1 and 5/1) mottles; massive; firm; gray (10YR 5/1) clay flow in places; common till pebbles and weathered fragments of limestone; mildly alkaline; abrupt, wavy boundary.

C—97 to 110 inches, mottled yellowish-brown (10YR 5/4), light olive-brown (2.5Y 5/4), and gray (5Y 5/1) light clay loam; massive; firm; common till pebbles; many weathered fragments of limestone; mildly alkaline, calcareous.

The solum ranges from 72 to 120 inches in thickness, and thickness is generally the same as depth to calcareous glacial till. The solum is very strongly acid below the Ap horizon. Thickness of the silt mantle ranges from 24 to 48 inches but is typically about 36 inches. The glacial till is 2 to 10 percent coarse fragments.

Figure 7.—**Plowed field of Clermont silt loam. Note the scattered pin oak trees in the field.**

A dark-gray (10YR 4/1) A1 horizon about 3 to 4 inches thick and an accompanying lighter colored A2 horizon are present in undisturbed areas. The Ap horizon is generally grayish brown (10YR 5/2) or dark grayish brown (10YR 4/2).

The upper part of the Bt horizon is dominantly gray (N 5/0), and the lower part is dark brown (7.5YR 4/4) or dark yellowish brown (10YR 4/4). In the upper part of the B horizon, structure ranges from moderate, medium, prismatic to weak, medium to thick, platy and generally parts to subangular blocky. The lower part of the B horizon generally has weak, coarse, prismatic structure that parts to moderate or weak subangular blocky. In places in the B&A horizon zones of gray A2 material cap the prisms and extend 2 inches down the sides of the prisms. In the upper part of the B horizon, light-gray silty coatings are common on degradation surfaces. Thin, discontinuous clay films are common in the lower part of the B horizon.

In places the upper part of the C horizon is partly weathered. The presence of clay flows on vertical surfaces and the noncalcareous material are evidence of this. The C horizon is generally clay loam, but texture ranges from loam to clay. This horizon is clay in areas where the till is high in content of shale derived from Ordovician bedrock. The till is commonly underlain, at a depth slightly below the solum, by unweathered Ordovician bedrock.

Clermont soils are the poorly drained members of a drainage sequence that includes the well-drained Cincinnati soils, the moderately well drained Rossmoyne soils, the somewhat poorly drained Avonburg soils, and the dark-colored, poorly drained Blanchester soils. Clermont soils are commonly adjacent to Avonburg and Blanchester soils in many areas. They are not so dark in the A horizon as Blanchester soils. They are grayer throughout the profile and have a more clayey B2 horizon than Avonburg soils.

Clermont silt loam (Ct).—This nearly level soil is on uplands in broad, irregularly shaped areas between drainageways and at the heads of low-gradient waterways where runoff water tends to pond (fig. 8). Many areas in the northeastern part of the county are hundreds of acres in size and form a continuous pattern several miles in length. Areas in the western and southern parts of the county are generally not more than 15 acres in size.

Included with this soil in mapping are small areas of darker Blanchester soils and small areas of better drained Avonburg soils. The Blanchester soils are in low, flat drainageways or in depressions. The Avonburg soils are in slightly higher areas around and between areas of Clermont soil. Also included are a few areas where a weakly expressed fragipan is at a depth of about 22 inches and extends to a depth of 36 inches. Where a weak fragipan is present, the upper part of the subsoil contains less clay than is typical.

The many crayfish casts and holes in this soil, especially in summer and fall (fig. 9), are evidence of its wetness. Numerous iron-manganese concretions, BB size or smaller, are on the surface. Because of these, the soil is locally referred to as "buckshot" land. In places where this soil is almost white when dry, it is called "buttermilk" land. In other places it is called "crawdad" land.

In several areas in the north-central part of the county, no calcareous till is above the shale or limestone bedrock. If a layer of shale is between the subsoil derived from the till and limestone, the lower part of the subsoil, because of the influence of the shale, is generally fine textured and has greenish or olive hues. Where this condition exists, depth of leaching is considerably less, and a neutral reaction at a depth of 50 inches is common. Depth to shale and limestone is as shallow as 7 feet in these areas.

Wetness is a severe limitation where this soil is farmed. Artificial drainage is difficult to achieve because of lack of slope and adequate outlets. Where drainage is accomplished on this soil, it is generally by a system of shallow surface ditches called "bedding." Because of its silty surface layer, this soil is very susceptible to erosion. Even where slope is only 1 percent, much of the material of the surface layer in unprotected areas will be lost because of sheet erosion. Seasonal wetness, surface ponding, slow runoff, and very slow permeability are limitations to most nonfarm uses. Capability unit IIIw-1; woodland suitability group 2w1.

Figure 8.—**Water ponded on Clermont silt loam in April.**

Cut and Fill Land

Cut and fill land (Cu) consists of areas that are generally small where excavated or cut soil material has been filled or graded into a natural depression or excavation. This land type is dominantly adjacent to or in areas of Urban land complexes. Included in mapping is a sanitary land fill about three-quarters of a mile southeast of Laurel.

In the glaciated uplands of the county, the soil material is generally calcareous clay loam that is a mixture of glacial till, subsoil material, and a small amount of the original surface layer. In places in rural-fringe areas, recently constructed housing developments are on Cut and fill land. In these areas the original land surface has been graded, and the soil material on higher positions has been cut away and used to fill depressions. The resulting soil material is a mixture and can no longer be identified as an individual soil.

In some fill areas the fill material contains many sizes of slabs of limestone and clay shale because of the bedrock encountered in the original excavation. Low areas are gen-

Figure 9.—Crayfish "castles" on Clermont silt loam.

erally filled with soil, stones, and, in places, trash. Slopes are generally level but in places range to steep, especially around or adjacent to roads or dams.

Cut and fill land has a low content of organic matter and low fertility. In many places it is poorly suited to plants, especially where it is stony. Graded areas are bare and are easily eroded, but grasses or such legumes as crown vetch can be established by mulching, fertilizing, and seeding. Trees are suitable for planting in most areas, especially trees that can tolerate alkaline soils. Capability unit and woodland suitability group not assigned.

Eden Series

The Eden series consists of moderately steep to very steep, well-drained soils. These soils formed in material weathered from interbedded Ordovician shale and limestone. They are mainly on steep and very steep hillsides and the moderately steep parts of dissected uplands along the major drainage systems in the western and southern parts of the county.

In a representative profile the surface layer is very dark grayish-brown, flaggy silty clay loam 4 inches thick. The subsoil, to a depth of 9 inches, is dark grayish-brown silty clay loam. Between depths of 9 and 27 inches it is dark yellowish-brown silty clay that is flaggy in the lower part. Below this, to a depth of 40 inches, is light olive-brown very flaggy clay. Below a depth of 40 inches is interbedded shale and limestone bedrock.

Permeability in Eden soils is slow, and the rooting zone is moderately deep. Runoff is rapid, and available water capacity is medium. Eden soils are commonly strongly acid in the root zone.

Eden soils are used mostly for woods and pasture.

Representative profile of Eden flaggy silty clay loam, 25 to 50 percent slopes, moderately eroded, in a wooded area in Washington Township, 200 feet west of Bear Creek Road and three-fourths mile north of Anthony Meldahl Dam:

A1—0 to 4 inches, very dark grayish-brown (10YR 3/2) flaggy silty clay loam, dark brown (10YR 3/3) rubbed; moderate, fine, subangular blocky structure; friable; many roots; medium acid; clear, smooth boundary.

B1—4 to 9 inches, dark grayish-brown (10YR 4/2) heavy silty clay loam; moderate, medium, subangular blocky structure; firm; many roots; strongly acid; clear, smooth boundary.

B21t—9 to 18 inches, dark yellowish-brown (10YR 4/4) silty clay; strong, medium, subangular blocky structure; firm; many roots; thin, continuous, dark yellowish-brown (10YR 4/4) clay films on ped faces; 10 percent weathered limestone fragments and flags 3 to 15 inches in diameter; strongly acid; gradual, wavy boundary.

B22t—18 to 27 inches, dark yellowish-brown (10YR 4/4) flaggy silty clay; strong, medium, subangular blocky structure; firm; common roots; thin, continuous, dark yellowish-brown (10YR 4/4) and thin, very patchy, olive-brown (2.5Y 4/4) clay films on ped faces; 20 percent weathered limestone fragments 3 to 15 inches in diameter; strongly acid; gradual, wavy boundary.

C—27 to 40 inches, light olive-brown (2.5Y 5/4) very flaggy clay; moderate, medium to thick, platy relict shale structure; very firm, sticky and plastic; 60 percent weathered limestone fragments 3 to 15 inches in diameter; moderately alkaline.

R—40 inches, interbedded limestone and shale.

The solum ranges from 18 to 30 inches in thickness. In most places 2 to 20 percent flaggy limestone fragments are present in the solum and on the surface. In areas that are wooded or in permanent pasture the solum is typically very dark grayish brown (10YR 3/2), but in a few cultivated areas it has an Ap horizon, 4 to 7 inches thick, that has a hue of 10YR or 2.5YR, a value of 4, and a chroma of 2 or 3. The A1 horizon ranges from neutral to medium acid. In some profiles the B1 horizon is less than 2 inches thick or is absent. The B2t horizon commonly has a hue of 10YR, a value of 4 or 5, and a chroma of 4 or 5. In places the B horizon has a hue of 2.5Y, a value of 4 or 5, and a chroma of 4 to 6. The Bt horizon is commonly medium acid, but it ranges from strongly acid to neutral. The Bt horizon is heavy silty clay loam, silty clay, or clay. In some profiles a C horizon of variegated greenish-gray and yellowish-brown shale, 6 to 12 inches thick, is present.

Eden soils are in a drainage sequence that includes the well-drained, shallow Fairmount soils and the somewhat poorly drained and moderately well drained Sees soils. Eden soils have a thicker solum than Fairmount soils and a thinner solum than Sees soils. The Eden soils differ from the Edenton soils in having a clayey B horizon that formed in residuum of limestone and shale bedrock rather than a somewhat loamy B horizon that formed in glacial till.

Eden flaggy silty clay loam, 12 to 18 percent slopes, moderately eroded (EaD2).—This moderately steep soil is in irregularly shaped areas that surround drainageways and in long, narrow areas that are parallel to each other on side slopes of uplands. Areas are commonly 5 to 50 acres in size. In places areas of olive-brown or dark yellowish-brown eroded soils are present. This soil has a profile similar to that described as representative for the series, except the surface layer is slightly thicker.

Included with this soil in mapping are small areas of shallower Fairmount soils, areas of steeper Eden soils, and areas of sloping Cincinnati soils. Also included are a few areas of slightly eroded soils and a few areas of severely eroded soils.

Erosion is a very severe hazard where this soil is cultivated. Slope and slow permeability are limitations to many nonfarm uses. Capability unit VIe–1; woodland suitability group 3c1.

Eden flaggy silty clay loam, 18 to 25 percent slopes, moderately eroded (EaE2).—This steep soil is in irregularly shaped areas surrounding drainageways. Areas are as large as 100 acres. Bedrock is commonly exposed in ravines or gullies that are commonly several hundred feet apart. Pieces of limestone 6 inches or more in length are present on the surface. This soil has a profile similar to that described as representative for the series, except the surface layer is slightly thicker.

Included with this soil in mapping are small areas of shallower Fairmount soils, areas of steeper Eden soils, and areas of moderately steep Cincinnati soils. Also included are a few areas of slightly eroded soils and a few areas of severely eroded soils.

Becase of steep slopes and a continuing very severe erosion hazard, this soil should be kept in permanent vegetation, such as permanent pasture or woods (fig. 10). Slope is a severe limitation to most nonfarm uses. Capability unit VIe–1; woodland suitability group 3c1.

Eden flaggy silty clay loam, 25 to 50 percent slopes, moderately eroded (EaF2).—This very steep soil is in broad areas that border or surround major streams and their tributaries. Areas are as much as 100 acres in size. This soil has the profile described as representative for the series. In areas where this soil is severely eroded the surface layer is olive brown. Pieces of limestone 10 inches or more in length are present on the surface. The surface layer of this soil varies from 2 to 5 inches in thickness because of soil erosion and soil creep. Because of soil creep, the surface layer is thicker on the benchlike positions.

Included with this soil in mapping are a few areas of slightly eroded soils and a few areas of severely eroded soils. Also included are small areas of shallower Fairmount soils.

Because of very steep slopes and a very severe erosion hazard, this soil should be kept in permanent vegetation, such as permanent pasture or woods. Very steep slopes are a severe limitation to most nonfarm uses. Capability unit VIe–1; woodland suitability group 3c2.

Edenton Series

The Edenton series consists of sloping to very steep, well-drained soils that formed in clay loam weathered from glacial till of Illinoian age over shale and limestone bedrock. Most of these soils are steep to very steep, but a few are sloping to moderately steep. They are on uplands, mainly in the western and southern parts of the county.

In a representative profile in an undisturbed area, the surface layer is dark-brown loam 5 inches thick. The upper part of the subsoil, to a depth of 22 inches, is dark yellowish-brown clay loam. The lower part, to a depth of 27 inches, is light olive-brown silty clay loam. Below a depth of 27 inches and extending to a depth of 40 inches is light olive-brown clay. This clay is underlain by interbedded shale and limestone bedrock.

***Figure 10.*—Redcedar trees in an area of Eden flaggy silty clay loam, 18 to 25 percent slopes, moderately eroded.**

Permeability in Edenton soils is moderately slow, and the rooting zone is moderately deep. Runoff is rapid to very rapid. Available water capacity is medium. Edenton soils are commonly medium acid to strongly acid in the root zone.

Edenton soils are mostly in woods and pasture. These soils are mostly on valley walls along the major drainage streams of the county.

Representative profile of Edenton loam, 25 to 50 percent slopes, moderately eroded, in a brushy area 2 miles north of Owensville, 200 feet west of Owensville-Belfast Road and 400 feet south of Brushy Fork Creek in Stonelick Township:

A1—0 to 3 inches, dark-brown (10YR 3/3) loam, brown (10YR 4/3) when crushed and rubbed; weak, fine, granular structure; friable; many roots; slightly acid; abrupt, smooth boundary.

AB—3 to 5 inches, dark-brown (10YR 3/3) and about 30 percent dark yellowish-brown (10YR 4/4) loam; weak, fine and medium, subangular blocky structure; friable; few, small, angular till pebbles; many roots; medium acid; clear, smooth boundary.

B21t—5 to 9 inches, dark yellowish-brown (10YR 4/4) clay loam; weak, medium, subangular blocky structure; friable; common roots; thin, patchy, dark yellowish-brown (10YR 4/4) clay films on vertical and horizontal ped faces; 3 percent small, angular till pebbles; strongly acid; clear, smooth boundary.

B22t—9 to 15 inches, dark yellowish-brown (10YR 4/4) clay loam; moderate, medium, subangular blocky structure; firm; few roots; continuous, thin, yellowish-brown (10YR 5/4) clay films on vertical and horizontal ped faces; 3 percent angular till pebbles; strongly acid; clear, smooth boundary.

B23t—15 to 22 inches, dark yellowish-brown (10YR 4/4) clay loam; moderate, medium, subangular blocky structure; firm; few roots; thin, patchy, brown (10YR 4/3) clay films on vertical and horizontal ped faces; 3 percent small, subangular chert and igneous rock fragments; medium acid; abrupt, wavy boundary.

IIB3—22 to 27 inches, light olive-brown (2.5Y 5/4) silty clay loam; strong, medium, angular blocky structure;

firm; some weathered shale material in this horizon; flaggy limestone fragments at contact line with B23t horizon; neutral; abrupt, wavy boundary.

IIC—27 to 40 inches, light olive-brown (2.5Y 5/4) clay; moderate, medium to thick, relict, platy shale structure; very firm, sticky and plastic; 60 percent weathered limestone fragments 3 to 15 inches in diameter; abrupt, wavy boundary.

R—40 inches, interbedded shale and limestone bedrock.

The solum ranges from 20 to 40 inches in thickness over interbedded layers of shale and limestone bedrock. The A horizon ranges from 2 to 8 inches in thickness. In cultivated areas the Ap horizon is dark grayish-brown (10YR 4/2) or brown (10YR 4/3). The B horizon is strongly acid to neutral. In the B2 horizon hue ranges from 10YR to 7.5YR, and value is 4 or 5. Chroma is 3 or 4. The B2 horizon ranges from silty clay loam to clay. The lower part of the B horizon that is derived from residuum ranges from silty clay loam to clay. The IIC horizon ranges from 0 to 15 inches in thickness.

Where Edenton soils border Eden soils, the B horizon derived from till is thinner, and the lower part of the B horizon is heavier in texture, approaching that of the Eden soils. In these areas interbedded shale and limestone bedrock are at a shallower depth than is typical for Edenton soils.

Edenton soils are in a drainage sequence that includes the well-drained Hickory and Cincinnati soils, the moderately well drained Rossmoyne soils, the somewhat poorly drained Avonburg soils, the poorly drained Clermont soils, and the very poorly drained Blanchester soils. Edenton soils are generally adjacent to Eden, Hickory, or Fairmont soils. They have a B horizon that is coarser textured than that in Eden soils, and it formed in glacial till instead of residuum of limestone and shale bedrock. Edenton soils, unlike Hickory soils, are underlain by limestone and shale bedrock. They have thicker A and B horizons than Fairmount soils.

Edenton loam, 6 to 12 percent slopes, moderately eroded (EbC2).—This sloping soil is in areas near the heads of drainageways and on uplands. Areas are irregular and narrow in shape and commonly are less than 15 acres in size. In plowed or cultivated fields many small areas of dark yellowish-brown, eroded soil are evident on the surface. This soil is commonly next to gently sloping Rossmoyne and Cincinnati soils and moderately steep Edenton, Cincinnati, and Hickory soils. It has a profile similar to that described as representative for the series, except the surface layer and subsoil are somewhat thicker.

Included with this soil in mapping are small areas of sloping Cincinnati soils. Also included are areas of slightly eroded soils and areas of severely eroded soils.

Erosion is a severe hazard where this soil is farmed. Slope, moderately slow permeability, and moderate depth to bedrock are limitations to many nonfarm uses. Capability unit IIIe-1, woodland suitability group 3o1.

Edenton loam, 12 to 18 percent slopes, moderately eroded (EbD2).—This moderately steep soil is in irregularly shaped areas surrounding drainageways. Areas are commonly less than 50 acres in size. They generally include a few small gullies. In places in plowed or cultivated fields small areas of dark yellowish-brown eroded soil are present. This soil is generally next to steep Edenton soils, sloping Edenton soils, or Cincinnati soils. It has a profile similar to that described as representative for the series, except the surface layer and subsoil are slightly thicker.

Included with this soil in mapping are many small areas of moderately steep Hickory soils. Also included are areas of slightly eroded soils.

Erosion is a very severe hazard where this soil is cultivated. Slope is a limitation to most nonfarm uses. Capability unit IVe-2; woodland suitability group 3r1.

Edenton loam, 18 to 25 percent slopes, moderately eroded (EbE2).—This steep soil is in irregularly shaped areas surrounding drainageways. Areas are commonly less than 50 acres in size. Erosion scars are readily visible on the surface, and in places bedrock is exposed in ravines or gullies. This soil is generally next to sloping and moderately steep Edenton, Hickory, or Cincinnati soils and next to very steep Edenton or Eden soils. It has a profile smiliar to that described as representative for the series, except the surface layer and subsoil are slightly thicker.

Included with this soil in mapping are many small areas of Hickory soils and areas of slightly eroded soils.

Because of steep slopes and a continuing very severe erosion hazard, this soil should be kept in permanent vegetative cover, such as permanent pasture or woods. Redcedar is the dominant tree on this soil. Steep slopes are a severe limitation to most nonfarm uses. Capability unit VIe-1; woodland suitability group 3rl.

Edenton loam, 25 to 50 percent slopes, moderately eroded (EbG2).—This very steep soil is in irregularly shaped areas surrounding deep drainageways. Areas are commonly 10 to 100 acres in size. Bedrock is commonly exposed in ravines or gullies, and smaller gullies that are somewhat healed over are readily evident in wooded areas. This soil is generally next to sloping Edenton, Hickory, or Cincinnati soils and steep Edenton soils. It has the profile described as representative for the series.

Included with this soil in mapping are areas of slightly eroded and severely eroded soils. Also included are many small areas of Hickory soils.

Most areas of this soil are in trees, dominantly redcedar.

Very steep slopes, a continuing very severe erosion hazard, and the moderate depth to bedrock are limitations to most uses. Capability unit VIe-1; woodland suitability group 3rl.

Edenton clay loam, 12 to 25 percent slopes, severely eroded (EcE3).—This moderately steep to steep soil is in irregularly shaped areas surrounding drainageways and in areas between sloping and very steep soils on uplands. Areas are commonly 25 to 100 acres in size. This soil is commonly next to very steep Edenton soils and sloping Edenton or Cincinnati soils. It has a profile similar to that described as representative for the series, except that many gullies have cut through the weathered Illinoian till and into the underlying shale and limestone bedrock. In places this truncation is so advanced that calcareous material is at a depth of 1 foot or less. The original surface layer of this soil has been removed by erosion. The present one of clay loam was formerly the subsoil.

Included with this soil in mapping are many small areas of moderately steep Cincinnati and Hickory soils.

Redcedar is the dominant tree on this soil.

Severe erosion, a continuing very severe erosion hazard, and moderately steep or steep slopes are major limitations to the use of this soil for farming. Steepness of slope and the moderate depth to bedrock are limitations to many nonfarm uses. Capability unit VIe-1; woodland suitability group 4rl.

Edenton and Fairmount soils, 25 to 50 percent slopes, severely eroded (EdG3).—These very steep soils are in irregularly shaped areas on hillsides and valley walls. Areas are commonly 10 to 30 acres in size. The original surface layer of these soils has been removed by erosion. The present one, which is mostly clay loam, is the former subsoil. Both Edenton and Fairmount soils are within most of the areas mapped as this undifferentiated unit, but Edenton soils are dominant in some areas and Fairmount soils in others. Areas of Fairmount soils are generally more flaggy than areas of Edenton soils. These soils have many gullies that have cut through the weathered till and into the underlying shale and limestone rock. In places this truncation is so advanced that calcareous material is on the surface. These soils are commonly next to severely eroded Edenton clay loam that has slopes of 12 to 25 percent.

Included with these soils in mapping are spots of very steep, severely eroded Eden soils.

Severe erosion, a continuing very severe erosion hazard, and very steep slopes are major limitations to the use of this soil for most purposes. Capability unit VIIe–1; woodland suitability group 4rl.

Eel Series

The Eel series consists of nearly level, moderately well drained soils. These soils formed in alluvium that washed from silt-mantled, glaciated uplands. They are on flood plains adjacent to stream channels.

In a representative profile in a cultivated area, the surface layer is dark grayish-brown silt loam 9 inches thick. The subsoil, to a depth of 17 inches, is brown loam; to a depth of 27 inches, it is brown silt loam that has grayish-brown and yellowish-brown mottles; and to a depth of 33 inches, it is dark yellowish-brown silty clay loam that has grayish-brown and yellowish-brown mottles. Below this, to a depth of 60 inches, is dark-brown loam that has grayish-brown, yellowish-brown, and dark-brown mottles.

Permeability in Eel soils is moderate, and the rooting zone is deep. Available water capacity is high, and the content of organic matter in the surface layer is medium. Eel soils are easily worked in spring, and if properly managed, they are well suited to crops commonly grown in the county. They are commonly slightly acid or neutral in the root zone.

Eel soils are used mostly for such cultivated crops as corn. Some areas are wooded.

Representative profile of Eel silt loam in a cultivated field in Jackson Township, one-fourth mile west of Burdsall Road and 1½ miles south of Marathon along the East Fork of the Little Miami River:

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine and medium, granular structure; friable; many roots; slightly acid; abrupt, smooth boundary.

B21—9 to 17 inches, brown (10YR 4/3) loam; weak, fine and medium, subangular blocky structure; friable; dark-brown (10YR 3/3) organic coatings and dark grayish-brown (10YR 4/2) coatings on ped faces; common roots; neutral; clear, smooth boundary.

B22—17 to 27 inches, brown (10YR 4/3) silt loam; common, fine, distinct mottles of grayish brown (10YR 5/2) and yellowish brown (10YR 5/4) ; weak, medium, subangular blocky structure; friable; common roots; neutral; clear, smooth boundary.

B23—27 to 33 inches, dark yellowish-brown (10YR 4/4) light silty clay loam; common, medium, distinct, grayish-brown (10YR 5/2) and yellowish-brown (10YR 5/6) mottles; weak, fine, subangular blocky structure; friable; few roots; few black manganese concretions; neutral; gradual, wavy boundary.

C—33 to 60 inches, dark-brown (10YR 4/3) heavy loam; common, coarse, distinct, grayish-brown (10YR 5/2), yellowish-brown (10YR 5/4), and dark-brown (7.5YR 3/2) mottles; massive; friable; many dark-brown (7.5YR 3/2) manganese stains; mildly alkaline, calcareous.

The solum ranges from 24 to 40 inches in thickness. It ranges from slightly acid to neutral. The A horizon ranges from dark grayish brown (10YR 4/2) to brown (10YR 4/3) in color. The B horizon is typically brown (10YR 4/3), dark yellowish brown (10YR 4/4), or yellowish brown (10YR 5/4). Common to many, fine to medium, faint to distinct mottles, some of which have chroma of 2 or less, are within a depth of 24 inches, and in places a few are directly below the plow layer. The B horizon is typically silt loam or loam, but in places individual horizons are light silty clay loam. The C horizon ranges from loam or silt loam to sandy loam and is mottled and stratified. The material in the C horizon commonly becomes coarser with depth and is calcareous.

Eel soils are in a drainage sequence that includes the well-drained Genesee soils and the somewhat poorly drained Shoals soils. They are commonly adjacent to soils on terraces or uplands.

Eel silt loam (Ee).—This nearly level soil is on flood plains along the Little Miami River and the tributaries of the Ohio and Little Miami Rivers. Areas are commonly long and 100 to 300 feet wide. They are less than 50 acres in size. Even if this soil is not limed, reaction in the surface layer remains near neutral because of periodic flooding. This soil is commonly next to Genesee or Shoals soils.

Included with this soil in mapping are small areas where the surface layer of this soil is darker colored than that in the profile described as representative of the series and small areas where the surface layer is sandy loam. Also included are a few areas where the surface layer is loam.

Wetness is a moderate limitation where this soil is farmed. Flooding is a limitation to many nonfarm uses. Capability unit IIw–1; woodland suitability group 1o1.

Fairmount Series

The Fairmount series consists of well-drained, steep to very steep, shallow soils. These soils formed in residuum of interbedded, soft calcareous shale and hard limestone that is thin and breaks readily into slabs and flags, which are common on and throughout the soil. They are on the stream-dissected hillsides of uplands, mainly in the western and southern parts of the county.

In a representative profile in a wooded area, the surface layer is very dark grayish-brown very flaggy silty clay loam 7 inches thick. The subsoil, to a depth of 17 inches, is olive-brown, firm silty clay loam. Below the subsoil is calcareous, greenish-gray, soft shale interbedded with hard layers of Ordovician limestone.

Permeability in Fairmount soils is moderately slow, and the rooting zone is shallow. Runoff is rapid, and available water capacity is low. Fairmount soils are neutral to mildly alkaline throughout the surface layer and subsoil.

Fairmount soils are used mostly for woods or pasture. Redcedar is the dominant tree in pastured or brushy areas; while oak, hickory, and ash are dominant in wooded areas.

Representative profile of Fairmount very flaggy silty clay loam, 25 to 50 percent slopes, moderately eroded, in a wooded area in Miami Township, 1,465 feet west of Milford-Loveland Road, 1,465 feet east of the Little Miami River, and 4 miles south of Loveland at Boy Scout Camp Edgar Friedlander:

A1—0 to 7 inches, very dark grayish-brown (10YR 3/2) very flaggy silty clay loam; moderate, fine and medium, angular blocky structure; friable; common flagstones; many roots; neutral; clear, smooth boundary.

