SOIL SURVEY OF

Greene County, Ohio

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

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all who need the information, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in the period 1964-73. Soil names and descriptions were approved in 1974. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1973. 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 Greene County Soil and Water Conservation District.

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 Greene County are shown on the detailed map at the back of this survey. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number 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 of each. It also shows the page where each soil is described and the capability unit and woodland suitability group 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 section "Descriptions of the Soils."

Foresters and others can refer to the section "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 Greene 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 in the section "General Nature of the County."

***Cover:* A typical rural scene in Greene County, Ohio. Soybeans in the foreground is a common crop.**

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Issued March 1978

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SOIL SURVEY OF GREENE COUNTY, OHIO

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

GREENE COUNTY is in the southwestern part of Ohio (fig. 1) about midway between Columbus and Cincinnati. It has an area of approximately 265, 792 acres, or 415 square miles.

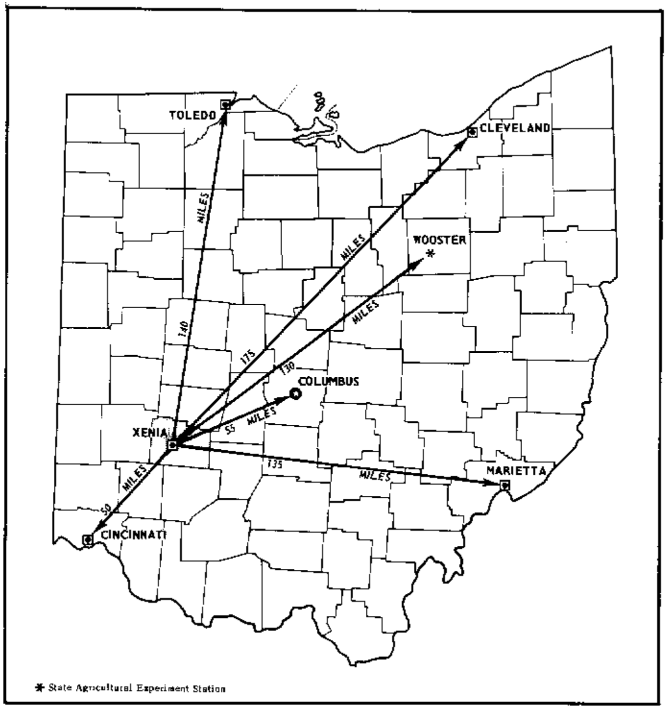

Figure 1.—Location of Greene County in Ohio.

The total population of the county in 1970 was 127,057. Xenia, the county seat and second largest city, is in the west-central part of Greene County. It had a population of 25,373 in 1970, and Fairborn, the largest city, had a population of 32,267. Other communities in Greene County are Bellbrook, Bowersville, Cedarville, Clifton, Jamestown, Spring Valley, and Yellow Springs.

Greene County is in the glaciated region of Wisconsin age in Ohio. Large areas, particularly in the eastern part of the county, are used for farming. Many areas of deep, fertile, nearly level to gently sloping soils are well suited to this use. Corn, soybeans, wheat, oats, and hay are the major crops. In addition to cash grain, the sale of livestock and livestock products also provides a large part of the annual farm income in the county.

Because of its proximity to the expanding metropolitan area of Dayton, much of the land used for farming in the western part of Greene County is increasingly being used for residential, industrial, commercial, and recreational uses and for other nonfarm uses. Wright-Patterson Air Force Base is in the northwestern corner of the county.

The county has many public and private elementary and secondary schools, one vocational school, and six colleges and universities.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Greene 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 speed 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 characteristics. Each soil series is named for a town or geographic feature near the place where a soil of

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that series was first observed and mapped. Ragsdale and Xenia, 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 is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Eldean silt loam, 0 to 2 percent slopes, is one of several phases within the Eldean 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 woodland, 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 soil 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 Greene 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. Miamian-Casco complex, 12 to 18 percent slopes, moderately eroded, is an example.

An undifferentiated group is made up of two or more soils that could be mapped separately 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." Miamian and Hennepin soils, 18 to 25 percent slopes, is an example.

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

While a soil survey is in progress, soil scientists take soil samples needed for laboratory measurements 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 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 slow permeability or a high water table. They see that streets, road pavements, and foundations for houses crack on a given kind of soil and they relate this failure to a high shrink-swell potential. 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 the survey area. A soil association is a landscape that has a distinctive pattern of soils in defined proportions. It typically consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in an association can occur in other associations, but in different patterns.

A map showing soil associations is useful to people who want to have a general idea of the soils in a survey area, who want to compare different parts of that area, or who want to locate large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide for broad planning on a watershed, a wooded tract or a wildlife area or for broad planning of recreational facilities, community developments, and such engineering works as transportation corridors. It is not a suitable map for detailed planning for management of a farm or field or for selecting the exact location of a road or building or other structure, because the soils within an association ordinarily vary in slope, depth, stoniness, drainage, and other characteristics that affect their management.

The soil associations in this survey area have been grouped into two general kinds of landscapes for broad interpretative purposes. Each of the broad groups and the soil associations in it are described on the following pages.

Soils That Formed Mainly in Glacial Till and Loess on Uplands

These soils are in areas throughout the county. They are mostly deep soils that formed in glacial till and a loess mantle of variable thickness. A few areas of these soils have bedrock at a depth of less than 40 inches. A few areas of the soils formed entirely in loess, and some formed in sand and gravel. Most areas are farmed; corn and soybeans are the main crops. Some small grain and meadow crops are also grown. This group of associations makes up about 81 percent of the county.

1. Miamian-Celina association

Gently sloping to steep, well drained and moderately well drained soils that formed in loam glacial till; on uplands

This association is mainly in two major areas of the county. The largest of these areas is in northwestern Greene County, north of Little Beaver Creek and west of Little Miami River. The other major area is in the eastern part of the county.

This association makes up 17 percent of the county. It is about 55 percent Miamian soils, 15 percent Celina soils, and 30 percent minor soils.

Miamian and Celina soils formed in loam glacial till. Miamian soils are well drained and are mostly sloping to steep. Celina soils are moderately well drained and are dominantly gently sloping.

Minor in this association are Crosby, Brookston, Reesville, and Hennepin soils. A few areas of Ritchey soils underlain by bedrock at a depth of less than 20 inches are in places, particularly in Miami, Cedarville, Beaver Creek, and Xenia Townships.

The gently sloping soils of the association are used for cultivated crops, and the sloping and steep soils are commonly used for pasture; however, those parts of the association in northwestern Greene County near the expanding metropolitan area of Dayton are increasingly being used for housing and other nonfarm purposes. The area in the eastern part of the county is used dominantly for farming. In a few places in the northwestern area of the association, the soils are underlain by deposits of sand and gravel at a depth of 10 to 30 feet. Many steep slopes and a severe hazard of erosion are the major limitations of this association for farming and for some nonfarm uses. Moderately slow permeability is an additional limitation for some nonfarm uses.

2. Brookston-Celina-Crosby association

Level to gently sloping, very poorly drained to moderately well drained soils that formed in loam glacial till; on uplands

The largest area of this soil association is a strip extending from north to south along the eastern border of the county. A few smaller areas are scattered across the northern part of Greene County.

This association makes up about 8 percent of the County. It is about 65 percent Brookston soils, 15 percent Celina soils, 15 percent Crosby soils, and 5 percent minor soils.

The soils formed mostly in loam glacial till. Brookston soils are very poorly drained and are level or slightly depressional. Celina soils are moderately well drained and mostly gently sloping. They are on irregular-shaped knolls and slight rises that dot the landscape. Crosby soils are somewhat poorly drained and are nearly level to gently sloping.

Minor in this association are well drained Miamian soils and very poorly drained Ragsdale soils.

Most of the acreage in this association is intensively farmed. If artificially drained, Brookston and Crosby soils are well suited to corn and soybeans. On these soils wetness caused by a seasonal high water table is the major limitation for most nonfarm uses. Celina soils and gently sloping areas of Crosby soils are subject to erosion, but erosion control is different because slopes are short and irregular. Some areas of Celina and Miamian soils on the better drained rises and knolls have few limitations for building sites.

3. Miamian-Eldean-Casco association

Gently sloping to very steep, well drained soils formed in loam glacial till and sand and gravel; on uplands

This association is in areas scattered throughout the western part of Greene County. The soils of this association make a very intricate pattern of moderately steep to very steep stream valley sides and gently sloping to steep, glacier-deposited hills (kames).

This association makes up about 8 percent of the county. It is about 45 percent Miamian soils, 25 percent Eldean soils, and 10 percent Casco soils. Minor soils make up the remaining 20 percent.

The soils are well drained. Miamian soils formed in loam glacial till. In some places they are underlain by deposits of sand and gravel at a depth of 10 to 30 feet. The Eldean soils formed in loamy material underlain by sand and gravel. Casco soils are also underlain by sand and gravel, but at a shallower depth than Eldean soils.

Minor in this association are Rodman and Hennepin soils. These soils are steep and very steep.

The gently sloping areas of the association are commonly used for cultivated crops, and the sloping to moderately steep areas are used for pasture. The steep and very steep soils are mostly wooded. Sand and gravel underlying many parts of the association are mined commercially. Many steep slopes, a severe hazard of erosion, and droughtiness are limitations for many uses. Stoniness on eroded areas is a hazard, particularly on Eldean and Casco soils. Because the soils are well drained, where slope is not a limitation, there are few limitations for residential development, and the soils are increasingly being used for this.