B—7 to 17 inches, olive-brown (2.5Y 4/4) heavy silty clay loam; moderate, medium, subangular blocky structure; firm when moist, plastic when wet; common flagstones; many roots; mildly alkaline; clear, wavy boundary.

R—17 inches, horizontally bedded, intermittent, soft, calcareous shale and hard limestone.

The solum ranges from 10 to 18 inches in thickness. Depth to the interbedded shale and limestone horizon is 10 to 20 inches. Coarse fragments of hard Ordovician limestone are on the surface and in the solum in various quantities. A1 or Ap horizon ranges from very dark grayish brown (10YR 3/2) to black (10YR 2/1). The B horizon is generally olive brown (2.5Y 4/4), but the range of color includes light olive brown (2.5Y 5/4), dark yellowish brown (10YR 4/4), and yellowish brown (10YR 5/4). It is heavy silty clay loam or silty clay.

Fairmount soils are in a drainage sequence that includes the well-drained Eden soils and the somewhat poorly drained and moderately well drained Sees soils. Fairmount soils have a thinner solum than these soils and, unlike either the Eden or Sees soils, lack the clay films on faces of peds in the B horizon.

Fairmount very flaggy silty clay loam, 18 to 25 percent slopes, moderately eroded (FaE2).—This steep soil is on uplands on the sides of hills that border or surround major streams and their tributaries. Areas are as large as 20 acres. Numerous outcroppings of rock are on the surface. The surface layer of this soil ranges from 5 to 8 inches in thickness. This soil has a profile similar to that described as representative for the series, except the surface layer is slightly thicker. It is commonly next to areas of very steep Fairmount soils and sloping and moderately steep Cincinnati, Hickory, and Edenton soils. Included in mapping are small areas of steep Eden soils.

Most of the acreage of this soil is used for pasture. Slope is not so steep that machinery cannot be used to maintain pastures.

Steepness of slope, a continuing very severe erosion hazard, and shallowness to bedrock are major limitations to most uses. Capability unit VIIs–1; woodland suitability group 4d1.

Fairmount very flaggy silty clay loam, 25 to 50 percent slopes, moderately eroded (FaG2).—This very steep soil is in long, narrow areas on uplands along the rims of the sides of hills that border major streams and their tributaries. Areas are generally immediately below the upland level. Numerous outcroppings of rock are on the surface. Rock ledges are common. The surface layer of this soil ranges from 3 to 7 inches in thickness. This soil has the profile described as representative for the series. It is generally next to areas of steep Fairmount soils and sloping and moderately steep Cincinnati, Hickory, and Edenton soils.

Included with this soil in mapping are small areas of very steep Eden soils.

Very steep slope, a continuing very severe erosion hazard, and shallowness to bedrock are major limitations to most uses. Most areas of this soil are wooded. Capability unit VIIs–1; woodland suitability group 4d1.

Fox Series

The Fox series consists of well-drained, gently sloping to sloping soils that are moderately deep over sand and gravel. These soils formed in a silt mantle and in the underlying medium-textured outwash material that overlies layers of calcareous sand and gravel outwash at depths of 20 to about 40 inches. They are on stream terraces along the Little Miami River and its tributaries. Areas range from 100 yards to one-half mile in width.

In a representative profile in a cultivated area, the surface layer is dark-brown silt loam 8 inches thick. The subsoil, to a depth of 15 inches, is friable dark-brown and reddish-brown silt loam. The lower part of the subsoil, to a depth of 35 inches, is dark reddish-brown friable clay grading to gravelly loam in the lower part. Below this, to a depth of 60 inches or more, is very friable outwash gravel and sand.

Permeability in Fox soils is moderate in the subsoil and moderately rapid below the subsoil. The rooting zone is moderately deep, and available water capacity is medium. Fox soils are commonly strongly acid in the root zone.

Fox soils are well suited to truck and vegetable crops. These soils are used intensively for farming. Commonly grown crops are corn, soybeans, and small grain.

Representative profile of Fox silt loam, 2 to 6 percent slopes, in a cultivated field in Batavia Township, 115 feet east of Elklick Road and 1,650 feet south of the East Fork of the Little Miami River, 4½ miles southeast of Batavia:

Ap—0 to 8 inches, dark-brown (7.5YR 4/2) silt loam; moderate, medium, granular structure; friable; many roots; strongly acid; clear, smooth boundary.

B1—8 to 10 inches, dark-brown (7.5YR 4/4) silt loam; weak, medium, subangular blocky structure; friable; many roots; medium acid; abrupt, smooth boundary.

B21t—10 to 15 inches, reddish-brown (5YR 4/4) heavy silt loam; moderate, medium, subangular blocky structure; friable; common roots; continuous, thin, dark reddish-brown (5YR 3/4) clay films on ped faces; 5 percent pebbles; 5 percent vesicular pores; strongly acid; clear, smooth boundary.

IIB22t—15 to 22 inches, dark reddish-brown (5YR 3/4) clay; moderate, medium, subangular blocky structure; friable; common roots; thin, patchy, dark reddish-brown (5YR 3/4) clay films on ped faces; 10 percent pebbles; 5 percent vesicular pores; strongly acid; gradual, smooth boundary.

IIB23t—22 to 29 inches, dark reddish-brown (5YR 3/3) clay; moderate, medium, subangular blocky structure; friable; common roots; thin, patchy, dark reddish-brown (5YR 3/4) clay films on ped faces; 12 percent pebbles; 5 percent vesicular pores; medium acid; clear, smooth boundary.

IIB3t—29 to 35 inches, dark reddish-brown (5YR 3/3) gravelly loam; massive; very friable; thin, patchy, dark reddish-brown (5YR 3/4) clay films on vertical ped faces; 25 percent pebbles; neutral; gradual, smooth boundary.

IIC—35 to 60 inches, brown (7.5YR 4/4) gravel and sand; single grained; very friable; 80 percent pebbles; moderately alkaline, calcareous.

The solum ranges from 24 to 38 inches in thickness over layers of sand and gravel. The silt capping ranges from 0 to 18 inches in thickness. The A horizon ranges from dark brown (7.5YR 4/2) to brown (7.5YR 4/4). The B horizon ranges from dark brown (7.5YR 3/2 and 7.5YR 4/4) to dark reddish brown (5YR 3/3). The silt-capped part of the B horizon includes heavy silt loam or silty clay loam. The outwash-derived part of the B horizon (IIB2) includes clay loam, sandy clay loam, or clay. The B horizon ranges from strongly acid to neutral. In places tongues of the B3 horizon extend into the C horizon for several feet. The proportion of sand and gravel in the C horizon varies considerably.

The clay content of the B horizon is somewhat higher than that for the defined range of the series, and color in the Ap horizon includes a hue of 7.5YR, which is outside of the defined range of the series. These differences, however, do not alter the usefulness or behavior of the soils.

Fox soils are similar to Ockley, Rodman, and Casco soils. They are adjacent to Ockley soils in many places and have a thinner solum than those soils. Fox soils have a thicker solum than Rodman and Casco soils.

Fox silt loam, 2 to 6 percent slopes (FnB).—This gently sloping soil is on terraces. Areas are irregular in shape and 10 to 15 acres in size. This soil is commonly next to steeper soils on uplands, soils on bottom lands, and level Ockley soils. It has the profile described as representative for the series.

Included with this soil in mapping are small areas of nearly level soils and moderately eroded Fox soils. Also included are areas where the surface layer is loam and some areas where gravelly spots are on the surface.

Erosion is a moderate hazard where this soil is farmed. This soil has few limitations to most nonfarm uses. Capability unit IIe-3; woodland suitability group 2o1.

Fox silt loam, 6 to 12 percent slopes, moderately eroded (FnC2).—This sloping soil is on terraces at the base of steep uplands and on terrace escarpments. Areas are generally less than 20 acres in size.

This soil has a profile similar to that described as representative for the series, except the surface layer has considerable subsoil material mixed in it. The soil tends to be sticky when wet and hard and cloddy when dry. It is rather difficult to work except under conditions of optimum moisture content. Erosion is variable within short distances, and the reddish-brown subsoil is evident on the surface in places.

Included with this soil in mapping are small areas of deeper Ockley soils. Also included are a few areas of slightly eroded soils and a few areas where the surface layer is loam.

Erosion is a severe hazard where this soil is cultivated. This soil is droughty during dry periods. Slope is a limitation to many nonfarm uses. Capability unit IIIe-3; woodland suitability group 2o1.

Fox-Urban land complex, gently sloping (FuB).—This gently sloping complex is on terraces underlain by stratified sand and gravel outwash. Most of the surface layer of the Urban land part of this mapping unit has been disturbed or buried by earthmoving operations in preparation for basement excavations. The alterations to the surface layer are of such an extent that natural soil characteristics have been obliterated, and precise classification is difficult. The amount of surface area occupied by a residential development varies, depending on housing density and lot size. The soil in undisturbed areas is Fox silt loam that has a profile similar to that described as representative for the series. Included in mapping are small areas of sloping soils.

The areas of this complex are well drained. Droughtiness and a moderately deep rooting zone are limitations to some nonfarm uses. The soils are well suited to homesites and onsite sewage disposal, but rapid permeability in the substratum contributes to ground-water pollution in places. Capability unit and woodland suitability group not assigned.

Genesee Series

The Genesee series consists of nearly level, well-drained soils that formed in loamy alluvium. These soils are in areas adjacent to the stream channels of nearly every stream in the county. They are subject to periodic flooding. The width of the areas ranges from broad to narrow. The largest areas are along the East Fork of the Little Miami River and its major tributaries. Large areas are also along the Little Miami River in the northwest part of the county.

In a representative profile in a cultivated area, the surface layer is dark-brown silt loam 8 inches thick. The subsoil extends to a depth of 34 inches and is dark yellowish-brown friable loam. The underlying material, to a depth of 60 inches, is dark-brown heavy sandy loam in the upper part and increases in sand content to light sandy loam in the lower part. It is massive in the upper part and single grained in the lower part.

Permeability in Genesee soils is moderate, and the rooting zone is deep. Runoff is slow, and available water capacity is high. The root zone of Genesee soils is commonly neutral in reaction.

Genesee soils are important and valuable as cropland in the county. They are easily worked in spring, and if properly managed, they are very well suited to crops generally grown in the county, such as corn and soybeans.

Representative profile of Genesee silt loam in bluegrass pasture in Williamsburg Township along the north side of Barnes Run, about 200 yards south of Hennings Mill Road and 350 yards west of Musgrove Road, 4 miles south and 1 mile east of Williamsburg:

Ap—0 to 8 inches, dark-brown (10YR 4/3) silt loam; moderate, medium, granular structure; friable; neutral; clear, smooth boundary.

B21—8 to 15 inches, dark yellowish-brown (10YR 3/4) heavy loam; weak, medium, subangular blocky structure; friable; thin, continuous, dark-brown (10YR 3/3) coatings on ped faces; neutral; clear, smooth boundary.

B22—15 to 25 inches, dark yellowish-brown (10YR 4/4) loam; weak, medium, subangular blocky structure; friable; thin, discontinuous, dark-brown (10YR 3/3) coatings on ped faces, some clay bridging in pores and patchy films in root channels; neutral; gradual, smooth boundary.

B23—25 to 34 inches, dark yellowish-brown (10YR 4/4) loam; week, medium, subangular blocky structure; friable; mildly alkaline; gradual, wavy boundary.

C—34 to 60 inches, dark-brown (10YR 4/3) heavy sandy loam; massive in upper part of horizon and single grained in lower part; very friable; moderately alkaline, calcareous.

The solum ranges from 24 to 40 inches in thickness. Reaction ranges from slightly acid to mildly alkaline. The Ap horizon ranges from brown (10YR 4/3) to dark grayish brown (10YR 4/2). The B horizon is typically dark yellowish brown (10YR 4/4) but ranges to dark brown (10YR 4/3). Texture of the B horizon generally ranges from silt loam to loam, but in places it ranges to light silty clay loam or sandy loam. The C horizon is commonly dark-brown to yellowish-brown stratified loam, sandy loam, and fine sand. It is mildly alkaline to moderately alkaline and is calcareous.

Genesee soils are in a drainage sequence that includes the moderately well drained Eel soils and the somewhat poorly drained Shoals soils. They are commonly adjacent to Eel soils, which are mottled with gray above a depth of 24 inches. They are are adjacent to well-drained Ross soils, but they have a lighter colored A horizon than Ross soils. Genesee soils are similar to Stonelick soils, but they are slightly higher in elevation, and they have a higher silt and clay content throughout the profile.

Genesee silt loam (Gn).—This nearly level soil is on flood plains. Areas are long, narrow or broad, and, except for a 500-acre tract southeast of Milford, up to 150 acres in size.

Included with this soil in mapping are areas adjacent to East Fork in which the soils are more acid in the solum than this soil, have a darker brown substratum, and lack calcareous material within the subsoil. Also included are areas where the surface layer is loam and small areas of Eel soils.

Wetness is a moderate limitation in areas where this soil is farmed. The hazard of flooding is a limitation to most nonfarm uses. Capability unit IIw-1; woodland suitability group 1o1.

Glenford Series

The Glenford series consists of gently sloping to steep, moderately well drained soils. These soils formed in stratified silt loam or silty clay loam lacustrine sediment. Glenford soils are on terraces, as wide as one-half mile, along the major drainage streams of the county.

In a representative profile in a cultivated area, the surface layer is dark grayish-brown silt loam 10 inches thick. The subsoil, to a depth of 45 inches, is dark yellowish-brown silty clay loam that has grayish-brown mottles in the lower part. To a depth of 55 inches, the subsoil is dark-brown silty clay loam that has grayish-brown and strong-brown mottles. Below this, to a depth of 100 inches, is mixed strong-brown and gray silty clay loam.

Permeability in Glenford soils is moderately slow, and the rooting zone is deep. Runoff ranges from moderate to rapid. The water table is seasonally high, particularly during winter and spring, and the soils are somewhat soft and unstable when saturated. Available water capacity is high. Glenford soils are commonly medium acid or strongly acid in the root zone.

Glenford soils are used mainly for farming and housing sites. Corn and soybeans are commonly grown crops.

Representative profile of Glenford silt loam, 2 to 6 percent slopes, in a cultivated field in Batavia Township, 2 miles northwest of Batavia and 500 feet southeast of the Clermont County Community Service Center:

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) silt loam, brown (10YR 4/3) rubbed; weak, fine, subangular blocky structure parting to moderate, medium, granular; friable; many roots; medium acid; abrupt, smooth boundary.

B1—10 to 21 inches, dark yellowish-brown (10YR 4/4) silty clay loam; weak, medium, subangular blocky structure; friable; common roots; thin, patchy brown (10YR 5/3) silty coatings on vertical ped faces; strongly acid; clear, smooth boundary.

B21t—21 to 32 inches, dark yellowish-brown (10YR 4/4) silty clay loam; few, fine, distinct, grayish-brown (10YR 5/2) mottles; moderate, medium, subangular blocky structure; friable; few roots; thin, patchy, brown (10YR 5/3) clay films on vertical ped faces; medium acid; clear, smooth boundary.

B22t—32 to 45 inches, dark yellowish-brown (10YR 4/4) silty clay loam; common, medium, distinct, grayish-brown (10YR 5/2) mottles; moderate, medium, subangular blocky structure; firm; few dark manganese stains; thin, patchy, grayish-brown (10YR 5/2) clay films on vertical and some horizontal ped faces; medium acid; gradual, smooth boundary.

B3—45 to 55 inches, dark-brown (7.5YR 4/4) silty clay loam; common, medium, distinct, grayish-brown (10YR 5/2) and strong-brown (7.5YR 5/6) mottles; moderate, medium, subangular blocky structure; firm; medium acid; gradual, smooth boundary.

C—55 to 100 inches, mixed strong-brown (7.5YR 5/6) and gray (10YR 6/1) silty clay loam; massive; few brown to black manganese stains and concretions; neutral.

The solum ranges from 30 to 60 inches in thickness. The Ap horizon ranges from dark grayish brown (10YR 4/2) to brown (10YR 5/3). In places slight laminations are evident in the B or C horizon. The C horizon is generally silty clay loam but ranges to heavy silt loam or a light silty clay loam in places.

Glenford soils are similar to Markland soils, but they have coarser textured B and C horizons.

Glenford silt loam, 2 to 6 percent slopes (GpB).—This gently sloping soil is in irregularly shaped areas that are less than 25 acres in size. It is generally adjacent to steeper Glenford, Eden, and Edenton soils. This soil has the profile described as representative for the series.

Included with this soil in mapping are a few areas of moderately eroded soils and a few areas of nearly level soils. Also included are small areas of soils that have a silt mantle up to 18 inches thick.

Erosion is a moderate hazard where this soil is cultivated. Moderately slow permeability is a limitation to some nonfarm uses. Capability unit IIe-2; woodland suitability group 2o2.

Glenford silt loam, 6 to 12 percent slopes, moderately eroded (GpC2).—This sloping soil is in irregularly shaped areas less than 15 acres in size. It is commonly adjacent to steeper Glenford, Eden, and Edenton soils. This soil has a profile similar to that described as representative for the series, except the surface layer is about 4 inches thinner.

Included with this soil in mapping are a few small areas of slightly eroded soils and a few small areas of severely eroded soils.

Erosion is a very severe hazard where this soil is farmed. Slope and moderately slow permeability are limitations to many nonfarm uses. Capability unit IIIe-1; woodland suitability group 2o2.

Glenford silt loam, 18 to 25 percent slopes, moderately eroded (GpE2).—This steep soil is in escarpment-like areas on terraces. Areas are generally in brush and are commonly less than 20 acres in size. This soil is generally next to gently sloping and sloping soils and soils on flood plains. Many areas of yellowish-brown eroded soil are evident on the surface. This soil has a thinner surface layer and subsoil than the soil described as representative for the series. The substratum of this soil is at a depth of about 30 inches. Included in mapping are areas of moderately steep Glenford silt loam.

A continuing severe erosion hazard is the major limitation to most farm uses. Slope is a limitation to most nonfarm uses. Capability unit VIe-2; woodland suitability group 2r1.

Gravel Pits

Gravel Pits (Gr) consists of open excavations on outwash terraces along the Little Miami River at Miamiville and along the East Fork of the Little Miami River near the junction of U.S. Highway No. 50 and State Highway No. 222. Thse pits are 10 to 20 feet deep. Before being excavated, Fox or Ockley soils were dominant on these terrace levels. The upper layer of the soil material remaining after excavation ranges from loam to clay loam and is 1 to 3½ feet thick. It is underlain by stratified gravel and sand.

The gravelly material varies in thickness and changes in composition within short distances. The gravel consists mainly of limestone and some quartz and granite minerals.

The soil material commonly has poor physical properties. Organic-matter content and available water capacity are low. Erosion is a hazard in most areas, and instability results in gullying and siltation.

Areas not currently being mined should be resurfaced with soil material in which vegetation could be established. If protected from pollution and siltation, ponded gravel pits have potential for wildlife and recreational developments. Capability unit and woodland suitability group not assigned.

Hickory Series

The Hickory series consists of moderately steep to very steep, well-drained soils. They formed in a thin mantle of silt and in the underlying clay loam or loam weathered from glacial till of Illinoian age. These soils are mainly on uplands, mostly in the western and southern parts of the county.

In a representative profile in a wooded area, the surface layer is very dark grayish-brown loam 2 inches thick. The subsoil extends to a depth of 31 inches and is dark-brown, dark yellowish-brown, or brown loam or clay loam. Below this, to a depth of 60 inches, is brown, calcareous loam till.

Permeability in Hickory soils is moderate, and the rooting zone is moderately deep. Available water capacity is medium. Hickory soils are commonly strongly acid in the root zone.

Hickory soils are used mostly for woods or pasture (fig. 11).

Representative profile of Hickory loam, 18 to 35 percent slopes, moderately eroded, in a wooded area in Batavia Township, 250 feet east of northeast corner of Union Cemetery in Batavia, Ohio:

A1—0 to 2 inches, very dark grayish-brown (10YR 3/2) loam, dark brown (10YR 3/3), rubbed; moderate, medium, granular structure; friable; many roots; medium acid; abrupt, smooth boundary.

B1t—2 to 5 inches, dark-brown (10YR 4/3) loam; moderate, medium and fine, subangular blocky structure; friable; many roots; thin, very patchy, brown (7.5YR 4/4) clay films on ped faces; few small angular till pebbles; strongly acid; clear, smooth boundary.

B21t—5 to 11 inches, dark-brown (10YR 4/3) clay loam; strong, medium, subangular blocky structure; firm; many roots; thin, continuous, dark-brown (7.5YR 4/3) clay films on ped faces; few small angular till pebbles; strongly acid; gradual, smooth boundary.

B22t—11 to 16 inches, brown (7.5YR 4/4) clay loam; strong, medium, subangular blocky structure; very firm; common roots; thin, continuous, dark-brown (10YR 4/3) clay films on ped faces; few angular till pebbles; strongly acid; gradual, smooth boundary.

B23t—16 to 26 inches, brown (7.5YR 4/4) clay loam; strong, medium, subangular blocky structure; very firm; few roots; thin, patchy, dark-brown (10YR 4/3) clay films on 40 percent of ped faces; common angular till pebbles; strongly acid; gradual, smooth boundary.

B3t—26 to 31 inches, dark yellowish-brown (10YR 4/4) clay loam; moderate, medium, subangular blocky structure; firm; few roots; medium, continuous, dark-brown (7.5YR 4/2) clay films on ped faces; many angular till pebbles; neutral; clear, wavy boundary.

C1—31 to 36 inches, brown (10YR 4/3) loam; massive; friable; yellowish-brown (10YR 5/4) patchy clay films on cleavage surfaces; material from B3 horizon is mixed into top 4 inches of C1 horizon; mildly alkaline, calcareous.

C2—36 to 60 inches, brown (10YR 4/3) loam; massive; friable; very patchy, thin, yellowish-brown (10YR 5/4) clay films on some vertical cleavage planes; mildly alkaline, calcareous.

Figure 11.—An area of Hickory clay loam, 25 to 50 percent slopes, severely eroded.

The solum ranges from 2 to 4 feet in thickness over calcareous glacial till. Glacial pebbles are generally present throughout the profile, but in places they are absent in the A horizon. The A1 or Ap horizons range from very dark grayish brown (10YR 3/2) in wooded areas to brown (10YR 4/3) in plowed areas. Texture of the surface layer is generally silt loam where a thin (less than 18 inches) silt mantle is present. In areas of severely eroded soils the surface layer is clay loam. The B2 horizon is medium acid or strongly acid. It ranges from brown (10YR 4/3) to dark yellowish brown (10YR 4/4). The B horizon ranges from silty clay loam in the upper part of the Bt horizon to clay loam in the lower part of the Bt horizon. The C horizon commonly is brown (10YR 4/3), dark yellowish-brown (10YR 4/4), or yellowish-brown (10YR 5/4) light clay loam or loam to sandy loam. Depth to calcareous material ranges from 24 to 48 inches. These soils have a thinner solum and are shallower to carbonates than is defined in the range of the series. This difference, however, does not alter their usefulness or behavior.

Hickory soils are in a drainage sequence that includes the well-drained Cincinnati and Edenton soils, the moderately well drained Rossmoyne soils, the somewhat poorly drained Avonburg soils, the poorly drained Clermont soils, and the very poorly drained Blanchester soils. Hickory soils are generally next to Edenton or Cincinnati soils. They lack the fragipan of Cincinnati soils and have thinner A and B horizons. Unlike Edenton soils, which have a C horizon made up of residuum from shale and limestone, Hickory soils have a C horizon of glacial till.

Hickory loam, 12 to 18 percent slopes, moderately eroded (HkD2).—This moderately steep soil is on uplands between areas of gently sloping or sloping and very steep soils. Some areas of this soil are irregularly shaped and dissected by drainageways; others are narrow and are parallel with each other along side slopes. Areas are as much as 50 acres in size. The soil is generally next to sloping Rossmoyne or Cincinnati soils and steep or very steep Edenton or Hickory soils.

This soil has a profile similar to that described as representative for the series, except the surface layer is thicker.

Included with this soil in mapping are small areas of slightly eroded soils. Runoff on this soil is rapid, and erosion is a very severe hazard where this soil is cultivated. Slope is a limitation to most nonfarm uses. Capability unit IVe–1; woodland suitability group 2r1.

Hickory loam, 18 to 35 percent slopes, moderately eroded (HkF2).—This steep to very steep soil is on uplands in irregularly shaped areas between areas of sloping or moderately steep soils and areas of very steep soils. It is dissected by tributaries of the major drainage systems in the county. Areas are commonly less than 60 acres in size, but in places they are as large as 100 acres. Most areas of this soil are wooded. This soil has the profile described as representative for the series.

Included with this soil in mapping are some small areas of slightly eroded soils.

Steep slope and rapid runoff are limitations to both farm and nonfarm uses. Capability unit VIe–2; woodland suitability group 2r1.

Hickory clay loam, 25 to 50 percent slopes, severely eroded (HlG3).—This very steep soil is in irregularly shaped areas on uplands, mostly within several miles of the East Fork of the Little Miami River. It has more of a dendritic drainage pattern than most other soils in the county. Areas are generally less than 100 acres in size, but several areas of 200 to 300 acres are immediately east and southeast of Batavia. Most areas of this soil are wooded.

This soil has a profile similar to that described as representative for the series, except in many places glacial till is on the surface because of severe erosion in the past. Also this soil is steeper than the representative soil. The original surface layer has been removed by erosion, and the present surface layer is clay loam subsoil material.

Severe erosion, rapid runoff, and very steep slopes are the major limitations to farm and nonfarm uses. Capability unit VIIe–1; woodland suitability group 3r1.

Huntington Series

The Huntington series consists of nearly level, well-drained soils that formed in moderately fine textured alluvium deposited by floodwaters of the Ohio River. These soils are in broad strips on the flood plain between the Ohio River and the uplands.

In a representative profile in a cultivated area, the surface layer is dark-brown silt loam 8 inches thick. The upper part of the subsoil, to a depth of 20 inches, is dark-brown silty clay loam. The lower part of the subsoil, to a depth of 52 inches, is brown silty clay loam. Below this, to a depth of 110 inches, is dark-brown clay loam or loam that is structureless (massive). Below a depth of 110 inches and extending to a depth of 133 inches or more are stratified layers of brown sandy loam and loam.

Permeability in Huntington soils is moderate, and the rooting zone is deep. Runoff is medium, and available water capacity is high. Huntington soils are commonly slightly acid in the root zone.

Huntington soils are important and valuable as cropland in the county. They are easily worked in spring and are very well suited to crops generally grown in the county. They are used mostly for cultivated crops. Tobacco is commonly grown in areas along the Ohio River. These soils are flooded by the Ohio River on the average of once a year, generally in spring. Many formerly cropped areas are now infested with johnsongrass.

Representative profile of Huntington silt loam in a cultivated field in Washington Township, one-fourth mile west of Neville:

Ap—0 to 8 inches, dark-brown (10YR 3/3) silt loam, dark brown (10YR 3/3) crushed; weak, fine, granular structure; many roots; friable; neutral; clear, smooth boundary.

B21t—8 to 20 inches, dark-brown (10YR 3/3) silty clay loam, dark brown (10YR 3/3) crushed; weak, coarse, prismatic structure parting to moderate, medium, subangular blocky; many roots; firm; dark-brown (7.5YR 3/2), very thin, continuous clay films on ped faces; slightly acid; gradual, smooth boundary.

B22t—20 to 28 inches, brown (7.5YR 4/4) silty clay loam; moderate, medium, subangular blocky structure; common roots; friable; very thin, patchy, dark-brown (7.5YR 4/2) clay films on horizontal ped faces; slightly acid; gradual, smooth boundary.

B23t—28 to 36 inches, brown (7.5YR 4/4) silty clay loam; moderate, coarse, subangular blocky structure; few roots; friable; thin, patchy, dark-brown (10YR 4/3) clay films on most horizontal and vertical ped faces; slightly acid; gradual, smooth boundary.

B3—36 to 52 inches, brown (7.5YR 4/4) silty clay loam; weak, coarse, subangular blocky structure; firm; worm and root channels lined with dark-brown (10YR 3/3) silt loam; slightly acid; gradual, smooth boundary.

C1—52 to 80 inches, dark-brown (10YR 4/3) light clay loam; massive; firm; slightly acid.

C2—80 to 110 inches, dark-brown (10YR 4/3) loam; massive; firm; slightly acid.

IIC3—110 to 133 inches, brown (7.5YR 4/4) stratified layers of sandy loam and loam; massive; slightly acid.

The solum is more than 40 inches thick. The dark-colored surface layer ranges from 10 to 24 inches in thickness. Reaction ranges from medium acid to mildly alkaline. The content of coarse fragments ranges from 0 to 5 percent, but coarse fragments are commonly lacking. Mica flakes are common in many profiles. The Ap horizon is dominantly dark brown (10YR 3/3) but ranges to dark yellowish brown (10YR 3/4). The B horizon ranges from slightly acid to strongly acid. In places the B horizon is dark reddish brown (5YR 3/4), especially in unusually high, well-drained locations. Texture is heavy silty clay loam or silty clay loam. The C horizon is commonly brown (7.5YR 4/4). It commonly has a larger proportion of sand than the B horizon. Texture of the C horizon ranges from sandy loam to heavy silty clay loam.

The clay content in the B horizon exceeds the defined range of the series. This difference, however, does not alter the usefulness or behavior of the soils.

Huntington soils are in a drainage sequence that includes the moderately well drained Lindside soils and the somewhat poorly drained Newark soils. They are commonly adjacent to Lindside soils, which are mottled below a depth of 24 inches. In places Huntington soils are adjacent to Newark soils, which are mottled below a depth of 10 inches and have a dark grayish-brown A horizon. The Newark soils, however, generally occur in lower, wetter areas.

Huntington silt loam (Hu).—This nearly level soil is in long, narrow to broad areas that are as large as 100 acres.

Included with this soil in mapping are a few areas of gently sloping soils that commonly border Newark soils in sloughways of the flood plain. Also included are areas where the subsoil is heavy silt loam and areas where the surface layer is loam.

Wetness is a moderate hazard where this soil is farmed. Periodic flooding is a limitation to many nonfarm uses. Capability unit IIw–1; woodland suitability group 2o1.

Lanier Series

The Lanier series consists of nearly level, well-drained soils. These soils formed in loamy flood plain sediment derived mostly from glaciated uplands and then deposited over gravel, sand, and stone fragments. They are in fairly narrow strips adjacent to streams that have fairly steep gradients and on alluvial deltas near the base of steep upland slopes.

In a representative profile in a cultivated area, the surface layer is very dark grayish-brown sandy loam 8 inches thick. The subsurface layer, to a depth of 16 inches, is dark-brown sandy loam that is calcareous. Both of these layers contain gravel of various sizes and fragments of limestone. The underlying material, to a depth of 60 inches, is very gravelly sandy loam and loamy sand mixed with many different sized stream cobblestones and flagstones, which are mostly local limestone in origin.

Permeability in Lanier soils is rapid, and the rooting zone is shallow. Runoff is slow, and available water capacity is low. These soils are easily worked, but they are droughty. They are subject to flooding. Lanier soils are commonly neutral to moderately alkaline in reaction in the root zone.

Lanier soils are mainly in pasture and woods. Areas that are cultivated commonly are used for growing corn and soybeans.

Representative profile of Lanier sandy loam in a crop field in Union Township, 1½ miles northeast of Mt. Carmel, 1,920 feet west of headquarters of Cincinnati Nature Center, and 100 feet east of stream channel:

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) sandy loam; weak, fine, granular structure; many roots; mildly alkaline; clear, smooth boundary.

A12—8 to 16 inches, dark-brown (10YR 3/3) sandy loam; weak, medium, granular structure; friable; moderately alkaline, calcareous; clear, smooth boundary.

IIC1—16 to 20 inches, brown (10YR 4/3) very gravelly sandy loam; massive; very friable; moderately alkaline, calcareous; diffuse, irregular boundary.

IIC2—20 to 60 inches, brown (10YR 5/3) very gravelly loamy sand; single grained; coarse fragments include pebbles, channers, flagstones, and cobblestones; dominantly limestone; moderately alkaline, calcareous.

The A horizon ranges from 10 to 20 inches in thickness. Lenses of finer sediment occur at any depth. The A horizon ranges from loam to sandy loam, but it is dominantly sandy loam. In some areas the Ap horizon is calcareous. The Ap horizon has a dominant color value of 3 and a chroma of 2 or 3. The content of coarse fragments ranges from 2 to 25 percent in the A horizon and from 35 to 70 percent below depths of 16 to 30 inches.

Lanier soils are similar to Genesee soils and are commonly adjacent to these soils, which are deeper and not underlain with coarse material at as shallow a depth.

Lanier sandy loam (Lg).—This nearly level soil is in areas that are long and narrow. These areas are commonly about 25 acres in size but range up to 65 acres.

Included with this soil in mapping are a few areas where this soil is underlain with brown loamy sand. Also included are a few small areas of coarser textured Riverwash.

Wetness and droughtiness are moderate limitations where this soil is farmed. Flooding is a limitation to many nonfarm uses. Capability unit IIw-5; woodland suitability group 2o1.

Lindside Series

The Lindside series consists of deep, moderately well drained, nearly level soils that formed in moderately fine textured alluvium of mixed origin. These soils are in narrow to broad areas on the flood plain along the Ohio River. They occur as narrow to broad natural levees, generally parallel with the river.

In a representative profile in a cultivated area, the surface layer is dark-brown silt loam 8 inches thick. In sequence, the subsoil, to a depth of 15 inches, is dark yellowish-brown silty clay loam; to a depth of 24 inches, it is brown silty clay loam; to a depth of 45 inches, it is brown silty clay loam mottled with grayish brown; and to a depth of 55 inches, it is brown clay loam mottled with grayish brown. Below this, to a depth of 90 inches, is brown silty clay loam mottled with grayish brown and yellowish brown.

Permeability in Lindside soils is moderate, and the rooting zone is deep. These soils are subject to flooding, and the water table is at a depth of 3 feet or less for appreciable periods. Available water capacity is high. Lindside soils are commonly medium acid in the root zone.

Lindside soils are only on the flood plain of the Ohio River. These soils are mainly planted to tobacco. Corn, soybeans, hay, and truck crops are other commonly grown crops. Where flooding is frequent, these soils are better suited to pasture or woods than to row crops. Many formerly cropped areas are now infested with johnsongrass.

Representative profile of Lindside silt loam in a cultivated field in Washington Township, one-half mile south of Moscow and 400 feet from the Ohio River shoreline:

Ap—0 to 8 inches, dark-brown (10YR 3/3) silt loam; weak, fine and medium, granular structure; friable; noticeable very small shiny mica flakes present; many roots; neutral; abrupt, smooth boundary.

B21—8 to 15 inches, dark yellowish-brown (10YR 4/4) silty clay loam; moderate, medium, subangular blocky structure; friable; common roots; thin, patchy, dark-brown (10YR 3/3) organic coating on ped faces; neutral; clear, smooth boundary.

B22—15 to 24 inches, brown (7.5YR 4/4) silty clay loam; moderate, medium and coarse, subangular blocky structure; friable; common roots; thin, very patchy, brown (10YR 5/3) clay films on most vertical ped faces; medium acid; gradual, smooth boundary.

B23—24 to 35 inches, brown (7.5YR 4/4) silty clay loam; common, medium, distinct, grayish-brown (10YR 5/2) mottles; moderate, coarse, subangular blocky structure; slightly brittle; common black (10YR 2/1) iron-manganese stains; few roots; thin, very patchy, dark yellowish-brown (10YR 4/4) clay films on most vertical and horizontal ped faces; medium acid; gradual, smooth boundary.

B24—35 to 45 inches, brown (7.5YR 4/4) silty clay loam; common, medium, distinct, grayish-brown (10YR 5/2) mottles; weak, coarse, subangular blocky structure; friable; few dark-brown (10YR 3/3) manganese stains; few roots; thin, very patchy, brown (7.5YR 5/4) clay films on ped faces; medium acid; gradual boundary.

B25—45 to 55 inches, brown (7.5YR 4/4) light clay loam; common, medium, distinct, grayish-brown (10YR 5/2) mottles; weak, coarse, subangular blocky structure; friable; evidence of lamination; few dark-brown (10YR 3/3) manganese stains; few roots; thin, very patchy, brown (7.5YR 5/4) clay films on ped faces; medium acid; gradual, smooth boundary.

C1g—55 to 70 inches, brown (7.5YR 4/4) silty clay loam; few, coarse, distinct mottles of grayish-brown (10YR 5/2) and yellowish-brown (10YR 5/6); massive; friable;

some dark manganese-iron stains; medium acid; gradual, smooth boundary.

C2g—70 to 90 inches, brown (7.5YR 4/4) silty clay loam; few, coarse, distinct, grayish-brown (10YR 5/2) and yellowish-brown (10YR 5/6) mottles; massive; friable; few dark manganese iron stains; medium acid.

The solum is more than 40 inches thick. It ranges from neutral to medium acid in reaction. Carbonates are lacking in the solum. The Ap horizon ranges from very dark grayish brown (10YR 3/2) to brown (10YR 4/3) but is commonly dark brown (10YR 3/3). In the B horizon hue is 7.5YR and 10YR, and both chroma and value are 4. The C horizon is stratified and ranges from silty clay loam to loam.

The moderately well drained Lindside soils are commonly adjacent to well-drained Huntington soils and somewhat poorly drained Newark soils on the flood plain of the Ohio River. They are slightly higher in elevation than Newark soils, but they are generally somewhat lower than Huntington soils. Lindside soils have less gray colors and mottling than Newark soils. Lindside soils are mottled whereas the Huntington soils are not.

Lindside silt loam (Ln).—This nearly level soil is typically in long areas that are narrow or broad and about 20 to 35 acres in size. Areas rarely are more than 50 acres in size.

Included with this soil in mapping are areas of soils that have a dense, fragipanlike layer between depths of 36 and 50 inches.

Wetness is a moderate limitation where this soil is farmed. Flooding is a limitation to most nonfarm uses. Capability unit IIw-1; woodland suitability group 2w2.

Mahalasville Series

The Mahalasville series consists of nearly level to slightly depressional, poorly drained soils. These soils formed in moderately fine textured material more than 42 inches thick over poorly sorted gravelly and sandy material. They are on terraces along the East Fork of the Little Miami River and its major tributaries.

In a representative profile in a cultivated field, the surface layer is 8 inches of very dark gray silty clay loam and 5 inches of black silty clay loam. In sequence, the subsoil, to a depth of 20 inches, is yellowish-brown silty clay loam mottled with very dark gray and black; to a depth of 34 inches, it is yellowish-brown silty clay loam mottled with dark grayish brown; to a depth of 44 inches, it is mixed grayish-brown and yellowish-brown silty clay loam; and to a depth of 50 inches, it is dark-gray clay loam mottled with dark yellowish brown. Below the subsoil, to a depth of 57 inches, is dark-gray clay loam mottled with dark yellowish brown. Below this, to a depth of 75 inches, is gray clay loam mottled with dark brown.

Permeability in Mahalasville soils is slow. Runoff is slow to ponded. They are saturated with water for sustained periods and have a seasonally high water table. When the water table is low, the rooting zone is deep. Available water capacity is high, and the content of organic matter is high in the surface layer. Mahalasville soils are mainly slightly acid or neutral in the surface layer and subsoil.

Mahalasville soils need to be drained where they are cultivated. If drained, they are well suited to corn and soybeans.

Representative profile of Mahalasville silty clay loam in a cultivated field in Williamsburg Township; 1 mile southwest of Williamsburg, one-eighth mile south of State Route No. 32, and one-fourth mile west of the Williamsburg-Bantam Road:

Ap—0 to 8 inches, very dark gray (10YR 3/1) silty clay loam; moderate, medium and fine, granular structure; friable; common roots; slightly acid; abrupt, smooth boundary.

A1—8 to 13 inches, black (10YR 2/1) silty clay loam; moderate, medium and fine, subangular blocky structure; friable; common roots; black (10YR 2/1) organic coatings on ped faces; slightly acid; gradual, wavy boundary.

B21tg—13 to 20 inches, yellowish-brown (10YR 5/4) silty clay loam; common, medium, prominent mottles of very dark gray (10YR 3/1) and black (10YR 2/1); moderate, medium, subangular blocky structure; firm; thin, continuous, very dark gray (10YR 3/1) coatings on ped faces; neutral; gradual, wavy boundary.

B22tg—20 to 34 inches, yellowish-brown (10YR 5/4) silty clay loam; common, medium, distinct mottles of dark grayish brown (10YR 4/2); moderate, medium, angular blocky structure; firm; thin continuous clay films of dark gray (10YR 4/1) on ped faces; mildly alkaline; clear, wavy boundary.

B23tg—34 to 44 inches, mixed grayish-brown (10YR 5/2) and yellowish-brown (10YR 5/4) silty clay loam; weak, medium, subangular blocky structure; firm; very dark gray (10YR 3/1) and black (10YR 2/1) krotovinas; thin patchy clay films of dark grayish brown (10YR 4/2) on horizontal ped faces; mildly alkaline; clear, wavy boundary.

IIB3g—44 to 50 inches, 65 percent dark gray (10YR 4/1) mottles and 35 percent dark yellowish-brown (10YR 4/4) mottles; light clay loam; weak, coarse, subangular blocky structure; firm; few small pebbles; few very dark gray (10YR 3/1) and black (10YR 2/1) krotovinas; thin patchy clay films of dark grayish brown (10YR 4/2) on ped faces; mildly alkaline; clear, wavy boundary.

IIC1g—50 to 57 inches, 60 percent dark gray (10YR 4/1) and very dark gray (10YR 3/1) mottles and 40 percent dark yellowish-brown (10YR 4/4) mottles; clay loam; massive; firm; few stones and pebbles, mostly rounded; mildly alkaline; clear, wavy boundary.

IIC2g—57 to 75 inches, 60 percent gray (10YR 5/1) mottles and 40 percent dark-brown (10YR 4/3) mottles; clay loam; massive; firm; small pebbles and stones throughout; some stratification evident; mildly alkaline.

The solum ranges from 40 to 60 inches in thickness. It is slightly acid to neutral in the upper part and is generally mildly alkaline in the lower part. The Ap horizon is very dark gray (10YR 3/1), very dark brown (10YR 2/2), or very dark grayish brown (10YR 3/2). In the Bt horizon hue is 10YR and 2.5Y, value is 4 or 5, and chroma ranges from 1 to 6. Mottles are few to common and faint to prominent. They have a hue of 10YR, a value of 3 or 4, and a chroma of 1 or 2. The upper 20 inches of the B2 horizon is dominantly silty clay loam. The lower part of the B horizon ranges from clay loam to loam. The C horizon is gray and mottled. Texture ranges from silt to sand. Considerable clay and gravel has mixed into this horizon or is in stratified layers. The upper part of the C horizon is neutral in some areas. Calcareous material is generally very deep.

Mahalasville soils are commonly adjacent to well-drained Ockley and Williamsburg soils and to steeper soils on uplands. Mahalasville soils have a darker colored A horizon than the adjacent soils.

Mahalasville silty clay loam (Mb).—This nearly level to slightly depressional soil is on terraces. Areas are less than 15 acres in size and are long and narrow or are irregular in shape. In many places this soil is on the part of the terrace adjacent to the upland, especially if a higher terrace elevation causes runoff water to pond in these areas.

Included with this soil in mapping are a few areas of soils that have more clay in the subsoil than this soil. These soils are wetter and saturated for longer periods. Also included are a few areas of soils that have a surface layer of silt loam.

Wetness is a moderate limitation where this soil is farmed. Severe wetness, ponding, and slow permeability are limitations to most nonfarm uses. Capability unit IIw-3; woodland suitability group 2w1.

Markland Series

The Markland series consists of gently sloping, moderately well drained or well drained soils. These soils formed in a thin mantle of silt and in the underlying neutral to calcareous silt and clay lacustrine sediment.

In a representative profile in a cultivated area, the surface layer is dark grayish-brown silt loam 10 inches thick. In sequence, the subsoil, to a depth of 12 inches, is yellowish-brown silt loam; to a depth of 22 inches, it is dark yellowish-brown, firm silty clay loam; and to a depth of 44 inches, it is dark yellowish-brown and yellowish-brown, firm silty clay that has grayish-brown mottles below a depth of 32 inches. Below the subsoil, to a depth of 80 or more inches, is brown, firm, calcareous silty clay and silty clay loam that is laminated.

Permeability in Markland soils is slow, and the rooting zone is deep. Runoff and available water capacity are medium. Markland soils are commonly strongly acid in the root zone.

Markland soils are used mostly for cultivated crops. Corn, soybeans, and small grain are commonly grown.

Representative profile of Markland silt loam, 2 to 6 percent slopes, in a cultivated field in Union Township; 1 mile west of Perintown, 330 feet south of Round Bottom Road, and 600 feet west of Barg Salt Run Road:

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, subangular blocky structure parting to weak, fine, granular; friable; many roots; neutral; abrupt, smooth boundary.

B1—10 to 12 inches, yellowish-brown (10YR 5/4) silt loam; dark grayish-brown (10YR 4/2) staining on ped faces; frequent dark grayish-brown (10YR 4/2) worm casts; moderate, medium, subangular blocky structure; friable; many roots; slightly acid; clear, smooth boundary.

IIB21t—12 to 22 inches, dark yellowish-brown (10YR 4/4) heavy silty clay loam; moderate to strong, medium, subangular blocky structure; firm; thin, continuous, dark yellowish-brown (10YR 4/4) and dark-brown (10YR 4/3) clay films on ped faces; many roots; strongly acid; clear, smooth boundary.

IIB22t—22 to 28 inches, dark yellowish-brown (10YR 4/4) silty clay; strong, medium, subangular and angular blocky structure; firm; common roots; dark-brown (10YR 4/3) clay films on ped faces and patches of grayish brown (10YR 5/2); black (10YR 2/1) iron-manganese stains on ped faces; strongly acid; gradual, smooth boundary.

IIB23t—28 to 32 inches, dark yellowish-brown (10YR 4/4) silty clay; dark-brown (10YR 4/3) ped faces; strong, coarse, subangular blocky structure; firm; thin continuous clay films; common roots; strongly acid; clear, smooth boundary.

IIB24tg—32 to 39 inches, yellowish-brown (10YR 5/6) silty clay; many, fine, distinct, grayish-brown (10YR 5/2) mottles; strong, coarse, angular blocky structure; firm; discontinuous dark-brown (10YR 4/3) clay films on ped faces; material appears finely laminated; slightly acid; clear, smooth boundary.

IIB3t—39 to 44 inches, yellowish-brown (10YR 5/4) silty clay; many, medium, distinct, grayish-brown (10YR 5/2) mottles; strong, coarse, angular blocky structure; firm; brown (10YR 4/3) continuous clay films on ped faces; few roots; neutral; material appears finely laminated; gradual, smooth boundary.

IIC1—44 to 60 inches, brown (10YR 5/3) silty clay; massive; firm; few roots; material appears finely laminated; dark-brown (10YR 4/3) coatings on surfaces of laminations; mildly alkaline, calcareous; gradual, smooth boundary.

IIC2—60 to 70 inches, brown (10YR 5/3) silty clay; massive; firm; material appears finely laminated; dark grayish-brown (10YR 4/2) coatings on surfaces of laminations; neutral; irregular boundary.

IIC3—70 to 80 inches, brown (10YR 5/3) heavy silty clay loam; massive; firm; few thin lenses of fine sand in this material, appear to be finely laminated; dark grayish-brown (10YR 4/2) coatings on few surfaces of laminations; moderately alkaline, calcareous. Depth to this horizon varies from 70 to 100 inches within short distances.

The solum ranges from 30 to 44 inches in thickness. In the upper part is a silty mantle that ranges from 1 to about 15 inches in thickness. The Ap horizon ranges from dark grayish-brown (10YR 4/2) to brown (10YR 4/3). The B1 horizon is lacking in some profiles, especially where the plowing is deep or where the silt mantle is thin. The B2 horizon has a hue of 10YR, a value of 4 or 5, and a chroma of 3 to 6. In places mottling is in the lower part of the B2 horizon. This horizon ranges from heavy silty clay loam to silty clay. Consistence is firm to very firm. Reaction ranges from strongly acid to slightly acid. The C horizon is yellowish-brown to brown, stratified silty clay and silty clay loam that has thin layers of fine sand in the lower part.

Markland soils are in a drainage sequence that includes the somewhat poorly drained McGary soils. They are commonly adjacent to nearly level McGary soils and steep Glenford soils. Markland soils differ from the Williamsburg and Sardinia soils in having a finer textured and less deeply leached B horizon. They are not so acid as Glenford soils.

Markland silt loam, 2 to 6 percent slopes (MdB).—This gently sloping soil is on undulating high terraces. Areas are irregular in shape and about 70 acres in size. This soil is next to nearly level McGary and steep Glenford soils.

Included with this soil in mapping are small areas of McGary silt loam, 0 to 2 percent slopes.

Erosion is a severe hazard where this soil is farmed. Slow permeability and clayey texture are limitations to many nonfarm uses. Capability unit IIIe-2; woodland suitability group 2o2.

Martinsville Series

The Martinsville series consists of gently sloping to moderately steep, well-drained soils. These soils formed in a silt mantle and in the underlying stratified outwash material. In places the mantle is as much as 24 inches thick. The soils are on relatively high terraces that are up to one-half mile wide and are along the Little Miami River and its tributaries.

In a representative profile in a cultivated area, the surface layer is dark-brown silt loam 8 inches thick. The subsurface layer, to a depth of 15 inches, is silt loam. It is dark brown in the upper part and dark yellowish brown in the lower part. The subsoil is dark brown. It is silt loam to a depth of 22 inches, silty clay loam to a depth of 33 inches, clay loam to a depth of 42 inches, and gravelly clay loam to a depth of 60 inches. Below this, to a depth of 80 inches, is dark yellowish-brown sandy loam.

Permeability in Martinsville soils is moderate, and the rooting zone is deep. Available water capacity is high.

These soils are commonly medium acid or strongly acid in the rooting zone.

Martinsville soils are well suited to field crops commonly grown in the county and are intensively used for growing these crops.

Representative profile of Martinsville soil in an area of Williamsburg and Martinsville silt loams, 2 to 6 percent slopes, in a cultivated field in Williamsburg Township; 2½ miles southwest of Williamsburg, one-fourth mile east of Kain Run, and 200 feet south of the Williamsburg-Bantam Road:

Ap—0 to 8 inches, dark-brown (10YR 4/3) silt loam; weak, fine, granular structure; friable; medium acid; abrupt, smooth boundary.

A21—8 to 12 inches, dark-brown (10YR 4/3) silt loam; weak, medium to thick, platy structure; friable; medium acid; clear, smooth boundary.

A22—12 to 15 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, thick, platy structure; friable; few, fine, distinct, black iron-manganese concretions; medium acid; clear, smooth boundary.

B21t—15 to 22 inches, dark-brown (7.5YR 4/4) heavy silt loam; moderate, medium, subangular blocky structure; friable; very thin, dark-brown (7.5YR 4/4), very patchy clay films; few brown (7.5YR 5/4) silty coats; medium acid; gradual, smooth boundary.

IIB22t—22 to 33 inches, dark-brown (7.5YR 4/4) light silty clay loam; moderate, medium and fine, subangular blocky structure; firm; thin, dark-brown (7.5YR 4/4), patchy clay films; few brown (7.5YR 5/4) silty coats; common medium and fine iron-manganese concretions; strongly acid; gradual, wavy boundary.

IIB23t—33 to 42 inches, dark-brown (7.5YR 4/4) clay loam; moderate, medium and fine, subangular blocky structure; firm; thin, dark-brown (7.5YR 4/4), patchy clay films; few brown (7.5YR 5/4) silty coats; common medium and fine iron-manganese concretions; medium acid; clear, smooth boundary.

IIB3—42 to 60 inches, dark-brown (7.5YR 3/2) heavy gravelly clay loam; firm; common streaks of very dark brown (7.5YR 3/2); few yellowish-brown (10YR 5/4) weathered remnants of limestone; medium acid at a depth of 45 inches increasing to neutral at a depth of 60 inches; clear, smooth boundary.

IIIC—60 to 80 inches, dark yellowish-brown (10YR 4/4) heavy sandy loam; massive; friable; neutral.

The solum ranges from 36 to 60 inches in thickness. Depth to carbonates is commonly the same as solum thickness, but in places the B3 horizon is mildly alkaline, and in other places the upper part of the C horizon is slightly acid to neutral. The silty mantle ranges from 12 to 24 inches in thickness. The soil material becomes neutral at a depth between 50 and 70 inches. The Ap horizon ranges from dark grayish brown (10YR 4/2) to brown (10YR 5/3). The Bt horizon ranges from brown (7.5YR 4/4) to yellowish brown (10YR 5/4) and is dominantly clay loam or silty clay loam. Depth to the B3 horizon is 40 to 60 inches, and texture is gravelly clay loam or heavy sandy loam. The C horizon is typically stratified silt, loam, and sandy loam and thin layers of clay loam.

Martinsville soils are in a drainage sequence that includes the very poorly drained Mahalasville soils. Martinsville soils differ from the similar Williamsburg soils in having little or no gravel and a higher reaction in the B and C horizons.

Martinsville soils only occur with the similar Williamsburg soils in this county, and they are mapped in undifferentiated mapping units with Williamsburg soils.

McGary Series

The McGary series consists of nearly level, somewhat poorly drained soils. These soils formed in a thin silt mantle and in the underlying neutral to calcareous lacustrine silt and clay. They are on a few terraces along the East Fork of the Little Miami River.

In a representative profile in a cultivated area, the surface layer, 8 inches thick, is dark grayish-brown silt loam underlain by 1 inch of gray silty clay loam. In sequence, the subsoil, to a depth of 14 inches, is grayish-brown silty clay loam that has dark yellowish-brown mottles; to a depth of 38 inches, it is grayish-brown, firm silty clay that has dark yellowish-brown mottles; and to a depth of 46 inches, it is mottled gray and dark yellowish-brown, firm silty clay. Below this, to a depth of 53 inches, is dark yellowish-brown silty clay that has gray mottles. Between depths of 53 and 65 inches is brown silty clay loam that has dark yellowish-brown mottles.

Permeability in McGary soils is slow, and the rooting zone is moderately deep. Runoff is slow, and available water capacity is medium. The McGary soils are commonly strongly acid to neutral in the root zone.

McGary soils are used mostly for cultivated crops. If adequately drained and fertilized, they are well suited to crops commonly grown in the county, such as corn, soybeans, and small grain.

Representative profile of McGary silt loam, 0 to 2 percent slopes, in a cultivated field in Union Township; 1 mile west of Perintown, 500 feet west of Barg Salt Run Road, and 650 feet south of the tracks of the Norfolk and Western Railway Company:

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

A2—8 to 9 inches, gray (10YR 6/1) light silty clay loam; common, fine, prominent, dark-brown (10YR 4/3) mottles; weak, fine, subangular blocky structure; friable; many roots; slightly acid; clear, smooth boundary.

B1tg—9 to 14 inches, grayish-brown (10YR 5/2) silty clay loam; many, medium, prominent, dark yellowish-brown mottles (10YR 4/4) in more than 40 percent of matrix; moderate, fine, subangular blocky structure; friable; common roots; thin to medium clay films on 70 percent of ped faces; medium acid; clear, smooth boundary,

IIB21tg—14 to 24 inches, grayish-brown (10YR 5/2) silty clay; many, coarse, prominent, dark yellowish-brown (10YR 4/4) mottles in more than 40 percent of matrix; few yellowish-brown (10YR 5/6) mottles; weak, medium, prismatic structure parting to coarse angular blocky; firm; few roots; thin continuous clay films of grayish brown (10YR 5/2) on ped faces; strongly acid; clear, smooth boundary.