4. *Milton-Miamian association*

Nearly level to very steep, well drained soils that formed in loam glacial till overlying limestone bedrock, and well drained soils that formed in loam glacial till; on uplands

This soil association is mainly in several areas in Bath and Miami Townships in the northern part of the county.

This association makes up 3 percent of the county. It is 45 percent Milton soils, 40 percent Miamian soils, and 15 percent minor soils.

Milton and Miamian soils are well drained. Milton soils formed in loam glacial till underlain by limestone bedrock at a depth of 20 to 40 inches. They are sloping to very steep and are generally in and along the sides of drainageways that dissect the association. Miamian soils formed in loam glacial till. They are commonly gently sloping to sloping.

Minor in this association are Ritchey and Fairmount soils. Ritchey soils are well drained. They are less than 20 inches thick over bedrock. Hillside seeps and springs are common in areas of Ritchey soils. Fairmount soils are very steep. In this association they are along Clifton Gorge near Yellow Springs and in places along Massie Creek.

Most areas of the mildly sloping soils are used for growing cash crops. The steep and very steep soils are commonly used for pasture or woodland. In some areas of the association in Bath Township, the underlying bedrock has been mined for use in the manufacture of cement. The steep and very steep soils in Miami Township along the Little Miami River at Clifton Gorge are used mainly for recreation, nature study, and scenic value. Many steep slopes, a severe hazard of erosion, and shallowness to bedrock are the major limitations of the soils in this association for most uses. On Milton soils, droughtiness because of shallowness to bedrock is also a limitation for certain uses.

5. *Miamian-Russell-Xenia association*

Nearly level to sloping, well drained and moderately well drained soils that formed in a thin layer of silty material and the underlying loam glacial till; on uplands

This association is one of the most extensive in Greene County. It covers large areas in the central and southwestern parts of the county. The areas are cut by V-shaped valleys.

This association makes up about 29 percent of the county. It is 45 percent Miamian soils, 15 percent Russell soils, 15 percent Xenia soils, and 25 percent minor soils.

The dominant soils formed partly in loess and partly in the underlying loam glacial till. Miamian soils are well drained and are mostly sloping. They are adjacent to streams and drainageways. Russell soils are well drained and gently sloping or sloping. They are typically adjacent to drainageways or narrow ridges between the smaller drainageways. Xenia soils are moderately well drained and are nearly level or gently sloping. They are generally farther from the drainageways than Russell or Miamian soils.

Minor in this association are Ragsdale, Reesville, Fincastle, and Birkbeck soils. Some areas of soils that are shallow to bedrock, such as Edenton, Milton, Randolph, and Ritchey soils, are also in a few places in the association.

Erosion control on the sloping soils is the major limitation for farming. Nearly level soils, however, have few limitations for farming. Moderately slow permeability is a limitation for some nonfarm uses. Some areas of Xenia soils, particularly the nearly level soils, have a temporary high water table in winter and early in spring. Those parts of this association in southwestern Greene County near Dayton are being increasingly used for residential development. Establishing lawns and gardens is difficult on some sloping Russell and Miamian soils that are eroded.

6. *Ragsdale-Reesville association*

Depressional to gently sloping, very poorly drained and somewhat poorly drained soils that formed in loess over loam glacial till; on uplands

This association is mostly in the east-central and southern parts of the county.

This association makes up about 16 percent of the county. It is about 55 percent Ragsdale soils, 35 percent Reesville soils, and 10 percent minor soils.

The soils of this association formed in more than 40 inches of loess over loam glacial till. Ragsdale soils are very poorly drained and are level to slightly depressional. Reesville soils are somewhat poorly drained and are nearly level to gently sloping. They are on slightly higher positions on the landscape than Ragsdale soils.

Minor in this association are moderately well drained Birkbeck and Xenia soils and well drained Miamian and Russell soils. These soils are on higher rises and knolls and along the sides of drainageways. Some areas of somewhat poorly drained Raub soils are also included.

If artificially drained, the dominant soils in this association are among the most productive for farming in Greene County. They are used intensively for growing cash crops. Corn and soybeans are the most common crops. Because of generally mild slopes, erosion is not a serious hazard on these soils. Wetness because of a seasonal high water table is a severe limitation on the major soils for many land uses. Temporary ponding of surface water after heavy rain is also a limitation on Ragsdale soils in the depressions. Building foundations and basements in the dominant soils are likely to be wet, unless these soils are adequately drained.

Soils That Formed in Glacial Outwash, Alluvium, and Loess on Terraces and Flood Plains

These soils are in areas scattered across the northern part of the county, and are mainly along the major streams in the southern part of the county. The soils are mostly deep. They formed in glacial outwash on terraces or in alluvium on flood plains. The upper layers of most soils on terraces formed in a loess mantle of variable thickness. Most areas of these soils are farmed intensively; corn and soybeans are the main crops. Much of the city of Xenia and Wright-Patterson Air Force Base are in these areas. This group of associations makes up about 19 percent of the county.