IIB22tg—24 to 38 inches, grayish-brown (10YR 5/2) silty clay; many, coarse, prominent, dark yellowish-brown (10YR 4/4) mottles in more than 40 percent of matrix; weak, coarse, prismatic structure parting to moderate, coarse, subangular blocky; firm; continuous, thin, dark-gray (10YR 4/1) and gray (10YR 5/1) clay films on vertical ped faces; thin patchy clay films of dark gray (10YR 4/1) and gray (10YR 5/1) on horizontal ped faces; neutral; clear, wavy boundary.

IIB23tg—38 to 46 inches, gray (10YR 5/1) silty clay; many, coarse, prominent, dark yellowish-brown (10YR 4/4) mottles in more than 40 percent of matrix; weak, coarse, subangular blocky structure; firm; few dark-gray (10YR 4/1) clay films on vertical ped faces; mildly alkaline; clear, irregular boundary.

IIC1g—46 to 53 inches, dark yellowish-brown (10YR 4/4) silty clay; many, coarse, prominent, gray (10YR 5/1) mottles in more than 40 percent of matrix; weak, coarse, subangular and angular blocky structure; firm; mildly alkaline; gradual, irregular boundary.

IIC2g—53 to 65 inches, brown (10YR 5/3) heavy silty clay loam; common dark yellowish-brown (10YR 4/4) mottles; few gray (10YR 5/1 and 10YR 6/1) clay films on vertical ped faces; massive, some natural horizontal laminations; firm; strongly alkaline, calcareous.

The solum ranges from 30 to 50 inches in thickness. The Ap horizon ranges from dark grayish brown (10YR 4/2) to grayish brown (10YR 5/2). In the B horizon mottles have a hue of 10YR, a value of 4 or 5, and a chroma of 4 to 6. The B horizon ranges from heavy silty clay loam to silty clay. The C horizon is calcareous, lacustrine, stratified silty clay and heavy silty clay loam and thin layers of silt.

McGary soils are in a drainage sequence that includes the moderately well drained to well drained Markland soils. McGary soils are commonly next to gently sloping Markland soils. They are mottled at shallower depths than Markland soils. McGary soils have a finer textured B horizon and are less deeply leached than similar Avonburg soils. McGary soils are underlain by lacustrine sediment, and Avonburg soils are underlain by glacial till.

McGary silt loam, 0 to 2 percent slopes (MgA).—This nearly level soil is on high terraces. Areas are irregular in shape and commonly less than 25 acres in size.

Included with this soil in mapping are a few areas of gently sloping soils at the heads of drainageways.

Wetness is a severe limitation where this soil is farmed. Seasonal wetness and slow permeability are limitations to many nonfarm uses. Capability unit IIIw-2; woodland suitability group 3w1.

Medway Series

The Medway series consists of nearly level, moderately well drained soils on flood plains and alluvial fans. The upper part of these soils is recent alluvium. It has been deposited over a darker colored and wetter buried soil, which is at a depth of less than 40 inches. Medway soils are commonly on flood plains of the larger streams in the county.

In a representative profile in a cultivated area, the surface layer is dark grayish-brown silt loam 8 inches thick. It is underlain by friable dark grayish-brown silt loam that is also 8 inches thick. Below this, to a depth of 32 inches, is a buried soil of very dark brown friable silty clay loam. Below the buried soil, to a depth of 44 inches, is dark yellowish-brown sandy clay loam that has mottles of dark gray. Below this material, to a depth of 60 inches, is dark yellowish-brown clay loam.

Permeability in Medway soils is moderate, and the root zone is deep. Runoff is slow because these soils are in depressions or in nearly level areas. Ponding after a heavy rain is common. Available water capacity is high. Medway soils range from slightly acid to mildly alkaline in the root zone. They are commonly used to grow corn, soybeans, and small grain.

Representative profile of Medway silt loam in a cultivated field in Jackson Township, about 400 feet southeast of Glancy Corner-Marathon Rd. and 1½ miles southwest of Marathon:

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

C—8 to 16 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; friable; common roots; neutral; abrupt, wavy boundary.

IIAb—16 to 32 inches, very dark brown (10YR 2/2) silty clay loam; moderate, fine and medium, granular structure; friable; common roots; neutral; clear, smooth boundary.

IIBbg—32 to 44 inches, dark yellowish-brown (10YR 4/4) sandy clay loam; common, medium, distinct, dark-gray (10YR 4/1) mottles; weak, medium, subangular blocky structure; firm; few roots; neutral; clear, smooth boundary.

IIB3bg—44 to 60 inches, dark yellowish-brown (10YR 4/4) light clay loam; common, fine, distinct, dark-gray (10YR 4/1) and common, medium, distinct, grayish-brown (2.5Y 5/2) mottles; weak, coarse, subangular blocky structure; firm; 5 to 10 percent gravel; mildly alkaline.

The combined thickness of the A and C horizons, which consist of medium-textured recent alluvium, is 14 to 20 inches. These horizons are slightly acid to neutral. In the Ap horizon color range includes dark grayish brown (10YR 4/2) and brown (10YR 4/3).

The C horizon is generally silt loam, but in places it is light silty clay loam. It is typically dark grayish brown (10YR 4/2), but in places it is brown (10YR 4/3). This horizon is structureless (massive) or has weak granular structure.

The buried soil is sandy clay loam, heavy silt loam, silty clay loam, and clay loam. It ranges from black (10YR 2/1) and very dark gray (10YR 3/1) to very dark brown (10YR 2/2). Reaction is typically neutral, but in places it is mildly alkaline. This Ab horizon ranges from 10 to 18 inches in thickness. The content of gravel and sand increases as depth increases in the buried soil.

The IIB horizon is silty clay loam, sandy clay loam, or clay loam. It ranges from dark yellowish brown (10YR 4/4) to dark brown (7.5YR 4/4) and is mottled with very dark gray (10YR 3/1), dark gray (10YR 4/1), or grayish brown (2.5Y 5/2). Reaction ranges from neutral to mildly alkaline.

Medway is the only soil in the county with a surface layer that is lighter colored than the underlying layers.

Medway silt loam, overwash (Mh).—This nearly level soil is on flood plains. It is commonly next to areas of Eel or Genesee soils.

Included with this soil in mapping are small areas of somewhat poorly drained Shoals soils and, in the vicinity of Goshen, several small areas of soils that have a dark-colored surface layer. Also included are a few areas where the recent deposits over the dark buried soil are as much as 32 inches thick.

Seasonal wetness, surface ponding, and hazard of flooding are the major limitations to use of this soil for farm and nonfarm purposes. In areas subject to frequent flooding, the soils are better suited to grass or trees than to cultivated crops. Capability unit IIw-4; woodland suitability group 2w1.

Newark Series

The Newark series consists of nearly level, somewhat poorly drained soils. These soils formed in moderately fine textured alluvium of mixed origin. They are in low slough-like areas on the flood plain along the Ohio River. Areas range from narrow to rather broad and are generally parallel to the river. Surface drainage in these areas is generally blocked by slightly higher natural levees of Huntington or Lindside soils.

In a representative profile in a cultivated area, the surface layer is dark grayish-brown silt loam 7 inches thick. In sequence, the subsoil, to a depth of 14 inches, is dark grayish-brown silt loam; to a depth of 25 inches, it is dark grayish-brown silty clay loam that has grayish-brown and yellowish-brown mottles; and to a depth of 38 inches, it is brown silty clay loam that has grayish-brown and yellowish-brown mottles. Below this, to a depth of 80 inches, are layers of brown, dark grayish-brown, and dark yellowish-brown silty clay loam that has grayish-brown mottles.

Permeability in Newark soils is moderate, and the rooting zone is moderately deep. These soils are subject to flooding and have a seasonally high water table. Ponding is a concern of management. Available water capacity is medium. Newark soils are commonly slightly acid or neutral in the root zone.

Newark soils are farmed along with other soils on the flood plain of the Ohio River. Fewer areas of this soil, however, are cultivated than areas of the adjacent higher, better drained Lindside and Huntington soils. If the soil is adequately drained and fertilized, corn, soybeans, hay, and tobacco are commonly grown. Where flooding is frequent, Newark soils are better suited to pasture or woods than to row crops. Many areas are infested with johnsongrass and are no longer cultivated.

Representative profile of Newark silt loam in a cultivated field in Washington Township, one-fourth mile north of Neville:

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; friable; few, very small, shiny mica flakes; common BB-sized, soft, dark-brown (10YR 3/3) concretions on the surface; many roots; slightly acid; abrupt, smooth boundary.

B1—7 to 14 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine and medium, granular structure; friable; few roots; common BB-sized iron-manganese concretions; slightly acid; clear, smooth boundary.

B21g—14 to 25 inches, dark grayish-brown (10YR 4/2) light silty clay loam; common, medium, distinct, grayish-brown (10YR 5/2) and yellowish-brown (10YR 5/6) mottles; weak, medium, subangular blocky structure; friable; common BB-sized iron-manganese concretions; few roots; neutral; clear, smooth boundary.

B22g—25 to 38 inches, brown (10YR 4/3) light silty clay loam; common, medium, distinct, grayish-brown (10YR 5/2) and yellowish-brown (10YR 5/4) mottles; moderate, medium, subangular blocky structure; friable; common BB-sized concretions; neutral; gradual, smooth boundary.

C1g—38 to 46 inches, brown (10YR 4/3) silty clay loam; grayish-brown (10YR 5/2) mottles; weak, coarse, subangular blocky structure; friable; common concretions and dark-brown (10YR 3/3) stains on ped faces; neutral; gradual, smooth boundary.

C2g—46 to 55 inches, brown (10YR 4/3) silty clay loam; common, medium, distinct, grayish-brown (10YR 5/2) and yellowish-brown (10YR 5/6) mottles; weak, coarse, subangular blocky structure; friable; common concretions; neutral; gradual, smooth boundary.

C3g—55 to 63 inches, dark grayish-brown (10YR 4/2) silty clay loam; common, medium, distinct, grayish-brown (10YR 5/2) and yellowish-brown (10YR 5/6) mottles; weak, coarse, subangular blocky structure; friable; slightly plastic when wet; many concretions and stains; mildly alkaline; clear, wavy boundary.

C4g—63 to 80 inches, dark yellowish-brown (10YR 4/4) silty clay loam; many, medium, prominent, grayish-brown (10YR 5/2) and brown (7.5YR 4/4) mottles; massive in place, parts along cleavage planes; slightly plastic when wet; few concretions; mildly alkaline.

The solum ranges from 25 to 40 inches in thickness. Reaction ranges from medium acid to mildly alkaline throughout the profile. The A horizon is as much as 16 inches thick. The Ap horizon is dark grayish brown (10YR 4/2) or brown (10YR 4/3). The B horizon ranges from silt loam to silty clay loam. The C horizon is stratified and ranges from silt loam to silty clay loam but includes thin strata of loam and fine sandy loam. The degree and amount of mottling in the B horizon varies with location.

Newark soils are commonly adjacent to the moderately well drained Lindside and well-drained Huntington soils on the flood plain of the Ohio River. Newark soils are grayer and have more mottles than the Lindside or Huntington soils.

Newark silt loam (Ne).—This nearly level soil is in low sloughlike areas that rarely are more than 50 acres in size. Included in mapping are a few areas where a rather dense fragipanlike layer is between depths of 36 and 55 inches. Immediately above this impermeable layer, a large number of concretions are present.

Wetness is a moderate limitation where this soil is farmed. Flooding is a limitation to many nonfarm uses. Capability unit IIw-4; woodland suitability group 2w2.

Ockley Series

The Ockley series consists of nearly level to gently sloping, well-drained soils. These soils formed in a silt mantle and in the underlying loamy, sandy, and gravelly outwash material. They are on terraces that are as much as one-half mile wide and are along the Little Miami River and its tributaries.

In a representative profile in a cultivated area, the surface layer is dark-brown silt loam 7 inches thick. The subsurface layer is dark yellowish-brown silt loam 4 inches thick. In sequence, the subsoil, to a depth of 17 inches, is brown silt loam; to a depth of 25 inches, it is dark-brown silt loam; to a depth of 33 inches, it is dark-brown loam; to a depth of 41 inches, it is dark-brown clay loam; and to a depth of 49 inches, it is dark reddish-brown clay. Below this, to a depth of 60 inches, is dark reddish-brown gravelly loam grading with depth to dark-brown sand and gravel.

Permeability in Ockley soils is moderate in the subsoil and moderately rapid in the substratum. The rooting zone is deep, and available water capacity is high. Ockley soils are typically neutral in the surface layer, strongly acid to medium acid in the subsoil, and neutral or alkaline in the substratum.

Ockley soils are among the best soils in the county. They make up only a minor percentage of total land area in the county but are used intensively for farming. They are well suited to truck and vegetable crops and other commonly grown crops in the county.

In a representative profile of Ockley silt loam, 0 to 2 percent slopes, in a cultivated field in Union Township; 1½ miles southeast of Milford, 300 feet north of Roundbottom Road, and 200 feet west of farm lane underneath Cincinnati Gas and Electric power transmission line:

Ap—0 to 7 inches, dark-brown (10YR 4/3) silt loam; moderate, fine, granular structure; friable; many roots; neutral; abrupt, smooth boundary.

A2—7 to 11 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, fine and medium, subangular blocky structure; friable; many roots; medium acid; clear, smooth boundary.

B11t—11 to 17 inches, brown (7.5YR 5/4) silt loam; weak, medium, subangular blocky structure; firm; many roots; thin, discontinuous clay films on ped faces; strongly acid; gradual, wavy boundary.

B12t—17 to 25 inches, dark-brown (7.5YR 4/4) silt loam; moderate, medium, subangular blocky structure; friable; common roots; thin discontinuous clay films on ped faces; medium acid; clear, smooth boundary.

IIB21t—25 to 33 inches, dark-brown (7.5YR 4/4) loam; strong, medium, subangular blocky structure; friable; few roots; thin, continuous, dark yellowish-brown (10YR 3/4) clay films on ped faces; strongly acid; gradual, smooth boundary.

IIB22t—33 to 41 inches, dark-brown (7.5YR 4/4) clay loam; moderate, medium, subangular blocky structure; firm; few roots; thin, continuous, dark yellowish-brown (10YR 3/4) clay films on ped faces; strongly acid; gradual, smooth boundary.

IIB3—41 to 49 inches, dark reddish-brown (5YR 3/3) clay; few dark-brown (7.5YR 4/4) ped faces; weak, medium and coarse, subangular blocky structure; firm;

15 percent partly weathered gravel; medium acid; gradual, smooth boundary.

IIIC—49 to 60 inches, dark reddish-brown (5YR 3/4) gravelly loam grading with depth to dark-brown (7.5YR 4/4) sand and gravel; single grained; stratified; about 65 percent gravel; neutral.

The solum ranges from 42 to 60 inches in thickness. It is underlain by stratified sand and gravel. The silt mantle ranges from 12 to 30 inches in thickness. The B horizon ranges from strongly acid to neutral. It has a hue of 7.5YR or 5YR. The reddest hues and lowest values are commonly just above the contact between the B and C horizons. The part of the B2t horizon below the silt cap is loam or clay loam. A B3 horizon of clay is generally present over a loam-textured C horizon of gravel and sand.

Ockley soils are adjacent to similar well-drained Fox soils in many places. They are deeper to sand and gravel than Fox soils. Ockley soils are less acid and less deeply leached than Williamsburg soils.

Ockley silt loam, 0 to 2 percent slopes (OcA).—This nearly level soil is on terraces. Areas are commonly less than 75 acres in size and are irregular in shape. In many places these soils are on bench terraces that extend between the bottom lands and uplands. This soil is generally next to gently sloping Ockley soils or sloping Fox soils. It has the profile described as representative for the series.

Included with this soil in mapping are small intermingled areas of Fox soils.

This soil has few or no limitations to most farming uses. It is also well suited to most nonfarm uses. Pollution of ground water is a hazard if these soils are used for disposal of effluent from septic tanks or for sanitary landfills. Capability unit I–1; woodland suitability group 1o1.

Ockley silt loam, 2 to 6 percent slopes (OcB).—This gently sloping soil is on terraces commonly adjacent to uplands. Areas are commonly irregular in shape and less than 50 acres in size. This soil has a profile similar to that described as representative for the series, except the surface layer is slightly thinner. It is generally next to nearly level Ockley soils or sloping Fox soils.

Included with this soil in mapping are small intermingled areas of Fox soils too small to separate. Also included are areas of soils that have a darker colored surface layer. These areas are shown by special symbols on the maps.

Erosion is a moderate hazard where this soil is farmed. This soil has few limitations to most nonfarm uses. Pollution of ground water is a hazard if this soil is used for the disposal of effluent from septic tanks or for sanitary landfills. Capability unit IIe–2; woodland suitability group 1o1.

Ockley-Urban land complex, nearly level (OdA).—This nearly level complex is on bench terraces underlain by sand and gravel outwash. Most of the surface layer of the Urban land part of this unit has been disturbed or buried by earthmoving operations preparatory to basement excavation. The soil material has been altered to such an extent that natural soil characteristics have been obliterated, and precise classification is difficult. Residential developments occupy variable proportions of the surface area, depending on housing density and lot size. The soil in undisturbed areas is dominantly Ockley silt loam that has a profile similar to that described as representative for the series.

Included in mapping are a few areas of gently sloping Ockley soils. Also included are areas of Williamsburg soils. The soils in this unit are well suited, except for the hazard of pollution to underground water supplies, to residential development. Capability unit and woodland suitability group not assigned.

Riverwash

Riverwash (Rh) consists mostly of a mixture of limestone flags, cobblestones, gravel, and fine soil material in or adjacent to channels of the major streams. The coarse fragments range mostly from 1 to 3 inches in diameter. The material in the upstream ends of Riverwash areas is coarser textured than that in the downstream ends.

Most areas are low islands or alluvial spits that are periodically inundated, depending on the water level of the stream. They are dominantly barren, but areas that are fairly well protected from swift water support a scrub growth of willow, elm, and sycamore trees and low shrubs.

If areas of Riverwash are not polluted or filled by refuse, they are used by aquatic birds, insects, and amphibious wildlife. Preserving these clean environmental areas is necessary so that water-tolerant vegetation and microorganisms will be available as food and cover for some species of wildlife.

During periods of low water these areas provide good fishing sites. They also can be used for hiking and rock collecting. During periods of high water these areas are hazardous to boating, particularly the use of powerboats. Capability unit and woodland suitability group not assigned.

Rodman Series

The Rodman series consists of moderately steep to steep, well-drained soils. They formed in loam 8 to 15 inches thick and in underlying loose, stratified, calcareous gravel and sand. These soils are on terraces and valley walls along the Little Miami River and its tributaries.

In a representative profile the surface layer is very dark brown loam 6 inches thick. The subsoil, to a depth of 10 inches, is dark yellowish-brown gravelly loam. Below this, to a depth of 60 or more inches, is dark yellowish-brown, stratified, loose gravel and sand.

Permeability in Rodman soils is rapid, and the rooting zone is shallow. Available water capacity ranges from low to very low. Rodman soils are commonly neutral or calcareous.

Rodman soils are mainly in woods or permanent pasture.

Representative profile of Rodman loam from an area of Rodman and Casco loams, 18 to 25 percent slopes, moderately eroded, in a flooded area in Miami Township, 500 feet east of the Little Miami River and one-half mile north of Milford:

A1—0 to 6 inches, very dark brown (10YR 2/2) loam; moderate, fine, granular structure; friable; many roots; neutral; clear, smooth boundary.

B—6 to 10 inches, dark yellowish-brown (10YR 3/4) gravelly loam; weak, fine, granular structure; friable; common roots; calcareous; clear, smooth boundary.

C—10 to 60 inches, dark yellowish-brown (10YR 4/4) gravel and sand; single grained; loose; calcareous, mildly alkaline.

The solum ranges from about 8 to 15 inches in thickness. It ranges from neutral to moderately alkaline. The A horizon ranges from very dark brown (10YR 2/2) to very dark grayish brown (10YR 3/2) in color and from sandy loam to gravelly loam in texture. The B horizon ranges from brown (10YR

5/3) and dark yellowish brown (10YR 3/4) to dark brown (7.5YR 4/4) in color and from loam or sandy loam to gravelly loam in texture. It has a weak to moderate, fine to medium, granular structure. The underlying material consists of calcareous stratified gravel and sand.

The calcium carbonate content immediately below the dark-colored surface layer is outside the defined range of the series. This difference, however, does not alter the usefulness or behavior of these soils.

Rodman soils differ from similar well-drained Casco soils in having a thinner solum that contains less clay than the solum of Casco soils. Rodman soils have a thinner solum than those of the well-drained Fox and Ockley soils.

Rodman and Casco loams, 12 to 18 percent slopes, moderately eroded (RkD2).—These moderately steep soils are on terraces and valley walls along the little Miami River and its tributaries. Areas are long and narrow and as large as 25 acres. Because these soils are medium to moderately coarse textured and porous, runoff is slow to medium. Both Rodman and Casco soils occur within most of the areas mapped as this undifferentiated unit. Rodman soils are dominant in some areas and Casco soils in others. These soils are commonly next to steeper Rodman and Casco soils, gently sloping Ockley and Fox soils, or level Genesee or Eel soils on bottom lands. Included in mapping are a few small areas of Fox soils.

Erosion is a very severe hazard if these soils are cultivated. Slope is a limitation to most nonfarm uses. Capability unit VIs–1; woodland suitability group 4f1.

Rodman and Casco loams, 18 to 25 percent slopes, moderately eroded (RkE2).—These steep soils are on terraces and valley walls along the Little Miami River and its tributaries. Areas are long and narrow and as large as 25 acres. Runoff on these soils is medium. Both Rodman and Casco soils occur within most of the areas mapped as this undifferentiated unit. Rodman soils, however, are dominant in some areas and Casco soils in others. These soils have the profiles described as representative for their series. The texture and thickness of soil layers and the material in the substratum vary considerably within short distances. These soils are commonly next to moderately steep Rodman and Casco soils, nearly level to gently sloping Ockley and Fox soils, or level Genesee and Eel soils on bottom lands.

Included with these soils in mapping are a few small areas of Fox soils.

Severe hazard of further erosion and steep slopes are the major limitations to use of these soils for most farm or nonfarm purposes. Capability unit VIIs–1; woodland suitability group 4f1.

Ross Series

Soils of Ross series are nearly level, well drained, and medium textured. They formed in stream flood plain alluvium washed from upland soils that formed in a silt mantle and in the underlying calcareous glacial till of Illinoian and Wisconsin age. The largest areas of these soils are on the flood plain of the East Fork of the Little Miami River.

In a representative profile the surface layer is very dark grayish-brown silt loam 8 inches thick. The underlying layers, to a depth of 22 inches, are very dark grayish-brown silt loam. Below these layers, to a depth of 30 inches, is very dark grayish-brown friable silty clay loam. Below this, to a depth of 60 inches or more, is dark yellowish-brown loam.

Ross soils are deep. Permeability is moderate, and the rooting zone is deep. Available water capacity is high. These soils are subject to periodic flooding, generally during winter and spring. They are commonly neutral in reaction throughout the root zone.

Most areas of Ross soils are used for corn and soybeans.

Representative profile of Ross silt loam in a cultivated field in Jackson Township, 1 mile south of Marathon on the flood plain of the East Fork of the Little Miami River, one-half mile east of the river:

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) silt loam, dark brown (10YR 3/3), rubbed; weak, fine, granular structure; friable; many roots; neutral; abrupt, smooth boundary.

A12—8 to 16 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, medium, granular structure; friable; many roots; very dark brown (10YR 2/2) very thin stains or coatings on most ped faces; neutral; clear, smooth boundary.

A13—16 to 22 inches, very dark grayish-brown (10YR 3/2) heavy silt loam; weak, medium, subangular blocky structure; friable; many roots; very dark brown (10YR 2/2) coatings on most ped faces; neutral; clear, smooth boundary.

A14—22 to 30 inches, very dark grayish-brown (10YR 3/2) light silty clay loam; weak, medium, subangular blocky structure; friable; few roots; neutral; clear, irregular boundary.

C—30 to 60 inches, dark yellowish-brown (10YR 4/4) heavy loam; weak, medium and coarse, subangular blocky structure in upper part grading to massive in lower part; friable; dark-brown (10YR 3/3) coatings on few vertical ped faces; calcareous, mildly alkaline.

The A horizon ranges from 24 to 40 inches in thickness. It ranges from very dark brown (10YR 2/2) to dark brown (10YR 3/3) and is slightly acid or neutral. The C horizon is neutral or mildly alkaline. It is commonly loam, but it may contain strata of sandy loam or light clay loam. Stratification in the C horizon varies with location, but each stratum is generally thin and discontinuous.

Ross soils are darker colored than adjacent similar Genesee and Eel soils.

Ross silt loam (Rn).—This nearly level soil is in areas generally immediately adjacent to stream channels. It is generally slightly higher in elevation than Genesee soils. Areas are long and narrow or are irregular in shape. They are less than 15 acres in size, except for one broad area of 100 acres near Marathon. This soil is one of the most productive in the county.

Included with this soil in mapping are a few areas of wetter bottom land soils.

Flooding is the main limitation to use of this soil; otherwise it has few or no limitations to use for farming. Flooding limits many nonfarm uses. Capability unit IIw–1; woodland suitability group 1o1.

Rossmoyne Series

The Rossmoyne series consists of nearly level to sloping, moderately well drained soils that have a fragipan. These soils formed in 18 to 40 inches of silt mantle and in the underlying weathered glacial till of Illinoian age. They are on uplands and ridgetops throughout the county.

In a representative profile in a cultivated area, the surface layer is dark-brown silt loam 9 inches thick. In sequence, the subsoil to a depth of 18 inches is yellowish-brown light silty clay loam; to a depth of 39 inches, it is a dense, brittle fragipan of yellowish-brown clay loam; and to a depth of 86 inches, it is mostly shades of yellowish-brown clay loam mottled with grayish brown or light brownish gray. Below this, to a depth of 130 inches, are layers of yellowish-brown loam and olive-brown silt loam.

Permeability in Rossmoyne soils is slow, and the rooting zone is moderately deep. Available water capacity is medium. The fragipan restricts the downward movement of water. Rossmoyne soils are commonly very strongly acid in the root zone.

Rossmoyne soils are used for such cultivated crops as corn, soybeans, and tobacco, especially in the southern and southwestern parts of the county. In the western part of the county some of these soils are used extensively for small estates and subdivisions.

Representative profile of Rossmoyne silt loam, 2 to 6 percent slopes, in a pasture in Tate Township on the west side of Bethel, 75 feet south of State Route No. 125 and one-fourth mile west of State Route No. 133:

Ap—0 to 9 inches, dark-brown (10YR 4/3) silt loam; weak, fine, granular structure; friable; many roots; very strongly acid; abrupt, smooth boundary.

B1t—9 to 18 inches, yellowish-brown (10YR 5/4) light silty clay loam; weak, medium, subangular blocky structure; friable; many roots; thin yellowish-brown (10YR 5/4) clay films on 40 percent of ped faces; very strongly acid; clear, wavy boundary.

IIBx1—18 to 30 inches, yellowish-brown (10YR 5/4) light clay loam; common, medium, distinct, grayish-brown (10YR 5/2) mottles; weak, coarse, prismatic structure; firm; till pebbles in places; slightly brittle; thin to medium, grayish-brown (10YR 5/2) clay films on 50 percent of vertical faces; very strongly acid; gradual, wavy boundary.

IIBx2—30 to 39 inches, yellowish-brown (10YR 5/4) clay loam; common, medium, distinct, light brownish-gray (10YR 6/2) mottles; weak, coarse, prismatic structure parting to moderate, coarse, angular blocky; firm; slightly brittle; thin to medium, light brownish-gray (10YR 6/2) and dark yellowish-brown (10YR 4/4) clay films on 75 percent of vertical faces; vesicular pores cover 2 percent of ped faces; common black (10YR 2/1) iron-manganese stains; compact and dense in place; strongly acid; clear, smooth boundary.