7. Ockley-Rush association

Mainly nearly level to gently sloping, well drained soils that formed in loamy or silty material; deep to sand and gravel; on terraces

This association is mostly in an irregular-shaped band that extends northeast to southwest in the west-central part of the county. Two small areas are in the northern part of the county along the Clark County line.

This association makes up about 5 percent of the county. It is about 45 percent Ockley soils, 25 percent Rush soils, and 30 percent minor soils.

The soils in the association are mostly nearly level to gently sloping on high terraces. A few sloping to steep soils are on the sides of stream valleys and escarpments. Ockley and Rush soils are well drained. Ockley soils formed in 42 inches or more of silty or loamy material overlying sand and gravel. Ockley soils are mainly gently sloping, and Rush soils more commonly are nearly level.

Minor in this association are Eldean, Casco, and Rodman soils. These well drained soils are in the few sloping to steep areas along stream valleys and escarpments. Also included in some areas are well drained Wea and Warsaw soils, moderately well drained Thackery soils, and somewhat poorly drained Sleeth soils. In some places in the association the sand and gravel is covered by a thin deposit of loam glacial till.

The part of this association north and northeast of Xenia is used mainly for farming. Part of the city of Xenia is on an area of this association, and nonfarm development is increasing in this area. The underlying sand and gravel of Ockley and Rush soils in most places is suitable for commercial use. Because natural drainage is good and slopes are mostly mild, the dominant soils in this association have few limitations for many different farm and nonfarm uses.

8. Eldean-Ockley-Wea association

Mainly nearly level to gently sloping, well drained soils that formed in loamy or silty material; moderately deep and deep to sand and gravel; on terraces

This association is in areas scattered along Mad River, Little Miami River, and their larger tributaries.

This associaton makes up 4 percent of the county. It is 40 percent Eldean soils, 25 percent Ockley soils, 10 percent Wea soils, and 25 percent minor soils.

The soils in this association are mostly nearly level to gently sloping and are well drained. They formed in sand and gravel deposits. A few sloping to steep soils are on the sides of stream valleys and escarpments that separate terrace levels. The dominant Eldean soils commonly are on the lower terraces, particularly along Little Miami River. Ockley soils are the main soils on the higher terraces along Little Miami River. Wea soils are mostly along Mad River in Bath Township. The depth to the underlying sand and gravel is less than 40 inches in Eldean soils and more than 40 inches in Ockley and Wea soils.

Minor in this association are well drained, sloping to steep Casco and Rodman soils. These soils are on sides of stream valleys and escarpments. Also included in places are well drained Rush soils in nearly level areas.

The part of this association adjacent to Mad River in Bath Township is used mainly for residential development. Other, smaller parts along Little Miami River near Oldtown and south of Spring Valley are farmed intensively. The deposits of sand and gravel which underlie this association are suitable for commercial use. The dominant soils in this association have few limitations for many farm and nonfarm uses because natural drainage is good and slopes are mostly mild. However, some of the Eldean soils on the lower terraces are subject to occasional flooding. Droughtiness on Eldean soils is also a limitation for farming.

9. Sloan-Ross-Algiers association

Level to nearly level, very poorly drained to well drained soils that formed in loamy, stream-deposited material; on flood plains

This association is on level to nearly level stream flood plains along the major streams in the county.

This association makes up 7 percent of the county. It is 45 percent Sloan soils, 15 percent Ross soils, 10 percent Algiers soils, and 30 percent minor soils.

The soils in this association formed in loamy sediments deposited by flooding streams. Sloan soils are very poorly drained, and Ross soils are well drained. Both have dark colored surface layers. Algiers soils are somewhat poorly drained. They have a layer of lighter colored sediment overlying older, darker colored soils.

Minor in this association are well drained Genesee soils and moderately well drained Eel soils. Also included in a few places, particularly along Mad River and south of Spring Valley, are areas of Linwood muck.

Because most flooding on soils of this association occurs in winter and early in spring, soils are better suited to crops grown in summer than at other times during the year. They are used intensively for cash crops, mainly corn and soybeans. The deep, dark colored surface layer of Ross soils is a good source of topsoil. Flooding is the major limitation for many land uses. In Sloan and Algiers soils, wetness resulting from a seasonal high water table is a limitation for some uses. Although these soils can be drained artificially, locating adequate outlets is generally difficult because the soils are nearly flat.

10. Westland association

Level to nearly level, very poorly drained soils that formed in loamy material underlain by sand and gravel; on terraces

This association is of relatively limited extent. It is mostly in small areas, scattered mainly in the northern part of Greene County. The largest area is in Cedarville and Ross Townships in the northeastern part of the county.