IIB22t—39 to 49 inches, brown (7.5YR 4/4) and yellowish-brown (10YR 5/4) clay loam; common, medium, distinct, grayish-brown (2.5Y 5/2) mottles; weak, coarse, prismatic structure parting to moderate, coarse, angular blocky; firm in place, friable when disturbed; thin to medium, grayish-brown (2.5Y 5/2) clay films on ped faces; common black (10YR 2/1) iron-manganese stains; few till pebbles; vesicular pores cover less than 1 percent of ped faces; very strongly acid; clear, wavy boundary.

IIB23t—49 to 60 inches, dark yellowish-brown (10YR 4/4) light clay loam; common, medium, distinct, grayish-brown (2.5Y 5/2) mottles; moderate, coarse, angular blocky structure; firm in place, friable when disturbed; medium, dark-brown (7.5YR 4/4) and grayish-brown (2.5Y 5/2) clay films on ped faces; few till pebbles; few black (10YR 2/1) iron-manganese stains; very strongly acid; gradual, wavy boundary.

IIB24t—60 to 73 inches, light yellowish-brown (10YR 6/4) clay loam; weak, coarse, angular blocky structure; firm in place, friable when disturbed; few black (10YR 2/1) iron-manganese stains and thin gray (10YR 5/1) clay films on ped faces; few small angular till pebbles; very strongly acid; gradual, wavy boundary.

IIB3—73 to 86 inches, light yellowish-brown (10YR 6/4) and brown (10YR 5/3) clay loam that has seams of gray (10YR 5/1); massive; firm; few angular till pebbles; friable; medium acid; gradual, wavy boundary.

IIC1—86 to 110 inches, yellowish-brown (10YR 5/4) loam; massive; firm; mildly alkaline, calcareous.

IIC2—110 to 130 inches, olive-brown (2.5Y 4/4) silt loam; massive; firm; compact in place; mildly alkaline, calcareous.

The solum ranges from 60 to 120 inches in thickness. The silt mantle ranges from 18 to 40 inches in thickness. The content of sand and small pebbles increases below the bottom of the silt mantle. Where the soils are not limed, reaction is very strongly acid to strongly acid to a depth of 40 inches. It increases gradually below that depth and in places is medium acid or slightly acid at a depth of 60 inches.

The A horizon ranges from dark grayish brown (10YR 4/2) to brown (10YR 5/3). Depth to gray mottles ranges from 14 to 25 inches. The B horizon is very strongly acid to depths of 30 to 75 inches. In the B2 horizons the matrix color ranges from dark yellowish brown (10YR 4/4) and brown (7.5YR 4/4) to yellowish brown (10YR 5/4) and brownish yellow (10YR 6/6). A fragipan, 16 to 30 inches thick, is at a depth of 18 to 30 inches. The upper 20 inches of the B2t horizon ranges from silty clay loam to clay loam. The fragipan is typically clay loam, but it is heavy loam in places. It is of moderate development and has a firm, brittle consistence. Dark iron-manganese concretions and stains are common in the fragipan, below the fragipan down to the B3 horizon, and, in places, within the B3 horizon.

Rossmoyne soils are in a drainage sequence that includes the well-drained Cincinnati soils, the somewhat poorly drained Avonburg soils, and the poorly drained Clermont and Blanchester soils. Rossmoyne soils differ from similar Sardinia soils in having a C horizon of glacial till and from Williamsburg soils in having a fragipan. They are underlain by glacial till, and Ockley soils are underlain by glacial outwash. Rossmoyne soils do not have the intense gray mottling in the upper layers that Avonburg soils have.

Rossmoyne silt loam, 0 to 2 percent slopes (RpA).—This nearly level soil is in areas commonly surrounded by gently sloping Rossmoyne soils or nearly level Avonburg soils. Where the landscape is nearly level, areas are irregular in shape and 2 to 5 acres in size. In sloping landscape, near and between the tributaries of the major drainage systems, the areas are irregular in shape and as much as 50 acres in size. This soil has a profile similar to that described as representative for the series, but the gray mottling in the subsoil occurs about 4 inches nearer to the surface in this soil.

Included with this soil in mapping are small areas of somewhat poorly drained Avonburg soils.

Wetness is a moderate limitation where this soil is farmed. Slow permeability and seasonal wetness are limitations to most nonfarm uses. Capability unit IIw-2; woodland suitability group 2o2.

Rossmoyne silt loam, 2 to 6 percent slopes (RpB).—This gently sloping soil is in irregularly shaped areas on ridges of the uplands. Ridges are 200 feet to 700 feet wide and are commonly near and between the tributaries of the major drainage systems in the county. Areas are commonly less than 100 acres in size. This soil also is on long, narrow ridgetops. It is generally next to sloping Rossmoyne or Cincinnati soils and nearly level Rossmoyne or Avonburg soils. This soil has the profile described as representative for the series.

Included with this soil in mapping are small areas where the soil is moderately eroded.

Runoff is medium to rapid on this soil. A moderate erosion hazard is the major limitation to use where this soil is used for cultivated crops. Slow permeability is a limitation for some nonfarm uses. Capability unit IIe-1; woodland suitability group 2o2.

Rossmoyne silt loam, 2 to 6 percent slopes, moderately eroded (RpB2).—This gently sloping soil is on uplands in irregularly shaped areas on ridges that are 200 to 700 feet wide. It is also on long, narrow ridgetops. Areas are commonly less than 100 acres in size. This soil is generally next to sloping Rossmoyne or Cincinnati soils and nearly level Rossmoyne or Avonburg soils. It has a profile similar to that described as representative for the series, except the surface layer is a mixture of former yellowish-brown subsoil and the remaining original dark-brown surface layer. Because erosion has caused the loss of much of the original surface layer, this soil requires a narrower range of optimum moisture conditions for tillage operations than the less eroded Rossmoyne soils.

Included with this soil in mapping are small areas of severely eroded soils. These areas are identified on the maps by special symbols.

Runoff is rapid on this soil, particularly where the surface is without vegetative cover. Further erosion is a continuing moderate hazard where this soil is used for cultivated crops. Slow permeability is a limitation to many nonfarm uses. Capability unit IIe–1; woodland suitability group 2o2.

Rossmoyne silt loam, 6 to 12 percent slopes, moderately eroded (RpC2).—This sloping soil is in irregularly shaped areas near the heads of drainageways and alongside the steeper soils on uplands. Areas are 10 to 50 acres in size. Areas, 1 to 3 feet or more in diameter, of yellowish-brown, eroded subsoil are evident in places in plowed fields. This soil is generally next to steeper Cincinnati, Edenton, Hickory, or Eden soils and gently sloping Avonburg or Rossmoyne soils. It has a profile similar to that described as representative for the series, except the surface layer is a mixture of the former subsoil and the remaining original surface layer. Erosion is not uniform, and small areas of slightly and severely eroded soils are likely to be present within short distances. The dominant erosion condition, however, is moderate.

Included with this soil in mapping are areas, generally less than 2 acres in size, of Edenton silt loam, 6 to 12 percent slopes, moderately eroded. These areas are at the terminal ends of spurs of the ridgetops.

Runoff is rapid on this soil, and the erosion hazard is severe where this soil is cultivated. Slope and slow permeability are limitations to nonfarm uses. Capability unit IIIe–1, woodland suitability group 2o2.

Rossmoyne silty clay loam, 6 to 12 percent slopes, severely eroded (RsC3).—This sloping soil is in areas at the heads of drainageways or between areas of gently sloping Rossmoyne or Cincinnati soils and the lower soils on bottom land or the steeper soils on uplands. Areas are irregular and narrow in shape and are commonly less than 35 acres in size. This soil has a profile similar to that described as representative for the series, except it has numerous gullies and scoured areas that are 1 foot or more in depth and 5 feet or more in width. The gullies occur on the landscape as areas of yellowish-brown silty clay loam or clay loam. The surface layer of this soil is mainly former subsoil material. Because this soil is severely eroded, a more intensive use of erosion-control practices is needed. Also, a more intensive use of crop residue is needed to provide for good tilth. Because of severe erosion in the past, the surface layer of this soil varies within short horizontal distances. It is commonly silty clay loam, but in places it is silt loam or clay loam.

Included with this soil in mapping are small areas of well-drained soils and slightly eroded soils.

Runoff is rapid on this soil, and the erosion hazard is very severe where this soil is cultivated. Slope and slow permeability are limitations to nonfarm uses. Capability unit IVe–3; woodland suitability group 3o1.

Rossmoyne-Urban land complex, gently sloping (RtB).—This gently sloping complex is on uplands underlain by glacial till. Most of the surface layer of the Urban land part of this unit has been disturbed or buried by earthmoving operations preparatory to basement excavation. The soil has been altered to such an extent in these areas that natural soil characteristics have been obliterated. Residential developments occupy various percentages of the surface area, depending on housing density and lot size. The dominant soil in undisturbed areas is Rossmoyne silt loam that has a profile similar to that described as representative for the series. Included in mapping are small areas of gently sloping Avonburg soils.

In most areas the soils in this unit are moderately well drained. Slow permeability because of the fragipan is the main limitation to most nonfarm uses. Capability unit and woodland suitability group not assigned.

Rossmoyne-Urban land complex, sloping (RtC).—This sloping complex is on uplands underlain by glacial till. Most of the surface layer of the Urban land part of this unit has been disturbed or buried by earthmoving operations preparatory to basement excavation. The soil has been altered to such an extent in these areas that natural soil characteristics have been obliterated. Residential developments occupy various percentages of the surface area, depending on housing density and lot size. The soil in undisturbed areas is dominantly Rossmoyne silt loam that has a profile similar to that described as representative for the series.

Included with this soil in mapping are a few areas of Cincinnati and Hickory soils that were too small to separate.

The soils in this unit are dominantly moderately well drained. Slow permeability, because of the fragipan, and slope are the main limitations to most nonfarm uses. Capability unit and woodland suitability group not assigned.

Sardinia Series

The Sardinia series consists of nearly level to gently sloping, moderately well drained soils. These soils formed in a silt mantle up to 30 inches thick or in loamy alluvium and in the underlying stratified loamy and silty outwash and alluvium that has small amounts of gravel. They are on relatively high terraces up to one-half mile wide along the Little Miami River and its tributaries.

In a representative profile in a cultivated area, the surface layer is dark grayish-brown silt loam 7 inches thick. The subsurface layer, to a depth of 10 inches, is brown silt loam mottled with grayish brown. The subsoil, to a depth of 66 inches, is layers of yellowish-brown, brown, or dark yellowish-brown silt loam or loam mottled with grayish brown. Below these layers, to a depth of 76 inches, the subsoil is yellowish-brown sandy clay loam. Below this, to a depth of 144 inches, is yellowish-brown sandy clay loam and gravelly sandy clay loam.

Permeability in Sardinia soils is moderate, and the rooting zone is moderately deep. Available water capacity is medium. These soils are easier to farm than the upland Rossmoyne soils of the county, because they generally dry out faster after rains. They are slightly acid to very strongly acid in the root zone.

Sardinia soils are among the best soils in the county for farming. They make up only a minor percentage of total land area in the county, but they are used intensively for farming. They are well suited to truck and vegetable crops.

Representative profile of Sardinia silt loam, 0 to 2 percent slopes, in a cultivated field in Williamsburg Township, 1¼ miles south of Williamsburg and three-eighths mile east of Williamsburg-Bantam Road:

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; friable; many roots; slightly acid; abrupt, smooth boundary.

A2—7 to 10 inches, brown (10YR 5/3) silt loam; common, medium, faint, grayish-brown (10YR 5/2) mottles; tongues of the Ap horizon extend into upper part of this horizon; weak, medium, subangular blocky structure; friable; many roots; slightly acid; clear, smooth boundary.

B1t—10 to 18 inches, yellowish-brown (10YR 5/4) silt loam; common, medium, distinct, grayish-brown (10YR 5/2) mottles; moderate, medium, subangular blocky structure; friable; thin, dark yellowish-brown (10YR 4/4), patchy clay films on ped faces; common roots; strongly acid; abrupt, smooth boundary.

B21t—18 to 26 inches, brown (10YR 5/3) silt loam; few, fine, faint, grayish-brown (10YR 5/2) mottles; yellowish-brown (10YR 5/4) crushed; moderate, medium, subangular blocky structure; friable; common roots; thin, dark yellowish-brown (10YR 4/4), continuous clay films on ped faces; very strongly acid; abrupt, smooth boundary.

IIB22t—26 to 34 inches, dark yellowish-brown (10YR 4/4) loam; weak, coarse, prismatic structure parting to weak, coarse, angular blocky and weak, thick, platy; firms, slightly brittle; few roots; gray (10YR 5/1) clay seams, ⅜-inch thick, form polygons 4 to 6 inches wide that are surrounded by yellowish-brown (10YR 5/6) silty material; dark grayish-brown (10YR 4/2) clay films in pores and grayish-brown (10YR 5/2) silt coatings on some ped faces; very strongly acid; gradual, wavy boundary.

IIB23t—34 to 43 inches, dark yellowish-brown (10YR 4/4) loam; weak, coarse, prismatic structure parting to weak, coarse, angular blocky and weak, thick, platy; firm, slightly brittle; few roots; gray (10YR 5/1) clay seams, ⅜-inch thick, form polygons 4 to 6 inches wide that are surrounded by yellowish-brown (10YR 5/6) silty material; dark grayish-brown (10YR 4/2) clay films in pores and grayish-brown (10YR 5/2) silt coatings on some ped faces; strongly acid; abrupt, wavy boundary.

IIB24—43 to 52 inches, dark yellowish-brown (10YR 4/4) and strong-brown (7.5YR 5/6) loam; grayish-brown (10YR 5/2) mottles; weak, thick, platy structure; firm; slightly acid; gradual, smooth boundary.

IIB25–52 to 66 inches, dark yellowish-brown (10YR 4/4) and yellowish-brown (10YR 5/6) loam; pale-brown (10YR 6/3) and grayish-brown (10YR 5/6) mottles; weak, thick, platy structure; firm; many very dark brown (10YR 2/2) iron-manganese concretions, BB shot size; slightly acid; gradual, smooth boundary.

IIIB3—66 to 76 inches, yellowish-brown (10YR 5/6) sandy clay loam; grayish-brown (10YR 5/2) clay seams; weak, medium, platy structure; friable; many very dark brown (10YR 2/2) iron-manganese concretions, BB shot size; neutral; gradual, smooth boundary.

IIIC1—76 to 97 inches, yellowish-brown (10YR 5/6) sandy clay loam; grayish-brown (10YR 5/2) clay seams; massive; friable; few very dark brown (10YR 2/2) iron-manganese concretions, BB shot size or larger; neutral.

IIIC2—97 to 144 inches, yellowish-brown (10YR 5/6) and grayish-brown (10YR 5/2) gravelly sandy clay loam; massive; friable; 20 percent pebbles; neutral.

The solum ranges from 60 to 90 inches in thickness. The silty mantle ranges from 12 to 26 inches in thickness. The Ap horizon ranges from dark grayish brown (10YR 4/2) to dark brown (10YR 4/3). The B horizon is very strongly acid or strongly acid to a depth of about 43 inches, then grading to neutral with depth. In the B horizon hue is 10YR or 7.5YR, value is 4 or 5, and chroma ranges from 4 to 6. The C horizon is medium acid to neutral and becomes calcareous with depth.

Sardinia soils are in a drainage sequence that includes the well-drained Williamsburg soils. They are adjacent to Williamsburg soils in many places. Sardinia soils have low-chroma mottles, which are lacking in Williamsburg soils. They are more deeply leached, have more yellowish colors in the B horizon, and have less sand and gravel in the C horizon than Ockley soils.

Sardinia silt loam, 0 to 2 percent slopes (SaA).—This nearly level soil is on high terraces. Areas are irregular in shape and less than 35 acres in size. This soil has the profile described as representative for the series.

Included with this soil in mapping are small areas of well-drained soils. Also included are areas where the soil is similar to this Sardinia soil but is somewhat poorly drained.

Wetness is a moderate limitation where this soil is farmed. Seasonal wetness is a limitation to nonfarm uses. Capability unit IIw–2; woodland suitability group 2o1.

Sardinia silt loam, 2 to 6 percent slopes (SaB).—This gently sloping soil is on high terraces. Areas are irregular in shape and less than 40 acres in size. This soil has a profile similar to that described as representative for the series, except the surface layer is 3 or 4 inches thinner. It is generally next to Williamsburg soils.

Included with this soil in mapping are small areas of severely eroded soils.

Erosion is a moderate hazard where this soil is farmed. Seasonal wetness is a limitation to nonfarm uses. Capability unit IIe–1; woodland suitability group 2o1.

Sees Series

The Sees series consists of deep, gently sloping to moderately steep, moderately well drained soils that formed in colluvium weathered from calcareous shales and limestones. These soils are on colluvial foot slope positions that are bounded on the upper slope mostly by Eden or Edenton soils and on the lower slope by soils on terraces or flood plains. A few limestone flags are on the surface of this soil. All of the Sees soils are on foot slopes or benches of valley walls along the major drainage systems of the county.

In a representative profile in a cultivated area, the surface layer is very dark grayish-brown silty clay loam 6 inches thick. The subsoil, to a depth of 43 inches, is layers of light olive-brown, firm and very firm silty clay loam or silty clay that has dark olive-gray mottles in the upper part and gray and grayish-brown mottles in the lower part. Below this, to a depth of 60 inches, is calcareous, very firm, light olive-brown silty clay that has grayish-brown mottles.

Permeability in Sees soils is slow, and the rooting zone is moderately deep. Runoff is medium. These soils have a few seepy or wet spots because of their position on the landscape. Available water capacity is medium. Sees soils are commonly neutral or mildly alkaline in the root zone.

Sees soils are used mostly for woods and pasture.

Representative profile of Sees silty clay loam, 12 to 18 percent slopes, moderately eroded, in former cropland in Union Township; 800 feet south of sharp turn in Baldwin Road, three-fourths mile southwest of the junction of Baldwin and Binning Roads, and 1¾ miles south-southeast of Perintown:

Ap—0 to 6 inches, very dark grayish-brown (10YR 3/2) silty clay loam; moderate, medium, granular structure; friable; many roots; neutral; abrupt, smooth boundary.

B21tg—6 to 9 inches, light olive-brown (2.5Y 5/4) heavy silty clay loam; few, fine, distinct, dark olive-gray (5Y 3/2) mottles; weak, coarse, prismatic structure parting to strong, fine and medium, angular blocky; firm; common roots; medium, patchy, dark grayish-brown (2.5Y 4/2) clay films on ped faces; neutral; clear, smooth boundary.

B22tg—9 to 17 inches, light olive-brown (2.5Y 5/4) light silty clay; common, fine, distinct, dark olive-gray (5Y 3/2) and yellowish-brown (10YR 5/6) mottles; strong, medium, prismatic structure parting to strong, coarse, angular blocky; firm; few roots; medium, patchy, dark grayish-brown (2.5Y 4/2) clay films on ped faces; neutral; clear, smooth boundary.

B23tg—17 to 24 inches, light olive-brown (2.5Y 5/4) heavy silty clay loam; common, fine, distinct, gray (5Y 5/1) mottles; moderate, coarse, prismatic structure; very firm; thin, patchy, dark grayish-brown (2.5Y 4/2) clay films on vertical ped faces; mildly alkaline, calcareous; gradual, smooth boundary.

B3tg—24 to 43 inches, light olive-brown (2.5Y 5/4) heavy silty clay loam; common, fine, faint, grayish-brown (2.5Y 5/2) mottles; weak, coarse, prismatic structure; very firm; thin, very patchy, dark grayish-brown (2.5Y 4/2) clay films on vertical ped faces; mildly alkaline, calcareous; gradual, smooth boundary.

Cg—43 to 60 inches, light olive-brown (2.5Y 5/4) silty clay; common, fine, faint, grayish-brown (2.5Y 5/2) mottles; massive; very firm; sticky, plastic; mildly alkaline, calcareous.

The solum ranges from 40 to 60 inches in thickness. Depth to interbedded shale and limestone ranges from 40 to more than 80 inches. Limestone fragments make up 0 to 15 percent of the solum and 0 to 35 percent of the C horizon. The solum ranges from slightly acid to mildly alkaline and calcareous. The A horizon ranges from 6 to 10 inches in thickness and from very dark grayish brown (10YR 3/2) to dark brown (10YR 3/3). In the B2 horizon hue ranges from 2.5Y to 10YR, value is 4 or 5, and chroma ranges from 3 to 6. The Bt horizon ranges from heavy silty clay loam to silty clay.

Sees soils are in a drainage sequence that includes the well-drained Fairmount and Eden soils. Sees soils have a thicker solum than Eden or Fairmount soils.

Sees silty clay loam, 4 to 12 percent slopes, moderately eroded (SeC2).—This gently sloping to sloping soil is in areas that are long or irregular in shape and less than 20 acres in size. Areas of this soil are typically less than 300 feet in width. Small gullies commonly occur at 100- to 300-foot intervals.

This soil has a profile similar to that described as representative for the series, except the surface layer is slightly thicker and the combination of surface layer and subsoil is generally thicker.

Included with this soil in mapping are small areas of soils that have a somewhat lighter colored surface layer.

Erosion is a moderate hazard where this soil is used for cultivated crops. Excess water from adjacent steeper soils, slope, and slow permeability are limitations to nonfarm uses. Capability unit IIIe-2; woodland suitability group 2w2.

Sees silty clay loam, 12 to 18 percent slopes, moderately eroded (SeD2).—This moderately steep soil is in areas that are irregular in shape or long. They are less than 30 acres in size and generally less than 400 feet in width. Small gullies occur at 100- to 300-foot intervals. Between these gullies the surface layer ranges from 6 to 8 inches in thickness. This soil has the profile described as representative for the series.

Included with this soil in mapping are small areas of soils that have a lighter colored surface layer.

Erosion is a very severe hazard when this soil is used for cultivated crops. The plow layer is sticky and difficult to till when wet. Excess water from adjacent steeper soils, slow permeability, and slope are limitations to most nonfarm uses. Capability unit IVe-2; woodland suitability group 2w3.

Shoals Series

The Shoals series consists of nearly level, somewhat poorly drained soils. They formed in medium-textured alluvium washed from upland soils that formed in a silt mantle and in the underlying glacial till of Wisconsin and Illinoian age. These soils are in small areas on the flood plains along most of the major streams in the county. They also occur in shallow, depressional, oblong areas at the bases of slopes in uplands where drainage is blocked by slightly higher natural stream levees.

In a representative profile in a cultivated area, the surface layer is dark grayish-brown silt loam 7 inches thick. The subsoil, to a depth of 38 inches, is grayish-brown silt loam or silty clay loam that has yellowish-brown mottles and contains numerous dark-brown, BB-size iron-manganese concretions in the lower part. Below this, to a depth of 75 inches, is silty clay loam stratified with silt loam, loam, fine sand, and, in places, lenses of fine gravel.

Permeability in Shoals soils is moderate, and runoff is very slow. This soil is subject to flooding and has a seasonally high water table. Where adequately drained, this soil has a moderately deep root zone. Available water capacity is medium. Shoals soils are commonly neutral or mildly alkaline in the root zone.

Shoals soils are cultivated along with other soils on the flood plains. Corn, soybeans, and hay are commonly grown crops. Where flooding is frequent, this soil is better suited to pasture or woods than to row crops.

Representative profile of Shoals silt loam in a cultivated field in Jackson Township along the East Fork of the Little Miami River, 1¾ miles south of Marathon:

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; friable; many roots; neutral; abrupt, smooth boundary.

B1g—7 to 14 inches, grayish-brown (10YR 5/2) silt loam; many, fine, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium, subangular blocky structure; friable; many roots; neutral; clear, smooth boundary.

B2g—14 to 38 inches, grayish-brown (10YR 5/2) light silty clay loam; common, medium, prominent, dark yellowish-brown (10YR 4/4) and yellowish-brown (10YR 5/8) mottles; weak, medium, subangular blocky structure; friable; few roots; numerous BB-size, very dark brown iron-manganese concretions and stains on ped faces between depths of 30 and 38 inches; slightly acid; gradual, smooth boundary.

C—38 to 75 inches, dark grayish-brown (10YR 4/2) silty clay loam; many, medium, faint, dark-brown (10YR 3/3) and few, medium, prominent, yellowish-brown (10YR 5/6) mottles; massive; stratified; friable; texture in strata of alluvium varies, and strata contain thin, discontinuous strata of silt loam, loam, and fine sand; thin streaks of fine gravel generally separate thicker strata; mildly alkaline, calcareous.

The solum ranges from 24 to 40 inches in thickness, but it is typically 30 to 38 inches thick. Reaction in the solum is slightly acid to neutral. The Ap horizon ranges from dark grayish-brown (10YR 4/2) to brown (10YR 5/3). The B horizon ranges from silt loam to light silty clay loam, but it is commonly light silty clay loam. The C horizon is massive and, in places, contains strata of sandy loam to clay loam material in the upper part. Sand and gravel are common below depths of 55 to 65 inches.

Shoals soils are commonly adjacent to such other soils on flood plains as the moderately well drained Eel and well-drained Genesee soils. They are grayer and have more mottling than Eel or Genesee soils.

Shoals silt loam (Sh).—This nearly level soil is on low flood plains. Areas rarely are more than 30 acres in size and are generally long and narrow.

Included with this soil in mapping are a few areas of dark-colored soils and small areas of Medway overwash soils.

Wetness is a moderate limitation where this soil is farmed. Flooding is a limitation to both farm and nonfarm uses. Capability unit IIw-4; woodland suitability group 2w1.

Stonelick Series

The Stonelick series consists of nearly level, well-drained soils that formed in alluvium washed from silt-capped glaciated uplands. These soils are on oxbow remnants between stream overflow channels. They occur as small areas along the East Fork of the Little Miami River and its tributaries.

In a representative profile in a cultivated area, the surface layer is brown sandy loam 12 inches thick. The next layer, to a depth of 18 inches, is brown loamy sand. Below this, to a depth of 70 inches, are layers of brown sandy loam and dark grayish-brown sandy loam.

Permeability in Stonelick soils is moderately rapid, and the rooting zone is deep. Available water capacity is medium. Stonelick soils are mildly alkaline throughout the profile.

Most areas of Stonelick soils are used for farming, but some areas are wooded. Corn and soybeans are commonly grown.

Representative profile of Stonelick sandy loam in a cultivated field in Batavia Township; 2½ miles south-southeast of Batavia, 100 feet east of the East Fork of the Little Miami River, and one-fourth mile west of Elklick Road:

Ap—0 to 12 inches, brown (10YR 4)3) sandy loam; weak, fine, granular structure; friable; calcareous, mildly alkaline; clear, smooth boundary.

C1—12 to 18 inches, brown (10YR 5/3) loamy sand; single grained; loose; calcareous, mildly alkaline; clear, smooth boundary.

C2—18 to 28 inches, brown (10YR 4/3) light sandy loam; weak, coarse, subangular blocky structure; very friable; calcareous, mildly alkaline; gradual, smooth boundary.

C3—28 to 50 inches, dark grayish-brown (10YR 4/2) sandy loam; weak, fine, granular structure; very friable; calcareous, mildly alkaline; gradual, smooth boundary.

C4—50 to 70 inches, brown (10YR 4/3) light sandy loam; single grained; very friable; calcareous, mildly alkaline.

Depth to the underlying layers of stratified sand and gravel is more than 40 inches. The A horizon ranges from brown (10YR 4/3) to dark grayish brown (10YR 4/2). The C horizon ranges from dark grayish brown (10YR 4/2) to brown (10YR 5/3). Texture ranges from loam to light sandy loam, and in places the C horizon contains a layer of loamy sand less than 15 inches thick at a depth of 10 to 40 inches.

These soils are commonly adjacent to similar Genesee soils. Stonelick soils are generally slightly lower in elevation and are sandier than Genessee soils.

Stonelick sandy loam (St).—This nearly level soil is on flood plains. Areas are generally less than 30 acres in size, but in places they are as large as 50 acres. This soil is in irregularly shaped areas on oxbow remnants between stream channels and in long, narrow strips between the streams and Genesee soils.