This association makes up about 3 percent of the county. It is about 70 percent Westland soils and 30 percent minor soils.

The soils in this association are low, level to nearly level terraces. Westland soils dominate the association. They are very poorly drained. They formed in 40 inches or more of loamy material underlain by sand and gravel. The sand and gravel in some places contains a considerable amount of silt and clay.

The minor soils in the association include small areas of very poorly drained Ragsdale, Patton, and Sloan soils. Somewhat poorly drained Sleeth soils are also included.

Most areas of this association are intensively farmed. Cash cropping is the major farm enterprise. Corn and soybeans are the main crops. Wetness resulting from a seasonal high water table is the major limitation of the soils for many land uses. If artificially drained and intensively managed, all of these soils are highly productive. Wetness severely limits the use of Westland soils for most nonfarm uses.

Use and Management of the Soils

This section briefly discusses management of the soils in Greene County for crops and pasture, and it gives some general practices used in managing the soils for those purposes. The system of capability grouping used by the Soil Conservation Service is explained, and the capability units used to group soils of Greene County are described according to that system. This section also provides information on the estimated yields in the county, discusses management of the soils for woodland and for wildlife, provides data pertinent to the use of the soils for engineering, and discusses the use of the soils for town and country planning.

Crops and Pasture

Field crops commonly grown in Greene County include corn, soybeans, wheat, oats, and other small grain. Plants suitable for meadow and pasture include alfalfa, adapted clovers, timothy, bromegrass, and orchardgrass. Special crops include tomatoes, sweet corn, popcorn, strawberries, tobacco, and other such crops suited to the climate.

General practices of management

The soils in Greene County differ in their suitability for specific crops and require widely different management; however, some basic or general management practices are needed on practically all of the soils. This section discusses the basic practices of maintaining fertility, using crop residue, improving drainage, and controlling erosion. The management of specified groups of soils is discussed in the section "Management by Capability Units," but more specific information can be obtained by consulting a representative of the Soil Conservation Service or the Ohio Cooperative Extension Service.

Maintenance of adequate levels of fertility.—Because many of the soils, particularly the light colored ones on the uplands and terraces, are naturally acid and low in content of plant nutrients, lime and fertilizer need to be added. Additions should be based on the results of soil tests, on the needs of the crop, and on the level of yields desired. For assistance in determining the kinds and amounts of fertilizer and lime to apply, farmers should consult the Ohio Cooperative Extension Service.

Use of crop residue.—Many of the soils, particularly the light colored ones, are not naturally high in organic matter content. To increase or maintain the organic matter content, all crop residue should be incorporated into the soil. If soybeans or other crops that produce little residue are grown, the cropping system should provide cover crops and sod crops. Maintaining the organic matter content of a soil helps to keep good structure and tilth.

Drainage.—Wetness is a hazard on about 40 percent of the acreage used for cultivated crops in the county. Crops grow well on somewhat poorly drained, poorly drained, and very poorly drained soils where excess water has been removed by surface drains, tile, or both. Land smoothing is also beneficial in many areas. Few or no practices are needed to improve drainage on the moderately well drained or well drained soils.

Control of erosion.—Erosion is a hazard on the gently sloping to very steep soils. About 45 percent of the acreage used for cultivation is subject to moderate or severe erosion. Practices of erosion control commonly used in the county are contour and cross-slope tillage; minimum tillage and no tillage systems; terraces, waterways, and diversions; using crop residue; and planting close-growing crops.

Irrigation

Irrigation is not widely used in Greene County, but it may be an important management practice in the future for growing special crops. In 1969, 108 acres were irrigated as compared to 11 acres in 1964. Some of the soils in the county are well suited to irrigation, but others are poorly suited. The features affecting the use of soils for irrigation are discussed in the section "Engineering Uses of the Soils."

For a soil to be suitable for irrigation, the surface layer should be sufficiently porous to absorb water readily. The soil should have good water holding capacity, and the movement of water and air in the subsoil or underlying material should be sufficient to prevent waterlogging.

The well drained soils on outwash terraces, such as Eldean, Warsaw, Wea, and Ockley soils, are well suited to irrigation. Eldean and Warsaw soils dry out quickly and warm up early in the spring, but they both have limited available water capacity and both are likely to have insufficient moisture during the growing season unless they are irrigated. Most nearly level and gently sloping, well drained soils of the uplands, such as Miamian and Milton soils, are moderately suited to irrigation. Eel, Genesee, and Ross soils of the bottom lands are well suited to irrigation if they are protected from flooding.

Soils that have slopes of more than 6 percent are generally not suited to irrigation. If the sloping soils are irrigated, however, the rate of water application must be regulated to control runoff and erosion.

Lack of good sources of water limits irrigation in some parts of the county. Generally, the soils on the bottom lands and outwash terraces have a good supply of underground water for irrigation.

Crop yields on many of the soils in Greene County can be improved by supplemental irrigation in dry periods during the growing season. Soil characteristics should be studied carefully before an irrigation system is installed. In addition, a qualified engineer should carefully evaluate the water supply, the crop or crops to be irrigated, the cost of equipment, and the economy of the operation. Additional information on irrigation is available from the local representative of the Ohio Cooperative Extension Service or the Soil Conservation Service.

Capability grouping

Capability grouping shows, in a general way, the suitability of soils for most field crops. The soils are grouped according to their limitations when used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive 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 other crops requiring special management.

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

In the capability system, the kinds of soil are grouped at three levels: the capability class, the subclass, and the 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 subject to little or no erosion but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife habitat. (None in Greene 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 habitat.
- 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 habitat.
- Class VIII soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife habitat, or water supply, or to esthetic purposes. (None in Greene 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, but not in Greene County, shows that the chief limitation is climate that is too cold or too dry.

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

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 or IIIw-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.

Management by capability units

The soils in Greene County have been placed in 25 capability units. The soils in each unit have about the same limitations, are subject to similar risks of damage, need about the same kind of management, and respond to management in about the same way. Mapping units that include Urban land have not been placed in a capability unit, because they are generally the sites for industrial, residential, or other community development.

In the following pages each capability unit is described, and management for each is discussed. To determine the soils in each capability unit, refer to the "Guide to Mapping Units" at the back of this survey. Also, the capability unit assigned to any soil is listed at the end of the description of that soil in the section "Descriptions of the Soils."

The descriptions of the capability units show soil features that limit the use of soils for crops and pasture. Only general management practices for overcoming the limitations are given. The control of erosion or wetness, for example, can be achieved by many methods or combinations of practices on any given field of any kind of soil. For specific information regarding control of erosion and the use of artificial drainage, suited crop varieties, or other management practices, the reader should contact the nearest office of the Soil Conservation Service or the Ohio Cooperative Extension Service.

CAPABILITY UNIT I-1

This unit consists of nearly level, well drained and moderately well drained soils on uplands, stream terraces, and outwash plains. These soils are in areas that are not commonly flooded. They have a surface layer of friable silt loam. The soils on stream terraces and outwash plains have a sandy and gravelly substratum below a depth of 40 inches.

The rooting zone is moderately deep to deep. Available water capacity is moderate to high. Permeability is moderately slow to moderate. These soils are seldom too wet or too dry for crops.

The main concerns of management are maintaining adequate fertility, good tilth, and a sufficient supply of organic matter.

These soils are suited to all row crops and meadow and pasture plants commonly grown in the county. They have no limitations for field crops and pasture. They have no erosion or only a slight hazard of erosion. The soils of this unit are also suited to the special crops commonly grown in the area, but artificial drainage is needed in places on the moderately well drained soils. If good management practices are used, these soils can be cropped frequently. They are suited to irrigation.

CAPABILITY UNIT IIe-1

This unit consists of gently sloping, well drained, and moderately well drained soils on uplands, stream terraces, and outwash plains. These soils commonly have a surface layer of friable silt loam. The soils on stream terraces and outwash plains have a sandy and gravelly substratum below a depth of 40 inches.

The rooting zone is moderately deep to deep. Available water capacity is moderate to high, and permeability is moderate to moderately slow. These soils are seldom too wet or too dry for crops.

A moderate hazard of erosion is the major limitation to use of these soils for cultivated crops. Additional management concerns are maintaining fertility, tilth, and organic matter.

These soils are suited to all grain, meadow, and pasture plants commonly grown in the county. They are also suited to special crops, such as potatoes and sweet corn. Crops can be grown continuously if appropriate management practices are used. These soils are suited to sprinkler irrigation if proper erosion-control practices are used.

CAPABILITY UNIT IIe-2

This unit consists of gently sloping, well drained soils on uplands, stream terraces, and outwash plains. These soils are moderately eroded. The plow layer is a mixture of material from the surface layer and from the upper part of the subsoil. The soils in this unit require more careful management if used for crops than do the less eroded soils because they have a lower capacity to absorb moisture and supply it to plants.

The rooting zone is moderately deep to deep. Available water capacity is moderate to high, and runoff is medium. Permeability is moderate to moderately slow. Tilth is poorer in the plow layer of these soils than in that of similar, less eroded soils. Poorer tilth reduces the range in moisture content suitable for plowing and cultivation. The soils in this unit that occupy stream terraces and outwash plains have a sandy and gravelly substratum that provides good internal drainage, particularly after periods of rain.

The main concern of management is controlling erosion. Additional management concerns are improving the level of fertility and incorporating crop residue to improve the tilth of these soils.