Wetness is a moderate limitation where this soil is farmed. Flooding is a limitation to most nonfarm uses. Capability unit IIw-5; woodland suitability group 2o1.

Williamsburg Series

The Williamsburg series consists of gently sloping to moderately steep, well-drained soils. These soils formed in a silt mantle or silty loamy alluvium as much as 24 inches thick and in the underlying outwash material of stratified loam, clay loam, sandy loam, and gravel. They are on relatively high terraces as much as one-half mile wide that are along the Little Miami River and its tributaries.

In a representative profile in a cultivated area, the surface layer is dark-brown silt loam 8 inches thick. The subsurface layer, to a depth of 16 inches, is brown or yellowish-brown silt loam. The subsoil, to a depth of 44 inches, is dark yellowish-brown and dark-brown silt loam, silty clay loam, or clay loam. Below this, to a depth of 70 inches, the subsoil is dark-brown gravelly clay loam. The material below this, to a depth of 80 inches, is yellowish-brown, dark yellowish-brown, and pale-brown gravelly loam and gravelly sandy loam.

Permeability is moderate in Williamsburg soils, the rooting zone is deep, and available water capacity is high. These soils are typically slightly acid to very strongly acid in the root zone.

Williamsburg soils are in a drainage sequence that includes the moderately well drained Sardinia soils. They are more deeply leached and have a lower base saturation than Ockley soils, and they are more yellowish in the subsoil than Ockley or Fox soils. Williamsburg soils differ from similar Martinsville soils in that they contain gravel and are more acid in and below the subsoil.

Williamsburg soils are used intensively for farming. They are well suited to crops commonly grown in the county.

Representative profile of Williamsburg silt loam in a cultivated area of Williamsburg and Martinsville silt loams, 2 to 6 percent slopes, in the southeastern part of Batavia Township, on a high terrace position 25 feet north of field boundary, 5 miles southeast of Batavia, 100 feet west of Elklick Road, and one-half mile south of the East Fork of the Little Miami River.

Ap—0 to 8 inches, dark-brown (10YR 4/3) silt loam; weak, medium and fine, subangular blocky structure; friable; slightly acid; abrupt, smooth boundary.

A2—8 to 12 inches, brown (10YR 5/3) silt loam; weak, fine and medium, subangular blocky structure; friable; medium acid; clear, wavy boundary.

B&A—12 to 16 inches, yellowish-brown (10YR 5/4) silt loam; moderate, medium and fine, subangular blocky structure; friable; continuous pale-brown (10YR 6/3) silt coatings on ped faces; few fine, black concretions; medium acid; clear, wavy boundary.

B12t—16 to 22 inches, dark yellowish-brown (10YR 4/4) heavy silt loam; moderate, medium, subangular blocky structure; friable; thin, very patchy, dark-brown (7.5YR 4/4) clay films on peds; few, thin, brown (7.5YR 5/4) silt coatings on ped faces; common, fine, black concretions; very strongly acid; gradual, wavy boundary.

IIB22t—22 to 34 inches, dark-brown (7.5YR 4/4) silty clay loam; moderate, medium, subangular blocky structure; firm; this, patchy, dark-brown (7.5YR 4/4) clay films on ped faces; thin, very patchy, brown (7.5YR 5/4) silt coatings on some peds; common, fine, black concretions; 2 percent small rounded pebbles; very strongly acid; gradual, wavy boundary.

IIB23t—34 to 44 inches, dark-brown (7.5YR 4/4) clay loam; moderate, medium, subangular blocky structure; firm; thin, patchy, brown (7.5YR 5/4) clay films; thin, brown (7.5YR 5/4) silty coatings in places; common, fine, black concretions; 5 percent small rounded pebbles; strongly acid; gradual, wavy boundary.

IIB24—44 to 70 inches, dark-brown (7.5YR 4/4) gravelly clay loam; weak, coarse, subangular blocky structure; firm; thin dark-brown (7.5YR 3/2) clay films on peds and as coatings on sand grains and gravel; common, fine, black concretions; 25 percent fine gravel; strongly acid, gradual, wavy boundary.

IIC—70 to 80 inches, yellowish-brown (10YR 5/4), dark yellowish-brown (10YR (4/4), and pale-brown (10YR 6/3) gravelly loam and gravelly sandy loam; lenses of silt loam and silty clay loam; medium acid becoming mildly alkaline and calcareous with depth.

The solum ranges from 60 to 84 inches in thickness. The upper 12 to 24 inches is loess or silty alluvium. The Ap horizon ranges from dark brown (10YR 4/3) to brown (10YR 5/3). The upper part of the B horizon ranges from dark brown (7.5YR 4/4) to yellowish brown (10YR 5/4). Texture of the part of this horizon that formed in the silty mantle is silt loam or silty clay loam. The lower part of the B horizon formed in outwash. The texture range of this part of the horizon includes sandy clay loam and clay loam or gravelly clay loam. Color in the lower part of the B horizon ranges from dark brown 7.5YR 3/2) to dark reddish brown (5YR 3/2). In some profiles a B3 horizon is present. In the B3 horizon hue ranges from 7.5YR to 2.5YR, value is 3, and chroma ranges from 2 to 4. This horizon is typically dark reddish brown (5YR 3/4). It ranges from 6 to 24 inches in thickness and is at a depth of about 50 to 60 inches. In the Bt horizon reaction ranges from very strongly acid to strongly acid. The C horizon is generally gravelly loam to sandy clay loam and contains strata of silt loam, silty clay loam, or gravelly sandy loam. It is medium acid to neutral, and in places it becomes mildly alkaline and calcareous with depth.

Williamsburg and Martinsville silt loams, 2 to 6 percent slopes (WvB).—These gently sloping soils are on terraces. Areas are irregular in shape. They are commonly 30 acres or less in size but in places are as large as 50 acres. These soils generally are next to sloping or moderately steep Williamsburg and Martinsville soils or steeper Edenton or Hickory soils on uplands. They have the profile described as representative of their respective series.

Included with these soils in mapping are small areas of moderately eroded soils and areas of soils that have a reddish-brown subsoil.

Erosion is a moderate hazard where these soils are used for crops. Slope is a limitation to some nonfarm uses. Capability unit IIe-2; woodland suitability group 1o1.

Williamsburg and Martinsville silt loams, 6 to 12 percent slopes, moderately eroded (WvC2).—These sloping soils are in areas along the margin of stream terraces next to bottom land. Areas are short and narrow or irregular in shape and as much as 30 acres in size. Because of erosion, the plow layer in most cultivated areas is 2 or 3 inches thinner than the one in the profile described as representative for the respective series. The extent of the erosion varies within short distances, and the former yellowish-brown or dark-brown subsoil is evident on the surface in places. These soils are commonly next to gently sloping Williamsburg and Martinsville or Sardinia soils.

Included with these soils in mapping are small areas of soils that have a loam surface layer.

The hazard of further erosion is severe where these soils are cultivated. Slope is a limitation to nonfarm uses. Capability unit IIIe-1; woodland suitability group 1o1.

Williamsburg and Martinsville silt loams, 12 to 18 percent slopes, moderately eroded (WvD2).—These moderately steep soils are in areas on the margin of stream terraces next to bottom land. Areas are short and narrow or irregular in shape and as much as 20 acres in size. Because of erosion, the surface layer in most areas is 4 to 6 inches thinner than the one in the profile described as representative for the respective series. The extent of the erosion varies within short distances, and the former yellowish-brown or dark-brown subsoil is evident on the surface in many places. These soils are commonly next to gently sloping or sloping Williamsburg and Martinsville soils.

Included with these soils in mapping are a few small areas that have a loam surface layer and small areas of slightly eroded soils.

The hazard of further erosion is very severe where these soils are cultivated. Slope is a limitation to most nonfarm uses. Capability unit IVe-1; woodland suitability group 1r1.

Formation and Classification of the Soils

In this section the factors and processes of soil formation are listed, and the effects of these factors and processes on the formation of soils in Clermont County are described. Next the current system of soil classification is explained, and each soil series is placed in categories of the comprehensive classification system. Finally, in the last part of this section, laboratory data are presented for selected soils. The soil series in this county, including a profile representative of each series, are described in the section "Descriptions of the Soils."

Factors of Soil Formation

Unique soils are formed as the result of complex interactions among principal soil-forming factors. How soils were formed and thus acquired their present character at any given geographical point depends upon the physical and mineralogical composition of the parent material, the relief, the climate under which the soil material has accumulated and existed, the plant and animal life in and on the soil, and the length of time the soil-forming processes have acted upon the parent material.

Climate, vegetation, and animals are active factors in soil formation. The vegetative, animal, and microbial life, influenced by climate, act upon parent material and gradually change it into a natural body having genetically related horizons. The effects of climate and vegetation during soil development are modified by the parent material and by the relief which influences drainage. The parent material and the relief determine the kind of soil profile that is formed, and in some cases dominate the other factors of soil formation.

Time is required so that active soil-forming factors can transform parent material into a soil. The weathering, leaching, translocation of soil particles, formation of soil structure, and other soil-forming processes require time to differentiate horizons in the soil parent material.

Parent material

Parent material from which a soil develops is the unconsolidated mass of rock material resulting from the weathering of rocks. Some kinds of parent material are derived from bedrock, and others have been transported into the county by glaciers. Still others have been transported by wind or water. The parent material largely determines the chemical and mineralogical composition of soils.

In Clermont County the uppermost bedrock belongs to the Ordovician System. More specifically, the bedrock belongs to the Richmond, Maysville, and Eden formations of the Cincinnati series and also the Point Pleasant bed of the Cynthiana member of the Trenton formation. Within this county these bedrocks are all carbonaceous limestones and calciferous shales. The shales are generally high in carbonates of calcium, magnesium, and iron. They are generally bluish gray to greenish gray, fine textured, and have a medium content of potassium and phosphorus. The limestone is generally thinly bedded with shale and is brownish gray, blue, or bluish gray. It is generally fossiliferous, siliceous, and somewhat ferrugenous and is crystalline or granular in texture. The limestone is dense and hard, and it resists weathering.

The Eden and Fairmount soils in Clermont County formed in residuum weathered from these sedimentary limestones and shales (fig. 12). The fragments of limestone commonly found in the soils are inherited from the parent material, as are the chert and other pebble fragments of soils developed in till.

The mantle of glacial till deposited over the bedrock 100,000 to 300,000 years ago during the Illinoian glacial stage is the most common parent material in the county. It is highly weathered and strongly leached. The deposit of till on the uplands ranges from almost none to deposits that have a thickness of 10 to 15 feet. Thicker deposits are generally confined to preglacial valleys and ravines. The amount of coarse fragments in the till that was derived mostly from local or nearby sedimentary rock varies. Some of the coarse fragments were transported from northern areas as far away as Canada. The major drainage systems have eroded much of the till to the extent that only a trace is on many of the steep valley walls. Typically, this is where Edenton soils are located, since they formed in thin glacial till over residual parent material.

Other soils in the county formed in two unlike parent materials. Most of the Illinoian glacial drift plain was capped with loess. In Clermont County the thickness of this wind-transported silt ranges from 0 to 5 feet, but it averages about 1½ feet. More than 80 percent of the soils in the county formed in this thin loess capping and in the underlying till. The thick solum of these soils is leached generally to a depth of 4 or 5 feet or more and is relatively low in natural fertility.

Figure 12.—**Interbedded limestone and calcareous shale bedrock outcropping along a stream in an area of Eden flaggy silty clay loam, 12 to 18 percent slopes, moderately eroded.**

Soils on terraces in Clermont County formed in transported alluvium of complex origin. Most of this parent material consists of glacial outwash of the Wisconsin age. This glacial outwash is found mainly in the valleys of the Little Miami River and the East Fork of the Little Miami River, although the Wisconsin glacier terminated well north of Clermont County.

The more recent material of the Wisconsin age, 10,000 to 30,000 years old, can be distinguished from the older material of the Illinoian age. For example, the material of the Wisconsin age contains a greater proportion of stones that were transported from the northern areas, 10 to 15 percent being igneous and quartzite rock as opposed to 3 or 4 percent for the material of the Illinoian age. Also, the Wisconsin glacial stones are generally well rounded, indicating much wear or waterworking.

The Wisconsin meltwater eroded Illinoian materials and transported Wisconsin outwash. These transported materials, when deposited, became thickbedded, stratified, highly calcareous gravel and sand parent materials of terrace soils. The terraces are capped with loess of variable thickness. In areas where the Casco, Fox, and Ockley soils formed, the loess cap is thin or missing, and the soils formed in sand, gravel, and water-deposited silts and clays.

Soils on terraces and flood plains bordering the Ohio River formed in alluvium. The origin of these parent materials is dominantly residual material, of which a slight proportion is of the Illinoian age, and very little if any is of the Wisconsin age. The residual materials are characteristically micaceous and contain considerable acid (carbonaceous) black shale, sandstone, and coal.

Soils on flood plain positions other than along the Ohio River formed mainly in alluvium washed from the nearby surrounding uplands. This alluvium is mostly highly calcareous till that has been eroded. Thus the soils that formed in this material are high in natural fertility and have continued fertility because of the periodic deposits of fresh alluvium from floods.

Some soils in the county formed in lacustrine or slackwater deposits of fine sand, silt, and clay. The Markland, McGary, and Glenford soils formed in such material. The finer textured these soils are, the less deeply leached they are in comparison to soils having a greater content of silts and fine sands.

Colluvium from the steep residual valley walls is the parent material for the Sees soils. This residual material slumped from the valley walls and accumulated to a depth of more than 5 feet in many places on the foot slope positions.

Climate

The climate of Clermont County is characteristically humid, temperate, and continental. Soils in the county formed under the influence of this type of climate in a region forested with hardwood trees. Conditions have not been favorable for the accumulation of organic matter, except locally where poor drainage, recently deposited material, or the mineral composition (such as abundance of lime) favors its retention. For this reason the dominant soils of the county are light colored. A further discussion concerning climatic data for the county is given in the section "General Nature of the County."

Climate, among its other influences, greatly regulates the rate of weathering and decomposition of minerals, and for this reason it is important to soil development. Important climatic factors include precipitation, temperature, and the evapo-transpiration ratio. These factors are closely related to biotic communities and, on a regional basis, determine the kind of soils that form. In an area the size of Clermont County, the climate is fairly uniform, and soil differences are determined more by local differences in vegetation, parent material, relief, drainage, and the age of soil materials. Generally the climate of the county is influential in the development of moderately deeply leached and fairly well weathered soils.

The climate has influenced the removal of material by leaching. Because soluble bases are removed as they are released by decomposition from mineral material, the soils that formed are acid. Translocation of clay and sesquioxides is accomplished by water percolating from the surface to lower horizons. Most soils of the county are naturally acid, at least in the upper horizons, because the bases are continually leached downward.

The Avonburg and Rossmoyne soils, as well as others, show evidence of clay movement from the A to the B horizons. Rossmoyne soils show evidence of more intense weathering than other soils. They are more acid and have a lower content of weatherable minerals than most other soils.

The Blanchester and Mahalasville soils, because of their position on the landscape, formed under a wetter microclimate than most soils of the county. This results in saturation for extended periods and in gleying that is caused by the reduction and leaching of iron.

A drier microclimate has prevailed on steep slopes where surface runoff is rapid. This has significantly retarded the development of the shallow Fairmount soils.

Relief

Relief influences soil development by its effect on water relationships, erosion, temperature relationships, and vegetative cover. Surface runoff, ponding, depth to water table, internal drainage, accumulation and removal of organic matter, and other phenomena are directly or indirectly affected by relief. For instance, southeast-facing slopes are warmer than northwest-facing slopes. The consequential influence on interrelationships of other soil-forming factors greatly determines soil development.

Physiographically, the southern part of Clermont County is in the Outer Bluegrass region. The rest of the county lies in the Till Plains. Five general landscape topographies are recognized in the county; upland flats, gently sloping to sloping uplands, steep hillsides or valley walls, and terraces and flood plains. More than 60 percent of Clermont County is nearly level or very gently sloping, and about 20 percent is sloping to moderately steep. The remaining 20 percent is steep to very steep. Elevation in the county ranges from approximately 975 feet in the northeastern corner of the county to approximately 490 feet along the Ohio River in the southwestern corner.

Relief frequently accounts for the development of different soils from the same kind of parent material. Among the external features of soils, relief is often the most reliable in differentiating many soil series. Commonly a given set of soil characteristics is related to the slope and internal drainage. This can be illustrated by comparing the Blanchester, Rossmoyne, and Hickory soils, all of which formed in Illinoian glacial till.

Surface runoff of rainfall on sloping soils collects in depressions or is removed via the drainage systems. From an equivalent rainfall, therefore, sloping soils receive less water and depressional soils receive more water than soils in flat landscapes. Thus, soils having complex, gentle slopes generally show the greatest degree of development because the soil is neither saturated nor droughty. Soil development on steep soils, however, tends to be inhibited by the reduced amount of water entering the soil because of the influence of slope on runoff. Also, the geological erosion is unfavorable from the standpoint of soil formation, because the soil is maintained in a youthful stage of development. This is found to be true for the Eden soils.

Plant and animal life

Most of the soils of Clermont County formed under forests which originally completely covered the region. The vegetation at the time of settlement in Clermont County was dominantly a virgin forest of mixed hardwood trees. The trees growing on the Clermont soils on the uplands were white oak, beech, white elm, hickory, and gray ash. Those growing on the Avonburg and Rossmoyne upland soils were beech, white oak, red oak, black oak, hickory, gray ash, hard maple, black walnut, and yellow-poplar.

The Blanchester soils supported elm, hickory, redgum, white oak, and swamp white oak. After the virgin upland forest was cut, pin oak, red maple, and sweetgum comprised the second growth, and in many places, especially on Blanchester soils, became the dominant trees. The trees on terraces were hard maple, yellow-popular, black walnut, beech, and blue ash. Those on flood plains were sycamore, buckeye, white ash, willow, swamp white oak, white oak, and wild cherry. The trees on the sides of steep valleys were yellow-poplar, hard maple, beech, chinquapin oak, white oak, scarlet oak, blue ash, white ash, wild cherry, black walnut, and basswood. Now the sides of the valleys are mostly covered with a second growth of black locust.

For a more detailed discussion of forests in the county, see the section "Use of Soils for Woodland."

Because of the clearing of forests and subsequent cultivation, accelerated erosion and a general depletion of organic matter from cultivated soils are readily evident. Construction of buildings and other operations by man have partly or completely destroyed soils in many places.

Higher forms of animal life contribute greatly to soil formation by mixing inorganic and organic materials, by loosening the soil, and by aiding in the decomposition of organic matter. Small animals, such as insects, worms, and crayfish, make the soil more permeable by burrowing channels in it. Crayfish are particularly influential in Clermont County. They bring to the surface each year a considerable volume of underlying material to build their "castles." After mixing the soil materials in their life activities, animals contribute to the content of organic matter of the soil after death. Micro-organisms, most numerous in the uppermost horizons, aid in the decomposing of organic matter and in the weathering of rocks. Many of the chemical processes is soils can be traced directly or indirectly to the activities of micro-organisms.

Time

The length of time that parent material has been exposed to soil-forming elements is important to soil development. Generally the longer the time that climatic elements and plant and animal life have acted upon parent material, the more distinct are the horizons of the soil profile. The distinctiveness of the horizons indicates the relative maturity of soils.

The approximate age and relative maturity of soils in Clermont County can be determined by the relative ages of deposits of till, loess, and alluvial parent material and by the relative degree of soil profile development. Soil maturity is influenced by and related to time. Maturity, however, is not directly proportional to time, because the soil-forming processes are influenced by interactions of the soil-forming factors. A mature soil profile is one that has easily recognized zones of eluviation (A horizon) and illuviation (B horizon). Less time is generally required for a mature soil to develop in a humid, warm area where vegetation is abundant than in a dry or cold area where vegetation is scarce. Also, less time is generally required if the parent material is coarse textured than if it is fine textured.

Soils that formed in recent flood plain alluvium, such as Huntington, Lindside, and Genesee, have no strongly differentiated horizons. The time necessary for other soil-forming factors to significantly influence the soil has not yet elapsed. These are the youngest and the least developed soils in the county.

The age of Eden and Fairmount soils on the steep residual valley walls is intermediate between that of level soils on the glaciated uplands and those on the recent flood plains. Geological erosion on sloping soils has removed part of the soil from the surface downward as it formed, and thus has prevented the full expression of other soil-forming factors.

The Avonburg, Cincinnati, Clermont, and Rossmoyne soils are among the oldest in the county. They have developed during the 100,000 to 300,000 years since the Illinoian glacial ice receded. The loess capping, more recent than the Illinoian glacial till, has been incorporated into the soil profile by continued processes of soil development. The till and loess parent materials developed over the years into the most weathered and most strongly leached soils of the county. This is evidenced by the relatively distinct horizons, low base saturation, and strong acidity.

Higher terrace soils in the major valley systems of the county are older than the flood plain soils and exhibit stronger characteristics of greater maturity. These soils formed in material of the early Wisconsin age or earlier capped by loess deposited since the Wisconsin glaciation. Thus, these soils are intermediate in age in comparison with other soils in the county.

Processes of Soil Formation

Basic chemical and physical processes, such as oxidation, reduction, hydration, hydrolysis, solution, eluviation (leaching), illuviation (accumulation), and others, bring about additions to, losses from, and transfers and transformations within soils (*12*). These many processes, influenced by the interrelationships of the soil-forming factors, are responsible for the changing of parent materials by steps and stages, none of which are distinct. First the change is to a youthful soil, and finally it is to a mature soil or to one that is dynamically in equilibrium with its environment.

Additions to soils are in the form of organic matter, sediment depositions, or accumulations of nutrients and colloidal material from such sources as organic matter, ground water, lime, and fertilizer. Most likely all virgin soils in the county except perhaps recent soils on flood plains, had a surface layer of organic accumulation known as an A1 horizon. Cultivation, however, has since destroyed this horizon, or severe erosion has removed all evidence of it from the soil profile. Some nutrients move in a cycle from soil to plants and then back to the soil as byproducts of organic-matter decomposition. This is true for all soils in the county except those in areas where this process is modified because of the harvesting of crops. The Blanchester soil has a high base saturation because of the periodic resupply of bases from ground water, which seasonally saturates the soil. The Genesee, Huntington, and Shoals soils periodically receive sediment deposits from flood waters.

Soil losses commonly result from erosion, leaching of soluble salts, eluviation of colloids with percolating waters, and harvesting of crops. Leaching of carbonates accounts for the most significant soil nutrient losses in Clermont County. Another cause of these losses is the harvesting of crops. Carbonates have been removed to a depth of 2 to 10 feet in most of the upland soils, such as Avonburg, Cincinnati, and Rossmoyne. The fact that the parent material of these soils was 20 to 35 percent calcium carbonate and that these soils are now acid in reaction indicates the tremendous change effected by leaching. Other minerals in the soils commonly break down through a complicated series of processes in many places. Eventually they are lost through leaching but at a slower rate than the carbonates.

The decomposition of other minerals commonly produces free iron oxides, which account for the fairly bright reddish or brownish colors in the Cincinnati, Fox, and Hickory soils. The recurrent or seasonal water table in Blanchester, Mahalasville and other soils causes a reduction of iron oxides and subsequent loss by leaching. This phenomenon is mainly responsible for the gray colors of these soils. The mottling observed in Avonburg and Clermont soils is caused by local accumulations of iron compounds (or other materials in other soils) or by localized oxidation of iron compounds. The presence of this mottling is an indication of the poor and somewhat poor drainage.

Classification of Soils

Soils are classified so that we can more easily remember their significant characteristics. Classification enables us to assemble knowledge about the soils, to see their relationship to one another and to the whole environment, and to develop principles that help us to understand their behavior and their 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 narrow categories of classification, such as those used in detailed soil surveys, allow us to organize and apply knowledge about soils in managing farms, fields, and woodlands; in developing rural areas; in engineering work; and in many other ways. Soils are placed in broad classes to facilitate study and comparison in large areas such as countries and continents.

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965 (*17*). Because this system is under continual study, readers interested in developments of the current system should search the latest literature available (*13*, *16*).

The current system of classification has six categories. Beginning with the broadest, these categories are order, suborder, great group, subgroup, family, and series. In this system the criteria used as a basis for classification are soil properties that are observable and measurable. The properties are chosen, however, so that the soils of similar genesis, or mode of origin, are grouped together. In table 9 the soil series of Clermont County are placed in four categories of the current system. Classes of the current system are briefly defined in the following paragraphs.

Order. Ten soil orders are recognized. They are Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. The properties used to differentiate among soil orders are those that tend to give broad climatic groupings of soils. The two exceptions to this are the Entisols and Histosols, which occur in many different climates. The four orders represented in Clermont County are Entisols, Inceptisols, Mollisols, and Alfisols.

Suborder. Each order is subdivided into suborders that are based mainly on those soil characteristics that seem to produce classes with the greatest genetic similarity. The suborders narrow the broad climatic range permitted in the orders. The soil properties used to separate suborders are mainly those that reflect either the presence or absence of waterlogging, or soil differences resulting from the climate or vegetation. The names of suborders have two syllables. The last syllable indicates the order. An example is *Aquent* (*Aqu*, meaning water or wet, and *ent*, from Entisol).

Great Group. Soil suborders are separated into great groups on the basis of uniformity in the kinds and sequence of major soil horizons and features. The horizons used to make separations are those in which clay, iron, or humus have accumulated; those that have pans that interfere with growth of roots, movement of water, or both; and thick, dark-colored surface horizons. Among the features used are the self-mulching properties of clay, soil temperature, major differences in chemical composition (mainly calcium, magnesium, sodium, and potassium), and dark-red and dark-brown colors associated with basic rocks. The names of great groups have three or four syllables and are made by adding a prefix to the name of the suborder. An example is Halpaquents (*Halpl*, meaning simple horizons, *aqu* for wetness or water, and *ent.* from Entisols).

Subgroup. Great groups are subdivided into subgroups, one representing the central (typic) segment of the group, and others, called intergrades, that have properties of the group and also one or more properties of another great group, suborder, or order. Subgroups may also be made in those instances where soil properties intergrade outside of the range of any other great group, suborder, or order. The names of subgroups are derived by placing one or more adjectives before the name of the great group. An example is Typic Haplaquents (a typical Haplaquent).

Family. Soil families are separated within a subgroup mainly on the basis of properties important to the growth of plants or on the behavior of soils when used for engineering. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence. A family name consists of a series of adjectives preceding the subgroup name. The adjectives are the class names for texture, mineralogy, and so on, that are used as family differentiae (table 9). An example is the fine-loamy, mixed, mesic family of Fluvaquentic Hapludolls.

Series. The series has the narrowest range of characteristics of the categories in the classification system. It is defined in the section "How This Survey Was Made." A detailed description of each soil series in the county is given in the section "Descriptions of the Soils."

Some of the soils in this county do not fit in a series that has been recognized in the classification system, but recognition of a separate series would not serve a useful purpose. Such soils are named for the series they strongly resemble because they differ from those series in ways too small to be of consequence in interpreting their usefulness or behavior. Soil scientists designate such soils as taxadjuncts to the series for which they are named. In this survey, soils named in the Fox, Hickory, Huntington, and Rodman series are taxadjuncts to those series.