These soils are suited to special crops, such as potatoes, sweet corn, and tomatoes. They can be used for permanent meadow, pasture, or tree crops and for most other crops commonly grown in the county. Cultivated crops can be continuously grown if appropriate management practices are used. These soils are suited to sprinkler irrigation if proper erosion-control practices are used. Cropping systems used on these soils should periodically include small grain, legumes, and grasses. This helps to control erosion, maintain organic matter content, and improve tilth.

CAPABILITY UNIT IIe-3

This unit consists of gently sloping, well drained soils on stream terraces and outwash plains. These soils commonly have a surface layer of friable silt loam.

The rooting zone is moderately deep. Available water capacity is moderate, and permeability is moderate. These soils have a sandy and gravelly substratum below a depth of 24 to 40 inches. They are seldom too wet for growing plants, but they are commonly droughty in late summer.

Soils in this unit have a moderate hazard of erosion. Additional concerns of management when these soils are cropped are improving the level of fertility and incorporating crop residue to maintain tilth.

These soils are suited to the row crops, hay, and pasture plants commonly grown in the county. Yields of most crops and plants are commonly reduced during periods of drought, particularly yields of those crops that are sensitive to a shortage of moisture, such as soybeans and corn. These soils are also suited to special crops and irrigation if proper erosion-control practices are used and if fertility, organic matter content, and tilth are maintained.

CAPABILITY UNIT IIe-4

This unit consists of gently sloping, well drained soils on uplands. These soils commonly have a surface layer of friable silt loam. They are underlain by limestone or limestone and shale bedrock at a depth of 20 to 40 inches.

The rooting zone is moderately deep. Available water capacity is moderate, and permeability is moderate to moderately slow.

The hazard of erosion is moderate, and the depth of rooting is limited by the bedrock. The moderate rooting depth and moderate available water capacity cause some droughtiness, particularly late in summer. The main concern of management is maintaining or improving fertility, organic matter content, and tilth.

The soils of this unit are suited to row crops, hay, and pasture plants commonly grown in the county. Growth of most crops, particularly corn and soybeans, is commonly reduced because the soils are droughty late in summer.

CAPABILITY UNIT IIw-1

Algiers silt loam is the only soil in this unit. It is a nearly level, somewhat poorly drained soil mainly on flood plains. It is subject to flooding, particularly late in winter and in spring. It has a seasonal high water table and is naturally wet until late in spring unless artificially drained.

The rooting zone is deep. Available water capacity is high, and permeability is moderate.

The major limitation to use of this soil is seasonal wetness. If the soil is worked when too wet, it becomes cloddy and difficult to till. It compacts readily if pasture is grazed when too wet. Surface water can be removed by shallow ditches and the seasonal high water table can be lowered by tile drains if suitable outlets are available. Diversion ditches are needed if this soil receives surface runoff from nearby slopes.

This soil is suited to hay and pasture plants that can tolerate wet conditions. It can be cultivated frequently if appropriate management practices are used. There is no erosion or only a slight hazard of erosion. If artificially drained, this soil is suited to such crops as corn and soybeans. In local areas where flooding is frequent, this soil is better suited to pasture or trees than to most other uses.

CAPABILITY UNIT IIw-2

This unit consists of nearly level to gently sloping, somewhat poorly drained soils on uplands, stream terraces, and outwash plains. These soils have a seasonal high water table and are slow to warm up in the spring unless they are artificially drained.

The rooting zone is moderately deep to deep. Available water capacity is moderate to high, and runoff ranges from slow to medium. Permeability is slow to moderate.

The major limitation to use of these soils is wetness, but erosion is a hazard on the steeper soils in this unit. If the soil is worked when too wet, it becomes cloddy, and is difficult to till. Crusting of the surface layer may occur in cultivated areas. If pastures are grazed when wet, the soils become compacted and the quality of the plant cover is damaged. These soils are suited to tile drainage. Sod waterways and surface drains are needed in places to remove excess water from the soil surface and from ponded areas.

If these soils are adequately drained and managed, they are suited to all the grain crops, hay, and pasture plants commonly grown in the county. Cultivated crops can be grown frequently, particularly on the nearly level soils. Green manure and winter cover crops should be used to maintain soil structure and tilth.

CAPABILITY UNIT IIw-3

This unit consists of nearly level to depressional, very poorly drained soils on uplands, lakebeds, stream terraces, and outwash plains. The water table is commonly near the surface much of the year.

The rooting zone is moderately deep to deep. Available water capacity is high, and runoff is very slow to ponded. Permeability is slow to moderate.

Wetness is the major limitation to the use of these soils. If the soil is worked when wet, it compacts, making the soil more difficult to till. Grazing pasture when the soil is too wet also results in soil compaction. The soils in this unit are suited to tile drainage if outlets are available. Both surface and subsurface drainage help to remove surplus water and lower the water table to provide an adequate rooting zone for plants.