TABLE 9.—*Classification of soil series into higher categories*

Series	Family	Subgroup	Order
Alluvial land, sloping.[1]			
Avonburg	Fine-silty, mixed, mesic	Aeric Fragiaqualfs	Alfisols.
Blanchester	Fine-silty, mixed, mesic	Typic Ochraqualfs	Alfisols.
Casco	Fine-loamy over sandy or sandy-skeletal, mixed, mesic	Typic Hapludalfs	Alfisols.
Cincinnati	Fine-silty, mixed, mesic	Typic Fragiudalfs	Alfisols.
Clermont	Fine-silty, mixed, mesic	Typic Ochraqualfs	Alfisols.
Eden	Fine, mixed, mesic	Typic Hapludalfs	Alfisols.
Edenton	Fine, mixed, mesic	Typic Hapludalfs	Alfisols.
Eel	Fine-loamy, mixed, mesic	Fluvaquentic Eutrochrepts	Inceptisols.
Fairmount	Clayey, mixed, mesic, shallow	Typic Hapludolls	Mollisols.
Fox [2]	Fine-loamy over sandy or sandy-skeletal, mixed, mesic	Typic Hapludalfs	Alfisols.
Genesee	Fine-loamy, mixed, mesic	Fluventic Eutrochrepts	Inceptisols.
Glenford	Fine-silty, mixed, mesic	Aquic Hapludalfs	Alfisols.
Hickory [3]	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols.
Huntington [4]	Fine-silty, mixed, mesic	Fluventic Hapludolls	Mollisols.
Lanier	Sandy-skeletal, mixed, mesic	Fluventic Hapludolls	Mollisols.
Lindside	Fine-silty, mixed, mesic	Fluvaquentic Eutrochrepts	Inceptisols.
Mahalasville	Fine-silty, mixed, mesic	Typic Argiaquolls	Mollisols.
Markland	Fine, mixed, mesic	Typic Hapludalfs	Alfisols.
Martinsville	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols.
McGary	Fine, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Medway	Fine-loamy, mixed, mesic	Fluvaquentic Hapludolls	Mollisols.
Newark	Fine-silty, mixed, nonacid, mesic	Aeric Fluvaquents	Entisols.
Ockley	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols.
Riverwash.[5]			
Rodman [6]	Sandy-skeletal, mixed, mesic	Typic Hapludolls	Mollisols.
Ross	Fine-loamy, mixed, mesic	Cumulic Hapludolls	Mollisols.
Rossmoyne	Fine-silty, mixed, mesic	Aquic Fragiudalfs	Alfisols.
Sardinia	Fine-silty, mixed, mesic	Aquic Hapludalfs	Alfisols.
Sees	Fine, mixed, mesic	Aquollic Hapludalfs	Alfisols.
Shoals	Fine-loamy, mixed, nonacid, mesic	Aeric Fluvaquents	Entisols.
Stonelick	Coarse-loamy, mixed (calcareous), mesic	Typic Udifluvents	Entisols.
Williamsburg	Fine-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols.

[1] Alluvial land, sloping, is classified only at the Great Group level (Udifluvents) because of its extreme variability. Udifluvents belong to the Order Entisols.

[2] These soils are taxadjuncts to the Fox series in that they have slightly more clay in the argillic horizon than is defined for the series. The classification of the taxadjunct is Typic Hapludalfs; clayey over sandy or sandy-skeletal, mixed, mesic.

[3] These soils are taxadjuncts to the Hickory series in that they have a thinner solum and are shallower to carbonates than is defined for the series.

[4] These soils are taxadjuncts to the Huntington series in that they have a weak argillic horizon. The classification of the taxadjunct is Typic Argiudolls; fine-silty, mixed, mesic.

[5] Riverwash is classified only at the Great Group level (Udifluvents and Fluvaquents) because of its extreme variability. Udifluvents and Fluvaquents both belong to the Order Entisols.

[6] These soils are taxadjuncts to the Rodman series in that they have a calcium carbonate equivalent of more than 40 percent immediately below the mollic epipedon. The classification of the taxadjunct is Eutrochreptic Rendolls; sandy-skeletal, crabonatic, mesic.

Laboratory Data

Laboratory data are given in table 10 for 12 soil series in Clermont County. Profile descriptions for these series are in the section "Descriptions of the Soils." Of the soils tested in table 10, the Fox, Hickory, and Huntington soils are slightly outside of the defined range of their respective series and are considered taxadjuncts in Clermont County. These differences are: Fox soils have slightly more clay in the Bt horizon than is defined for the series; Hickory soils have a thinner solum and are shallower to carbonates than is defined for the series; and Huntington soils have a weakly developed argillic horizon, which is outside of the defined range for the series. Data given in table 10 were obtained by laboratory analysis at the Agronomy Department, Ohio Agricultural Research and Development Center (OARDC), Columbus, Ohio. The soils analyzed were selected to add to the knowledge of Ohio soils and to aid in their proper classification and interpretations.

Published and unpublished laboratory data are available for nearly all soil series of Clermont County. Published laboratory data are also available in the soil surveys of nearby counties. Unpublished data are on file at the Agronomy Department, OARDC, Columbus, Ohio; the Ohio Department of Natural Resources, Division of Lands and Soil, Columbus, Ohio; and the Soil Conservation Service, State Office, Columbus, Ohio.

Some of the procedures used to obtain the data presented in table 10 are outlined in the following paragraphs.

Particle-size distribution data were obtained by the pipette method outlined by Steele and Bradfield (*14*), but using sodium hexametaphosphate as the dispersing agent and a 10-gram soil sample. The sand fractions were determined by sieving. The fine silt and coarse clay (20–0.2μ) were determined by sedimentation, and the fine clay ($<0.2\mu$) was determined by sedimentation in a centrifuge. The coarse silt was determined by subtracting sand, fine silt, and clay from the total sample. The percentage of

TABLE 10.—*Laboratory*

[Analyses by Agronomy Department, Ohio Agricultural Research and Development

Soil name and sample 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 (2.0 to 0.05 mm)	Silt (0.05 to 0.002 mm)	Clay (less than 0.002 mm)	Fine clay (less than 0.0002 mm)
		In	*Pct*	*Pct*	*Pct*	*Pct*	*Pct*	*Pct*	*Pct*	*Pct*	*Pct*
Blanchester silt loam, CL–13.	Ap	0–7	0. 6	1. 6	1. 3	3. 1	2. 8	9. 4	67. 5	23. 1	6. 4
	A12	7–14	. 8	1. 4	1. 3	3. 3	3. 4	10. 2	65. 6	24. 2	8. 0
	B1tg	14–20	. 9	1. 8	1. 4	3. 3	3. 1	10. 5	64. 6	24. 9	8. 0
	IIB21tg	20–29	1. 4	1. 9	1. 1	2. 5	2. 5	9. 4	58. 3	32. 3	10. 3
	IIB22tg	29–39	2. 3	2. 8	1. 2	2. 3	2. 2	10. 8	51. 0	38. 2	18. 5
	IIB22tg	39–49	3. 2	4. 3	2. 5	5. 6	4. 6	20. 2	43. 1	36. 7	18. 3
	IIB23tg	49–58	1. 6	3. 7	3. 2	7. 7	6. 3	22. 5	39. 0	38. 5	20. 2
	IIB3	58–68	1. 8	5. 3	4. 8	11. 8	9. 7	33. 4	31. 3	35. 3	19. 1
	IIC1	68–74	2. 7	6. 1	4. 9	11. 5	8. 5	33. 7	28. 8	37. 5	20. 6
	IIC2	74–83	1. 5	6. 8	7. 3	15. 3	7. 3	38. 2	26. 9	34. 9	13. 7
	IIIC3	83–90	. 6	1. 3	1. 3	6. 1	12. 3	21. 6	38. 3	40. 1	15. 0
	IIIC4	90–100	3. 1	5. 6	2. 9	9. 8	10. 0	31. 4	38. 5	30. 1	7. 6
Cincinnati silt loam, CL–8.	Ap	0–8	. 9	2. 2	2. 3	5. 9	5. 5	16. 8	66. 4	16. 8	5. 3
	B1t	8–14	. 7	1. 9	2. 2	5. 7	5. 1	15. 6	59. 9	24. 5	10. 6
	B21t	14–19	2. 1	3. 8	3. 6	9. 5	8. 1	27. 1	46. 5	26. 4	14. 3
	IIBx1	19–27	2. 1	4. 5	4. 6	12. 2	10. 6	34. 0	45. 0	21. 0	9. 3
	IIBx2	27–36	1. 8	3. 7	3. 8	11. 1	9. 4	29. 8	37. 7	32. 5	14. 4
	IIB22t	36–44	1. 6	3. 2	3. 3	8. 6	7. 2	23. 9	24. 6	51. 5	26. 4
	IIB23t	44–52	1. 6	3. 9	4. 1	10. 3	8. 0	27. 9	25. 5	46. 6	25. 5
	IIB3	52–60	2. 6	4. 6	4. 4	11. 1	9. 1	31. 8	33. 4	34. 8	17. 1
	IIC1	60–70	5. 4	7. 1	5. 4	11. 5	10. 3	39. 7	40. 1	20. 2	8. 9
	IIC2	70–80	6. 6	8. 2	5. 6	11. 9	10. 1	42. 4	41. 4	16. 2	5. 9
Clermont silt loam, CL–19	Ap	0–8	1. 0	3. 0	3. 6	10. 6	10. 0	28. 2	58. 1	13. 7	4. 3
	A2g	8–12	. 7	2. 3	3. 0	9. 3	8. 6	23. 9	59. 4	16. 7	6. 2
	A9Bg	12–17	. 8	2. 0	2. 6	8. 0	8. 0	21. 4	55. 4	23. 2	11. 1
	B9Ag	17–22	. 4	1. 6	2. 1	6. 2	6. 1	16. 4	52. 5	31. 1	18. 0
	B21tg	22–29	. 6	1. 4	1. 9	5. 5	5. 2	14. 8	47. 9	37. 3	23. 1
	B22tg	29–34	. 7	1. 9	2. 1	5. 8	4. 6	15. 1	49. 7	35. 2	22. 1
	B23tg	34–40	1. 1	2. 2	2. 4	6. 7	5. 8	18. 2	46. 7	35. 1	21. 2
	IIB24tg	40–51	. 7	2. 7	3. 5	10. 5	9. 9	27. 4	39. 8	32. 8	21. 2
	IIB24tg	51–60	1. 0	2. 9	3. 8	11. 9	10. 5	30. 2	36. 7	33. 1	21. 0
	IIB3	60–75	1. 0	2. 9	3. 7	11. 8	10. 6	30. 0	36. 7	33. 3	20. 5
	IIB3	75–86	1. 3	3. 3	3. 4	10. 3	10. 3	28. 6	36. 6	34. 8	18. 4
Eden flaggy silty clay loam, CL–17.	A1	0–4	. 3	. 4	. 3	. 6	1. 0	2. 6	61. 2	36. 2	11. 7
	B1	4–9	. 2	. 4	. 4	. 8	1. 3	3. 1	67. 6	29. 3	4. 5
	B21t	9–18	. 2	. 3	. 2	. 6	1. 3	2. 6	56. 9	40. 5	13. 7
	B22t	18–27	. 1	. 2	. 2	. 5	1. 3	2. 3	53. 0	44. 7	16. 8
Edenton loam, CL–12	A1	0–3	1. 6	5. 4	5. 3	14. 3	9. 3	35. 9	42. 9	21. 2	9. 0
	AB	3–5	2. 1	4. 1	4. 2	12. 0	8. 5	30. 9	42. 3	26. 8	10. 8
	B21t	5–9	2. 2	3. 9	3. 5	9. 9	7. 2	26. 7	41. 1	32. 2	14. 9
	B22t	9–15	1. 8	3. 7	3. 8	10. 7	8. 2	28. 2	37. 2	34. 6	16. 5
	B23t	15–22	1. 8	3. 8	3. 8	10. 4	8. 3	28. 1	38. 1	33. 8	16. 2
	IIB3	22–27	1. 3	1. 7	1. 3	3. 5	3. 6	11. 4	53. 3	35. 3	13. 2
Fox silt loam, CL–5	Ap	0–8	3. 6	7. 4	4. 8	6. 3	3. 1	25. 2	56. 0	18. 8	4. 8
	B1	8–10	3. 6	7. 3	4. 7	6. 4	3. 0	25. 0	55. 9	19. 1	5. 5
	B21t	10–15	2. 2	4. 7	4. 3	8. 1	3. 2	22. 5	50. 7	26. 8	13. 1
	IIB22t	15–22	5. 7	7. 0	3. 5	5. 3	3. 2	24. 7	33. 1	42. 2	25. 1
	IIB23t	22–29	5. 8	9. 3	3. 7	4. 2	3. 1	26. 1	28. 7	45. 2	27. 9
	IIB3t	29–35	10. 0	17. 3	6. 9	6. 9	4. 5	45. 6	30. 2	24. 2	12. 3
Hickory loam, CL–11	A1	0–2	3. 1	5. 9	6. 2	14. 7	8. 5	38. 4	39. 2	22. 4	10. 0
	B1t	2–5	3. 4	5. 7	6. 2	14. 9	9. 6	39. 8	34. 8	25. 4	10. 7
	B21t	5–11	2. 1	5. 1	5. 6	12. 8	8. 5	34. 1	32. 7	33. 2	17. 8
	B22t	11–16	2. 3	5. 5	6. 0	13. 0	8. 5	35. 3	29. 9	34. 8	19. 5
	B23t	16–21	3. 2	5. 3	5. 4	12. 3	8. 8	35. 0	29. 0	36. 0	22. 1
	B23t	21–26	2. 5	4. 6	5. 0	11. 9	9. 0	33. 0	30. 6	36. 4	22. 7
	B3t	26–31	2. 5	5. 6	5. 9	13. 4	9. 3	36. 7	29. 9	33. 4	20. 2
	C1	31–36	6. 9	8. 4	6. 7	14. 2	10. 0	46. 2	36. 7	17. 1	7. 7
	C2	36–46	4. 9	9. 4	7. 4	14. 8	10. 3	46. 8	37. 2	16. 0	7. 1

data

Center. Absence of data indicates that no determination was made]

Textural class	Reaction	Organic-matter content	$CaCO_3$ equivalent	Extractable cations (milliequivalents per 100 grams of soil)						Base saturation (sum)
				H	Ca	Mg	K	Sum of extractable cations	Sum of bases	
	pH	*Pct*	*Pct*							*Pct*
Silt loam	5.3	2.6	----	9.7	9.1	1.8	0.26	20.9	11.2	53
Silt loam	4.9	1.4	----	9.7	6.7	1.2	.17	17.8	8.1	45
Silt loam	5.0	.9	----	11.3	6.5	1.2	.18	19.2	7.9	41
Silty clay loam	4.9	.7	----	14.4	10.0	1.8	.24	26.4	12.0	45
Silty clay loam	5.1	.5	----	12.3	16.1	3.7	.39	32.5	20.2	62
Clay loam	5.3	.5	----	12.2	17.6	2.0	.30	32.1	19.9	62
Clay loam	5.7	.5	----	8.1	21.0	4.8	.32	34.2	26.1	76
Clay loam	6.2	.3	----	4.9	19.9	3.9	.23	28.9	24.0	83
Clay loam	6.9	.3	----	4.7	19.8	4.7	.25	29.4	24.7	84
Clay loam	7.4	----	2.2	----	----	----	----	----	----	----
Clay	7.6	----	6.9	----	----	----	----	----	----	----
Clay loam	7.7	----	31.1	----	----	----	----	----	----	----
Silt loam	4.8	1.4	----	9.7	1.8	.3	.23	12.0	2.3	19
Silt loam	4.7	.7	----	11.0	2.6	.5	.23	14.3	3.3	23
Loam	4.7	.3	----	10.6	4.1	1.1	.22	16.0	5.4	34
Loam	4.9	.3	----	8.3	3.6	1.2	.21	13.3	5.0	38
Clay loam	5.0	.5	----	11.7	6.0	1.8	.23	19.7	8.0	41
Clay	4.8	.3	----	18.4	10.4	3.6	.34	32.7	14.3	44
Clay	4.8	.3	----	16.8	9.5	3.4	.29	30.0	13.2	44
Clay loam	6.0	.5	----	5.0	14.3	3.4	.21	22.9	17.9	78
Loam	7.6	----	29.9	----	----	----	----	----	----	----
Loam	8.0	----	38.7	----	----	----	----	----	----	----
Silt loam	5.0	1.5	----	7.0	2.1	1.0	.14	10.2	3.2	32
Silt loam	4.9	.7	----	6.6	2.1	1.0	.09	9.8	3.2	33
Silt loam	4.9	.5	----	9.9	3.0	1.5	.15	14.5	4.6	32
Silty clay loam	4.8	.5	----	10.9	4.0	2.9	.11	17.9	7.0	39
Silty clay loam	4.9	.3	----	14.4	6.3	4.7	.19	25.6	11.2	44
Silty clay loam	5.0	.3	----	12.2	7.2	5.6	.33	25.3	13.1	52
Silty clay loam	5.1	.3	----	10.4	8.5	6.4	.33	25.6	15.2	59
Clay loam	5.4	.2	----	6.7	10.3	7.1	.21	24.3	17.6	72
Clay loam	5.7	.3	----	5.2	11.5	7.7	.21	24.6	19.4	79
Clay loam	6.4	.2	----	4.3	12.1	8.2	.19	24.8	20.5	83
Clay loam	6.8	.2	----	4.5	12.7	7.8	.17	25.2	20.7	82
Silty clay loam	6.0	7.7	----	11.3	14.6	1.4	.46	27.8	16.5	59
Silty clay loam	5.4	2.9	----	13.9	10.0	.8	.28	25.0	11.1	44
Silty clay	5.2	1.2	----	14.8	8.6	1.2	.34	24.9	10.1	41
Silty clay	5.4	1.0	----	11.6	14.0	1.3	.33	27.2	15.6	57
Loam	6.2	11.2	----	7.3	10.8	2.0	.59	20.7	13.4	65
Loam	5.6	2.8	----	7.8	6.7	1.7	.28	16.5	8.7	53
Clay loam	5.2	.9	----	8.5	7.5	2.1	.28	18.4	9.9	54
Clay loam	5.2	.7	----	8.2	9.0	2.0	.31	19.5	11.3	58
Clay loam	5.8	.5	----	4.9	12.0	2.1	.31	19.3	14.4	75
Silty clay loam	7.3	----	2.3	----	----	----	----	----	----	----
Silt loam	5.5	1.7	----	10.3	5.7	1.0	.20	17.2	6.9	40
Silt loam	5.6	1.5	----	7.8	5.4	1.1	.18	14.5	6.7	46
Silt loam	5.5	.7	----	6.9	8.3	1.2	.20	16.6	9.7	58
Clay	5.5	.9	----	11.5	15.7	1.3	.45	28.9	17.4	60
Clay	5.6	.9	----	12.2	18.3	1.3	.43	32.2	20.0	62
Loam	6.8	----	8.7	----	----	----	----	----	----	----
Loam	6.0	6.0	----	9.7	11.4	3.3	.36	24.8	15.1	61
Loam	5.4	2.2	----	9.1	6.7	2.7	.26	18.8	9.7	51
Clay loam	5.2	1.0	----	9.6	6.9	3.5	.28	20.3	10.7	53
Clay loam	5.5	.9	----	8.5	7.9	4.0	.28	20.7	12.2	59
Clay loam	5.4	.7	----	8.3	8.8	4.7	.32	22.1	13.8	62
Clay loam	5.6	.9	----	7.2	10.1	5.4	.30	23.0	15.8	69
Clay loam	6.8	.9	----	4.8	11.9	6.1	.26	23.1	18.3	79
Loam	8.3	----	28.6	----	----	----	----	----	----	----
Loam	8.3	----	30.7	----	----	----	----	----	----	----

Table 10.—*Laboratory*

Soil name and sample 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 (2.0 to 0.05 mm)	Silt (0.05 to 0.002 mm)	Clay (less than 0.002 mm)	Fine clay (less than 0.0002 mm)
		In	*Pct*	*Pct*	*Pct*	*Pct*	*Pct*	*Pct*	*Pct*	*Pct*	*Pct*
Huntington silt loam, CL-16.	Ap	0-8	.1	.3	.7	6.4	14.5	22.0	56.3	21.7	5.2
	B21t	8-14	.1	.2	.8	7.6	15.0	23.7	55.7	20.6	3.7
	B21t	14-20	0	.2	.7	4.0	9.6	14.5	56.6	28.9	4.5
	B22t	20-28	0	0	.2	1.3	8.9	10.4	57.2	32.4	6.7
	B23t	28-36	0	0	.1	1.3	10.0	11.4	57.5	31.1	7.1
	B3	36-44	0	0	.1	1.2	9.2	10.5	57.5	32.0	8.4
	B3	44-52	0	0	.2	2.2	7.7	10.1	55.5	34.4	9.7
	C1	52-60	0	0	.5	5.8	12.2	18.5	50.9	30.6	9.2
	C1	60-70	0	0	.9	11.4	14.9	27.2	45.7	27.1	8.2
	C1	70-80	0	0	.6	9.7	13.0	23.3	49.2	27.5	8.4
	C2	80-90	0	0	1.3	17.5	14.5	33.3	43.2	23.5	7.1
	C2	90-100	0	.1	1.2	12.0	12.2	25.5	49.0	25.5	7.6
	C2	100-110	0	.1	2.7	23.2	13.6	39.6	39.0	21.4	6.4
Markland silt loam, CL-9	Ap	0-10	.4	1.2	.9	1.5	3.5	7.5	75.0	17.5	2.9
	B1	10-12	.2	1.0	.9	1.1	2.9	6.1	71.0	22.9	5.8
	IIB21t	12-22	.1	.6	.4	.6	3.1	4.8	59.3	35.9	16.7
	IIB22t	22-28	0	.2	.1	.4	2.6	3.3	48.6	48.1	19.8
	IIB23t	28-32	0	.1	.1	.4	1.3	1.9	45.0	53.1	22.9
	IIB24t	32-39	0	.1	.1	.2	1.0	1.4	45.7	52.9	21.4
	IIB3t	39-44	0	0	0	.2	.7	.9	45.4	53.7	20.9
	IIC1	44-60	0	0	0	.2	.5	.7	56.1	43.2	16.0
	IIC2	60-70	0	0	.1	.3	.6	1.0	49.1	49.9	19.6
	IIC3	70-80	0	0	0	.1	.3	.4	61.9	37.7	13.0
Ockley silt loam, CL-7	Ap	0-7	.6	1.2	2.1	13.8	12.8	30.5	54.4	15.1	4.3
	A2	7-11	.5	1.6	2.2	13.7	12.4	30.4	53.0	16.6	4.1
	B11t	11-17	.6	1.5	2.0	12.7	11.4	28.2	52.2	19.6	6.9
	B12t	17-25	.4	1.2	1.8	12.8	11.0	27.2	51.1	21.7	6.5
	IIB21t	25-33	.7	1.5	1.8	13.5	11.4	28.9	44.6	26.5	12.6
	IIB22t	33-41	1.7	2.3	1.8	12.2	9.8	27.8	37.1	35.1	20.2
	IIB3	41-49	9.5	6.7	2.1	5.9	5.6	29.8	28.8	41.4	24.0
	IIIC	49-60	9.7	14.7	5.7	10.4	8.2	48.7	31.3	20.0	8.4
Rossmoyne silt loam, CL-3.	Ap	0-9	.5	1.7	1.8	4.5	4.4	12.9	73.4	13.7	3.2
	B1t	9-18	.2	1.1	1.5	4.3	4.8	11.9	59.9	28.2	15.2
	IIBx1	18-30	.5	1.9	2.9	9.2	9.7	24.2	48.6	27.2	16.0
	IIBx2	30-39	.3	1.7	2.8	9.2	10.0	24.0	46.2	29.8	18.9
	IIB22t	39-49	.5	1.8	2.9	9.7	10.6	25.5	44.6	29.9	17.7
	IIB23t	49-60	.6	1.9	2.8	9.1	9.8	24.2	41.7	34.1	21.5
	IIB24t	60-73	.8	2.7	3.6	11.2	11.3	29.6	43.0	27.4	16.7
	IIB3	73-86	1.3	2.6	3.2	8.5	9.0	24.6	44.8	30.6	15.0
	IIC1	86-110	4.1	5.7	4.5	9.8	9.2	33.3	45.8	20.9	7.3
	IIC2	110-130	2.3	3.8	2.9	6.5	6.6	22.1	55.4	22.5	6.4
Sardinia silt loam, CL-10	Ap	0-7	1.3	3.6	3.3	6.0	4.2	18.4	68.7	12.9	2.5
	A2	7-10	.7	1.9	2.2	4.2	3.2	12.2	68.1	19.7	6.2
	B1t	10-18	.4	1.4	1.6	3.6	3.0	10.0	65.6	24.4	10.1
	B21t	18-26	.2	1.3	2.4	5.7	4.8	14.4	61.2	24.4	10.2
	IIB22t	26-34	.6	3.2	5.6	12.6	9.9	31.9	47.7	20.4	9.4
	IIB23t	34-43	1.1	4.2	6.6	15.4	12.2	39.5	41.4	19.1	8.6
	IIB24	43-52	1.5	4.2	6.2	15.4	13.1	40.4	39.1	20.5	9.9
	IIB25	52-66	1.8	5.6	6.6	16.0	13.4	43.4	35.5	21.1	9.0
	IIIB31	66-76	.9	9.3	16.0	19.0	9.6	54.8	22.5	22.7	12.2
	IIIC1	76-97	1.5	10.0	14.0	21.4	8.7	55.6	20.7	23.7	14.2

data—Continued

Textural class	Reaction	Organic-matter content	$CaCO_3$ equivalent	Extractable cations (milliequivalents per 100 grams of soil)						Base saturation (sum)
				H	Ca	Mg	K	Sum of extractable cations	Sum of bases	
	pH	*Pct*	*Pct*							*Pct*
Silt loam	6.4	4.0	----------	6.3	9.4	2.6	.38	18.7	12.4	66
Silt loam	6.2	2.9	----------	6.3	8.6	2.3	.27	17.5	11.2	64
Silty clay loam	6.5	2.6	----------	6.9	12.6	3.1	.33	22.9	16.0	70
Silty clay loam	6.3	1.7	----------	8.0	12.9	3.0	.29	24.2	16.2	67
Silty clay loam	6.4	1.2	----------	6.9	11.5	2.2	.29	20.9	14.0	67
Silty clay loam	6.5	1.2	----------	7.2	11.6	1.8	.27	20.9	13.7	66
Silty clay loam	6.5	1.0	----------	7.4	12.7	2.1	.29	22.5	15.1	67
Silty clay loam	6.5	.9	----------	6.3	12.2	1.8	.20	20.5	14.2	69
Clay loam	6.4	.9	----------	5.6	10.3	1.7	.21	17.8	12.2	69
Clay loam	6.4	.7	----------	5.9	9.9	1.5	.18	17.5	11.6	66
Loam	6.5	.7	----------	4.9	9.3	1.7	.17	16.1	11.2	69
Loam	6.7	.7	----------	5.7	10.5	2.0	.17	18.4	12.7	69
Loam	6.4	.5	----------	4.0	8.2	1.7	.17	14.1	10.1	72
Silt loam	6.7	2.4	----------	4.4	8.0	1.2	.25	13.8	9.4	68
Slit loam	6.5	1.0	----------	4.8	6.7	1.3	.20	13.0	8.2	63
Silty clay loam	5.4	.7	----------	8.9	7.4	2.0	.27	18.6	9.7	52
Silty clay	5.1	.5	----------	11.7	7.9	2.8	.32	22.7	11.0	49
Silty clay	5.2	.5	----------	11.2	9.8	5.0	.41	26.4	15.2	58
Silty clay	6.3	.7	----------	6.3	11.1	5.8	.33	23.5	17.2	73
Silty clay	7.1	----------	----------	4.2	13.0	7.1	.30	24.6	20.4	83
Silty clay	7.8	----------	18.0	----------	----------	----------	----------	----------	----------	----------
Silty clay	7.3	----------	1.3	----------	----------	----------	----------	----------	----------	----------
Silty clay loam	7.9	----------	29.2	----------	----------	----------	----------	----------	----------	----------
Silt loam	6.9	2.4	----------	4.3	10.2	1.0	.55	16.0	11.7	73
Silt loam	6.0	1.7	----------	6.9	6.1	.8	.33	14.1	7.2	51
Silt loam	5.5	1.5	----------	8.3	5.7	.4	.23	14.6	6.3	43
Silt loam	5.6	1.4	----------	6.8	6.1	.6	.21	13.8	6.9	50
Loam	5.5	.9	----------	9.6	7.6	.7	.23	18.1	8.5	47
Clay loam	5.5	.9	----------	9.8	11.7	1.1	.32	22.9	13.1	57
Clay	5.6	.7	----------	12.7	14.2	1.6	.43	28.9	16.2	56
Loam	7.0	----------	16.8	----------	----------	----------	----------	----------	----------	----------
Silt loam	4.9	2.4	----------	9.3	3.7	.7	.18	13.9	4.6	33
Silty clay loam	4.5	.5	----------	13.1	4.4	1.2	.22	18.9	5.8	31
Clay loam	4.5	.3	----------	12.4	3.8	2.3	.20	18.7	6.3	34
Clay loam	4.4	.2	----------	13.6	3.7	3.8	.23	21.3	7.7	36
Clay loam	4.5	.3	----------	11.4	5.1	4.8	.19	21.5	10.1	47
Clay loam	4.7	.2	----------	12.1	7.2	6.5	.20	26.0	13.9	53
Clay loam	4.9	.2	----------	8.3	7.6	6.4	.20	22.5	14.2	63
Clay loam	5.9	.2	----------	3.9	9.1	7.4	.23	20.6	16.7	81
Loam	7.6	----------	17.5	----------	----------	----------	----------	----------	----------	----------
Silt loam	7.8	----------	24.3	----------	----------	----------	----------	----------	----------	----------
Silt loam	6.1	2.2	----------	6.4	5.5	.8	.92	13.6	7.2	53
Silt loam	6.4	.7	----------	5.8	6.0	1.1	.51	13.4	7.6	57
Silt loam	5.3	.5	----------	8.6	5.7	1.0	.37	15.7	7.1	45
Silt loam	4.8	.5	----------	12.4	4.8	.7	.23	18.1	5.7	32
Loam	4.8	.3	----------	10.4	3.5	.8	.14	14.8	4.4	30
Loam	5.3	.3	----------	6.3	6.2	1.6	.11	14.2	7.9	56
Loam	6.2	.3	----------	3.9	9.7	3.0	.13	16.7	12.8	77
Loam	6.5	.3	----------	4.4	10.1	2.6	.13	17.2	12.8	74
Sandy clay loam	6.6	.2	----------	3.3	9.7	3.0	.13	16.1	12.8	80
Sandy clay loam	6.6	.3	----------	4.0	11.2	3.4	.19	18.8	14.8	79

organic matter was determined by a dry combustion method. Bases were extracted by using a neutral solution of ammonium acetate. The extractable potassium in this solution was determined by using a flame photometer (*10*). Extractable calcium and magnesium in this solution were determined by the EDTA titration method (*3*). Extractable hydrogen (which also includes titratable aluminum) was determined by the triethanolamine method (*10*) and cation exchange capacities by the summation of extractable cations. Calcium carbonate equivalent was determined by the gasometric method of Dreimanis (*5*), employing the Chittick Apparatus. All pH measurements were made using a 1:1 soil-water ratio.

General Nature of the County

This section provides general information about the farming; geology, topography, and drainage; climate; organization and history; and public facilities and transportation in Clermont County.

Farming

In 1969, 1,608 farms were in Clermont County, and there were 162,405 acres of farmland. More than 90 percent of the farms were operated by owners and part owners. The acreage in farms accounted for about 55 percent of the county in 1969. The acreage has decreased in recent years, however, because highways, recreational areas, airports, and areas of expanding industry and housing have been built or enlarged. Also, some individual farms have been consolidated into larger holdings.

The number of farms in the county decreased from 1,694 in 1964 to 1,608 in 1969, but the average size of farms increased from about 97 acres to about 101 acres during the same period.

Production of cash crops, such as soybeans, corn, wheat, and tobacco, and livestock farming, especially dairying and beef cattle, are the most important types of farming in Clermont County.

In 1967, according to the Ohio Agricultural Research and Development Center (*8*), the cash receipts from farm marketing totaled $7,401,000. By percentage of total farm sales, the eight major commodities in Clermont County were tobacco, 22 percent; dairy products, 18 percent; cattle, 16 percent; soybeans, 13 percent; hogs, 9 percent; corn, 6 percent; poultry, 5 percent; and wheat, 2 percent.

In 1969 the principal kinds and numbers of livestock on farms in Clermont County were cattle and calves, 15,741; hogs and pigs, 9,963; sheep and lambs, 1,323; and chickens, 53,109.

The total acreage of cropland in the county in 1969 was 105,269 acres, or about 36 percent of the total land area. In 1964 the total acreage of cropland was 102,488 acres.

Major farming concerns in the county are the small size of the farms; the fact that large acreages of soils have naturally low productivity and need artificial drainage, and other large acreages need erosion control; the mediocre quality of the livestock; the unsatisfactory level of farm income; and the need for improved management practices. In 1969 only 145 of the 1,608 farms were more than 220 acres in size, and more than 60 percent of all farm operators worked 100 days or more elsewhere than on the farm. Approximately one-third of the farmland is Clermont silt loam or Avonburg silt loam, soils that have specific management requirements. Another one-third of the land presents contrasting problems of steep slopes and rapid runoff. Farmers, except when they are raising tobacco, generally do not follow long-time, specific plans for their crop and livestock enterprises.

Geology, Topography, and Drainage

Geologists refer to the surface of Clermont County as a "peneplain" that is 800 to 900 feet above sea level and dips to less than 500 feet above sea level at the mouth of Nine Mile Creek. This peneplain is eroded, as the county is dissected by the East Fork of the Little Miami River and other smaller streams.

The surface of the county is characterized by deep, narrow valleys and by level interstream areas that are remnants of the old peneplain. For several miles inland from the Ohio River and along the East Fork of the Little Miami River the surface is very broken and hilly.

Where erosion has dissected the plain most thoroughly, the larger streams have cut valleys ranging from 200 to 400 feet in depth and varying considerably in width. Along the Ohio River, the valley floor, which consists of level bottom land, ranges from one-half to one mile in width. Along the Little Miami River and East Fork of the Little Miami River, except at the junction of these streams south of Milford where the valley is 2 miles wide, the valley floors range from one-half to three-fourths of a mile in width in places. These are immediately succeeded by narrow tracts that are little more than wide enough to accommodate the streambed and that have steep slopes on both sides. Along the principal streams of the county the landscape is characterized by two or three levels where fairly well defined terraces are present and by two levels where remnants of very old terraces are present. Along the valley walls of these streams a few small, isolated areas of gravelly, sandy, and silty materials are present.

The drainage waters of the southern third of Clermont County flow directly into the Ohio River. The extreme northern part of the county drains into its tributary, the Little Miami River, and the rest of the county drains into the East Fork of the Little Miami River. Extending from these rivers are intricate systems of smaller streams which ramify the uplands, affording drainage outlets for practically every farm. In the eastern half of the county, however, there are many rather extensive level interstream areas where natural runoff is extremely slow. The smaller streams are mainly intermittent, flowing rapidly in winter and spring but drying up in summer.

More than 26 miles of the Ohio River forms the southern boundary of the county, providing opportunities for boating, water skiing, and other related sports. Good fishing is available in the East Fork of the Little Miami River, which meanders across the county. Much of its course is rough and wild, making it suitable to the establishment of dams for artificial lakes and recreational areas. Stonelick Lake is the only sizeable area of impounded water in the county available for recreation. This State park area covers approximately 1,000 acres, of which 140 acres are under water. It provides an opportunity for swimming, fishing, picknicking, and the use of small boats. Numerous private lakes provide, for a fee, fishing opportunities in various parts of the county. Landowners have at least 1,000 privately constructed ponds stocked with fish. The Captain Anthony Meldahl Dam on the Ohio River, 2 miles east of Neville, has created a large pool for recreational use that also serves to help control flood damage. The U.S. Army Corps of Engineers is planning, at the time this survey is being made, a large dam on the East Fork of the Little Miami River several miles southeast of Batavia. This reservoir will create a lake 14 miles long that will back water up almost to Williamsburg. This will be another large pool for recreational use and will also serve to control flood damage.

Climate[5]

Since weather data are not readily available for locations within Clermont County other than at Chilo, the data for Chilo, which is fairly representative of Clermont County, will be used.

The climate of Clermont County is characterized by large ranges of temperature annually, daily, and day to day. Winters are generally cloudy and cold, but subzero temperatures rarely occur. Summers are moderately warm and humid and have several days when temperatures exceed 89° F. In 8 years out of 10 the average annual temperature is within a range of 52.1 to 55.5° F. On clear nights when winds are light, a large variation in temperatures frequently occurs, mostly in the vicinity of hills. The daily range in temperature is generally greatest late in summer and early in fall and least in winter. Annual extremes in temperature generally occur soon after June 21 and December 22. The highest temperature during the year is equal to or greater than 93°F in 9 years out of 10, 97° F in 5 years out of 10, and 101° F in 1 year out of 10. The lowest temperature during the year is equal to or less than 6° F in 9 years out of 10, −3° F in 5 years out of 10, and −12° F in 1 year out of 10. The average extreme annual temperatures given in table 11 may differ in any month from those shown because the annual extremes in temperature do not occur in the same month each year. The probability of selected temperatures of 36° F or lower after specified dates in spring and before specified dates in fall are given in table 12.

Precipitation in Clermont County varies widely from year to year; however, it is normally abundant and well distributed throughout the year. Fall is the driest season. Showers and thunderstorms account for most of the rainfall during the growing season. The average number of days each year that have .01, .10, .50, and 1.00 inch or more of precipitation is 117, 71, 27, and 8 days, respectively. Heavy rains of 2.5, 3.5, 4.2, 5.1, 5.8, and 6.4 inches in 24 hours can be expected to occur at least once in 2, 5, 10, 25, 50, and 100 years, respectively. As is typical in much of Ohio, most precipitation during the winter is in the form of rain. During any year, the average snowfall can fluctuate widely from the averages shown in table 11. Also, sums of the 12 monthly 1-year-in-10 values for precipitation, as given in table 11, do not equal the annual values because all "dry" and "wet" months do not occur in the same year.

The amount of soil moisture goes through a seasonal cycle each year that is almost independent of the amount of precipitation received. It reaches its lowest point in October and is replenished during winter and early in spring when the amount of precipitation exceeds the amount of water lost by evaporation. A progressive drying of all soils occurs since the water needs of all crops reach a maximum in July and August, and rainfall is almost always insufficient to meet those needs.

When evaporation greatly exceeds precipitation for prolonged periods, a drought can occur. During the period 1929–68, extended periods of moderate to extreme drought in the southwestern part of Ohio, as determined from the Palmer Drought Severity Index, occurred during the 1930, 1934, 1936, 1941, 1944, 1951, 1953, 1954, 1960, 1964, and 1965 growing seasons. The longest continuing period of moderate to extreme drought in the southwestern part of Ohio was the 13 months from February 1934 through February 1935.

Generally humidity rises and falls inversely with the daily temperature and is lowest in summer and highest in winter. The annual relative humidity averages about 80 percent at 1 a.m. and 7 a.m., 55 percent at 1 p.m., and 65 percent at 7 p.m. During summer afternoons the relative humidity often is in the range of 50 to 60 percent. The seasonal variation in cloudiness is most clearly illustrated by the percentage of possible sunshine, which is about 75 percent in July but less than 40 percent in December. Fog that reduces visibility to less than one-fourth mile is most frequent in summer and fall. Since 1900, five tornadoes have been reported in Clermont County.

Organization and History

Clermont County, the eighth county formed in the Northwest Territory, was created by a proclamation of Governor St. Clair on December 6, 1800. Governor St. Clair chose the name Clermont, which was taken from Claremont, a department of France. Clermont County was formed from part of the original Hamilton County. In 1817 part of Clermont County was used to form what is now Brown County. Originally the county was larger than it is now, for only 10 counties made up the entire State of Ohio in 1801.

General William Lytle, known as "The Father of Clermont County," was famous as an Indian fighter, explorer, and surveyor. Many towns of the county are on sites originally owned or surveyed by General Lytle. In 1796 he laid out the village of Williamsburg, and, according to custom, he called it "Lytles Town." Williamsburg was named the county seat in 1801. The county seat was later moved to Batavia in 1824.

The first permanent settler within the present county boundaries was Colonel Thomas Paxton. He settled near Loveland in 1794. About the same time such explorers as Simon Kenton and Daniel Boone visited the county. By 1800 settlements dotted the banks of the Little Miami and Ohio Rivers, as well as Stonelick, East Fork, Bullskin, Indian, Bear, and Ten Mile Creeks and smaller tributaries. The lands of Clermont County were originally part of the vast Virginia Military Reservation, which included all territory west of the Alleghenies between the Little Miami and Scioto Rivers. This territory was claimed by Virginia under royal grants made in 1609 and set aside by the state

[5] By JERRY M. DAVIS, climatologist for Ohio, National Weather Service, U.S. Department of Commerce.

Table 11.—*Temperature and precipitation data*

[Data from Chilo]

Month	Temperature				Precipitation				
	Average daily maximum	Average daily minimum	Average maximum	Average minimum	Average total	One year in 10 will have— Less than—	One year in 10 will have— More than—	Average snowfall	Average number of days that have 1 inch or more of snow cover
	°F	°F	°F	°F	Inches	Inches	Inches	Inches	
January	41. 8	22. 2	64	0	3. 15	1. 28	5. 39	5. 0	2
February	45. 1	24. 3	65	4	3. 38	1. 07	6. 27	3. 4	1
March	53. 1	31. 1	73	15	4. 90	1. 92	8. 50	1. 8	1
April	65. 2	41. 1	82	26	3. 76	1. 56	6. 37	. 1	0
May	75. 7	50. 6	88	35	3. 61	1. 53	6. 07	0	0
June	83. 4	59. 4	93	46	4. 14	1. 68	7. 10	0	
July	86. 9	62. 3	96	51	3. 95	1. 69	6. 63	0	0
August	86. 3	60. 9	96	49	3. 23	1. 09	5. 88	0	0
September	80. 4	53. 6	93	38	2. 60	. 66	5. 07	0	0
October	70. 6	42. 5	85	27	2. 17	. 71	4. 00	0	0
November	55. 3	32. 2	75	15	2. 94	1. 13	5. 13	1. 3	0
December	44. 1	24. 2	64	6	2. 68	. 94	4. 80	2. 2	1
Year	65. 6	42. 0	[1] 97	[1] −3	40. 51	32. 34	49. 22	13. 8	5

[1] Based on records of extremes for year.

Table 12.—*Probabilities of occurrence of selected temperatures after given dates in spring and before given dates in fall*

Probability	Dates for given probability and temperature				
	20° F or lower	24° F or lower	28° F or lower	32° F or lower	36° F or lower
Spring:					
1 year in 10 later than	April 1	April 10	April 24	May 5	May 18
2 years in 10 later than	March 26	April 5	April 19	May 1	May 13
5 years in 10 later than	March 12	March 23	April 9	April 22	May 3
Fall:					
1 year in 10 earlier than	November 1	October 24	October 15	October 3	September 24
2 years in 10 earlier than	November 6	October 29	October 19	October 8	September 27
5 years in 10 earlier than	November 19	November 10	October 29	October 19	October 4

as bounty land for her veterans of the Revolutionary War. As is typical of all Virginia Military Lands, the county, consisting of 14 townships, was surveyed by metes and bounds, not by the rectangular system of land surveying.

Public Facilities and Transportation

Electricity and natural gas are supplied to the county by the Cincinnati Gas and Electric Company.

Sewage treatment is a matter of great importance and concern in this rapidly expanding residential county. Because of dominantly very slowly permeable soils throughout the area, such as Clermont and Avonburg, percolation for septic-tank effluent disposal is unsatisfactory without extensive leaching or filter beds. Villages having sewage treatment plants at present are Batavia, Bethel, Loveland, Milford, New Richmond, and Williamsburg. Several subdivisions now have sewage treatment plants or are making provisions for them. A sewage project, encompassing a part of Union, Pierce, and Batavia townships, is serving 3,250 customers with 60 miles of sewerlines. Two county water systems covering parts of 10 townships are in operation. They provide water for about 10,000 customers.

Clermont County has 26.5 miles of Ohio River frontage. The river furnishes low-cost water transportation. Railroad transportation is somewhat limited. The Norfolk and Western railroad roughly bisects the county from east to west, and the Baltimore and Ohio and Pennsylvania Railroads pass through the northwest corner of the county. Thirty-seven trucking firms operate from bases within the county. Based on present plans, the Circle Freeway (Interstate 275) and Appalachia Highway will cross part of the county. Two U.S. highways cross the county in a general east-to-west direction. U.S. Highway No. 52 parallels the Ohio River through the county. The combined lengths of State highways total 191.6 miles in the county. County roads have a combined length of 395.5 miles and township roads, 395.2 miles.

In 1968 a county airport started operations 3 miles southwest of Batavia. Five private airstrips are in the county.

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well-aerated soil is similar to that in the atmosphere; but that in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates such as crumbs, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern.

Available water capacity (also termed available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. In this survey available water is rated to a root-restricting zone or to a depth of 60 inches. Relative terms, in inches of water per inch of soil, are as follows:

Very low	Less than 3
Low	3–6
Medium	6–9
High	9–12
Very high	More than 12

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.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

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.

Clay film. A thin coating of clay on the surface of a soil aggregate. Synonyms: clay coat, clay skin.

Cobblestone. A rounded or partly rounded fragment of rock, 3 to 10 inches in diameter.

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.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrations of compounds, or of soil grains cemented together. The composition of some concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are examples of material commonly found in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

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.

Crusty soil. Soil tending to form a thin, massive or platy surface layer under the beating action of raindrops. The opposite of "crusty" is "self-mulching."

Drainage class (natural). Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low available water capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and have mottling in the lower B and the C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and some soils commonly have mottling at a depth below 6 to 16 inches.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

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.

Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geological agents.

Flood plain. Nearly level land, consisting of stream sediments, 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 content and clay but is rich in silt or very fine sand. The layer is seemingly cemented. When dry, it is hard or very hard 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 outwash (geology). Cross-bedded gravel, sand, and silt deposited by melt water as it flowed from glacial ice.

Glacial till (geology). Unassorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice; the deposits are stratified and occur in the form of kames, eskers, deltas, and outwash plains.

Gravelly soil material. 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. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Illuviation. The accumulation of material in a soil horizon through the deposition of suspended material and organic matter removed from horizons above. Since part of the fine clay in the B horizon (or subsoil) of many soils has moved into the B horizon from the A horizon above, the B horizon is called an illuvial horizon.

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.

Lacustrine deposit (geology). Material deposited in lake water and exposed by lowering of the water level or elevation of the land.

Landslide. The rapid downhill movement of a mass of soil and loose rock, usually when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Leaching. The removal of soluble materials from soils or other material by percolating water.

Loess. Fine-grained material, dominantly of silt-sized particles, that has been deposited by wind.

Mottling, soil. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: Abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are these: *fine,* less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Munsell notation. A system for designating color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with a hue of 10YR, a value of 6, and a chroma of 4.

Organic matter. A general term applied to a soil or to a soil horizon that consists primarily of organic matter, such as peat soils, muck soils, and peaty soil layers. In chemistry, organic refers to the compounds of carbon.

Parent material. Disintegrated and partly weathered rock from which soil has formed.

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod.

Permeability. The quality of a soil horizon that enables water or air to move through it. Terms and numerical ratings for permeability, in inches per hour, are as follows:

Very slow	Less than 0.06
Slow	0.06–0.2
Moderately slow	0.2–0.6
Moderate	0.6–2.0
Moderately rapid	2.0–6.0
Rapid	6.0–12.0
Very rapid	More than 12.0

Phase, soil. A subdivision of a soil, 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 series for example, may be divided into phases because of differences in slope, stoniness, thickness, or some other characteristic that affects its management but not its behavior in the natural landscape.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity or 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	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

Residual material. Unconsolidated, partly weathered mineral material that accumulates over disintegrating solid rock. Residual material is not soil but is frequently the material in which a soil has formed.

Root zone. The part of the soil that is penetrated, or that can be penetrated, by plant roots. Terms and numerical ratings for depth of the root zone are as follows: *shallow,* less than 20 inches; *moderately deep,* 20 to 40 inches; and *deep,* 40 to 60 inches.

Sand. Individual rock or mineral fragments in a soil that range in diameter from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Series, soil. A group of soils developed from a particular type of parent material and having genetic horizons that, except for texture of the surface layer, are similar in differentiating characteristics and in arrangement in the profile.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limits 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.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

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 either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically, the part of the soil below the solum.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it may soak into the soil or flow slowly to a prepared outlet without harm. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Variant, soil. A soil having properties sufficiently different from those of other known soils to suggest establishing a new soil series, but a soil of such limited known area that creation of a new series is not believed to be justified.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

Weathering. All physical and chemical changes produced in rocks at or near the earth's surface by atmospheric agents. These changes result in more or less complete disintegration and decomposition of the rock.

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GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs. Also, read both the descriptions of the capability units and the introduction to the section in which they are described, and read the section in which woodland suitability groups are described. Other information is given in tables as follows:

Estimated yields, table 1, page 12.
Woodland uses, table 2, page 14.
Wildlife habitat and kinds of wildlife, table 3, page 18.
Engineering uses of the soils, tables 4, 5, and 6, pages 24 through 41.
Town and country planning, table 7, page 44.
Acreage and extent, table 8, page 53.
Laboratory analyses, table 10, page 88.

Map symbol	Mapping unit	Page	Capability unit		Woodland suitability group
			Symbol	Page	Symbol
AdC	Alluvial land, sloping	52	-----	--	---
AvA	Avonburg silt loam, 0 to 2 percent slopes	54	IIIw-2	9	2w1
AvB	Avonburg silt loam, 2 to 6 percent slopes	54	IIIw-3	10	2w1
AvB2	Avonburg silt loam, 2 to 6 percent slopes, moderately eroded	54	IIIw-3	10	3w1
AwA	Avonburg-Urban land complex, nearly level	54	-----	--	---
Bc	Blanchester silt loam	55	IIw-3	8	2w1
CcB	Cincinnati silt loam, 2 to 6 percent slopes	57	IIe-1	8	2o2
CcB2	Cincinnati silt loam, 2 to 6 percent slopes, moderately eroded	57	IIe-1	8	2o2
CcC2	Cincinnati silt loam, 6 to 12 percent slopes, moderately eroded	57	IIIe-1	9	2o2
CcD2	Cincinnati silt loam, 12 to 18 percent slopes, moderately eroded	57	IVe-1	10	3d1
CkD3	Cincinnati and Hickory soils, 12 to 25 percent slopes, severely eroded	57	VIe-2	10	3d1
Ct	Clermont silt loam	59	IIIw-1	9	2w1
Cu	Cut and fill land	59	-----	--	---
EaD2	Eden flaggy silty clay loam, 12 to 18 percent slopes, moderately eroded	60	VIe-1	10	3c1
EaE2	Eden flaggy silty clay loam, 18 to 25 percent slopes, moderately eroded	61	VIe-1	10	3c1
EaF2	Eden flaggy silty clay loam, 25 to 50 percent slopes, moderately eroded	61	VIe-1	10	3c2
EbC2	Edenton loam, 6 to 12 percent slopes, moderately eroded	62	IIIe-1	9	3o1
EbD2	Edenton loam, 12 to 18 percent slopes, moderately eroded	62	IVe-2	10	3r1
EbE2	Edenton loam, 18 to 25 percent slopes, moderately eroded	62	VIe-1	10	3r1
EbG2	Edenton loam, 25 to 50 percent slopes, moderately eroded	62	VIe-1	10	3r1
EcE3	Edenton clay loam, 12 to 25 percent slopes, severely eroded	62	VIe-1	10	4r1
EdG3	Edenton and Fairmount soils, 25 to 50 percent slopes, severely eroded	62	VIIe-1	10	4r1
Ee	Eel silt loam	63	IIw-1	8	1o1
FaE2	Fairmount very flaggy silty clay loam, 18 to 25 percent slopes, moderately eroded	64	VIIs-1	10	4d1
FaG2	Fairmount very flaggy silty clay loam, 25 to 50 percent slopes, moderately eroded	64	VIIs-1	10	4d1
FnB	Fox silt loam, 2 to 6 percent slopes	65	IIe-3	8	2o1
FnC2	Fox silt loam, 6 to 12 percent slopes, moderately eroded	65	IIIe-3	9	2o1
FuB	Fox-Urban land complex, gently sloping	65	-----	--	---
Gn	Genesee silt loam	65	IIw-1	8	1o1
GpB	Glenford silt loam, 2 to 6 percent slopes	66	IIe-2	8	2o2
GpC2	Glenford silt loam, 6 to 12 percent slopes, moderately eroded	66	IIIe-1	9	2o2
GpE2	Glenford silt loam, 18 to 25 percent slopes, moderately eroded	66	VIe-2	10	2r1
Gr	Gravel pits	66	-----	--	---
HkD2	Hickory loam, 12 to 18 percent slopes, moderately eroded	67	IVe-1	10	2r1
HkF2	Hickory loam, 18 to 35 percent slopes, moderately eroded	68	VIe-2	10	2r1
HlG3	Hickory clay loam, 25 to 50 percent slopes, severely eroded	68	VIIe-1	10	3r1
Hu	Huntington silt loam	68	IIw-1	8	2o1
Lg	Lanier sandy loam	69	IIw-5	9	2o1
Ln	Lindside silt loam	70	IIw-1	8	2w2
Mb	Mahalasville silty clay loam	70	IIw-3	8	2w1
MdB	Markland silt loam, 2 to 6 percent slopes	71	IIIe-2	9	2o2
MgA	McGary silt loam, 0 to 2 percent slopes	73	IIIw-2	9	3w1
Mh	Medway silt loam, overwash	73	IIw-4	8	2w1
Ne	Newark silt loam	74	IIw-4	8	2w2
OcA	Ockley silt loam, 0 to 2 percent slopes	75	I-1	8	1o1
OcB	Ockley silt loam, 2 to 6 percent slopes	75	IIe-2	8	1o1
OdA	Ockley-Urban land complex, nearly level	75	-----	--	---
Rh	Riverwash	75	-----	--	---
RkD2	Rodman and Casco loams, 12 to 18 percent slopes, moderately eroded	76	VIs-1	10	4f1
RkE2	Rodman and Casco loams, 18 to 25 percent slopes, moderately eroded	76	VIIs-1	10	4f1
Rn	Ross silt loam	76	IIw-1	8	1o1
RpA	Rossmoyne silt loam, 0 to 2 percent slopes	77	IIw-2	8	2o2
RpB	Rossmoyne silt loam, 2 to 6 percent slopes	77	IIe-1	8	2o2
RpB2	Rossmoyne silt loam, 2 to 6 percent slopes, moderately eroded	78	IIe-1	8	2o2
RpC2	Rossmoyne silt loam, 6 to 12 percent slopes, moderately eroded	78	IIIe-1	9	2o2
RsC3	Rossmoyne silty clay loam, 6 to 12 percent slopes, severely eroded	78	IVe-3	10	3o1
RtB	Rossmoyne-Urban land complex, gently sloping	78	-----	--	---
RtC	Rossmoyne-Urban land complex, sloping	78	-----	--	---
SaA	Sardinia silt loam, 0 to 2 percent slopes	79	IIw-2	8	2o1
SaB	Sardinia silt loam, 2 to 6 percent slopes	79	IIe-1	8	2o1
SeC2	Sees silty clay loam, 4 to 12 percent slopes, moderately eroded	80	IIIe-2	9	2w2
SeD2	Sees silty clay loam, 12 to 18 percent slopes, moderately eroded	80	IVe-2	10	2w3
Sh	Shoals silt loam	81	IIw-4	8	2w1
St	Stonelick sandy loam	81	IIw-5	9	2o1
WvB	Williamsburg and Martinsville silt loams, 2 to 6 percent slopes	82	IIe-2	8	1o1
WvC2	Williamsburg and Martinsville silt loams, 6 to 12 percent slopes, moderately eroded	82	IIIe-1	9	1o1
WvD2	Williamsburg and Martinsville silt loams, 12 to 18 percent slopes, moderately eroded	82	IVe-1	10	1r1

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