If adequately drained and managed, the soils in this unit are suited to most crops commonly grown in the county. These soils can be rowcropped continuously if appropriate management practices are used. Undrained areas are suited to pasture, forest, or wetland wildlife habitat.

CAPABILITY UNIT IIw-4

Linwood muck is the only soil in this unit. It is a level, very poorly drained soil in depressions or basinlike areas on flood plains, stream terraces, and uplands. It is a dark colored soil formed in organic material overlying loamy mineral material. The water table is at or near the surface most of the year unless the soil is artificially drained.

The rooting zone is moderately deep to deep. Available water capacity is high, and runoff is very slow to ponded. Permeability is rapid in the organic layers and moderate in the loamy material.

Wetness is the major limitation to use of this soil. Its low lying position makes this soil difficult to drain. If drainage outlets can be obtained, water will readily drain from this soil. Open ditches are usually best, but tiling may be satisfactory if tile is placed in the firm underlying mineral material. The low position on the landscape makes this soil susceptible to frost damage comparatively early in fall and late in spring. Because of the high organic matter content in the upper layers of this soil burning is a hazard. The loose granular surface layer is also subject to soil blowing. Management practices are needed to protect the soil from fire and soil blowing.

This soil can be row cropped continuously if appropriate management practices are used. It is well suited to most truck crops common to the area. Small grain and meadow crops are not well suited to this soil, even if drained, because of lodging and periodic ponding or flooding. Undrained areas are better suited to forest or wetland wildlife habitat than to most other uses.

CAPABILITY UNIT IIw-5

This unit consists of nearly level, well drained and moderately well drained soils on flood plains. These soils have a surface layer of friable loam or silt loam. They are subject to flooding, but crop damage is generally slight.

The rooting zone is deep. Available water capacity is high, and permeability is moderate. Natural fertility is commonly medium to high.

Flooding is the only limitation to use of these soils for most commonly grown crops. Artificial drainage is ordinarily not needed. However, moderately well drained soils in places need artificial drainage, particularly for special crops. The soils are suited to many special crops. They are suited to irrigation. Row crops may be continuously grown if appropriate management practices are used. Areas that are subject to frequent flooding are best suited to permanent plant cover, such as grass or trees.

CAPABILITY UNIT IIs-1

This unit consists of nearly level, well drained soils on stream terraces, outwash plains, or uplands. These soils have a surface layer of silt loam or loam. They are underlain by either sand and gravel or bedrock at a depth of 20 to 40 inches.

The rooting zone is moderately deep. Available water capacity is moderate, and runoff is slow. Permeability is moderate.

Droughtiness is the main limitation to use of these soils. The main concerns of management are maintaining fertility, organic matter content, and tilth. This is especially important if the soils are row-cropped intensively.

These soils are suited to most grain, hay, and pasture plants and to some special crops commonly grown in the county. Areas underlain by sand and gravel are well suited to irrigation. These soils can be farmed intensively if proper management practices are used and soil moisture is conserved.

CAPABILITY UNIT IIIe-1

This unit consists of gently sloping and sloping, well drained soils on uplands. These soils are moderately eroded or severely eroded.

The rooting zone is moderately deep. Available water capacity is moderate, and runoff is medium to rapid. Permeability is moderate to moderately slow.

Because the surface layer is eroded, the main concerns of management are maintaining and improving soil fertility, soil structure, and organic matter content. Surface crusting is also a concern, particularly in severely eroded areas. This makes the soils more difficult to manage as a seedbed.

These soils are suited to most grain, hay, and pasture plants commonly grown in the county. They are not well suited to special crops because the hazard of erosion is severe and available water capacity is limited. These soils are well suited to meadow and pasture crops. These crops will in turn improve the tilth, productivity, and organic matter content of the soils.

CAPABILITY UNIT IIIe-2

Eldean silt loam, 6 to 12 percent slopes, moderately eroded, is the only soil in this unit. It is a sloping, well drained soil on stream terraces and outwash plains.

The rooting zone is moderately deep. Available water capacity is moderate, and runoff is rapid. Permeability is moderate. This soil has a sandy and gravelly substratum at a depth of 24 to 40 inches. This provides good internal drainage.

The major limitation to use of this soil is a severe hazard of erosion. The moderate depth to sand and gravel and the moderately eroded condition also cause a moderate limitation of droughtiness. The main concerns of management of this soil are maintaining or improving soil fertility, organic matter content, and tilth.

This soil is suited to most grain crops, and to hay and pasture plants commonly grown in the county. Because it is droughty, the soil is better suited to early-maturing crops than to late-maturing crops.

CAPABILITY UNIT IIIe-3

This unit consists of sloping, well drained soils on uplands that are underlain by limestone and shale bedrock at a depth of 20 to 40 inches. These soils are moderately eroded.

The rooting zone is moderately deep. Available water capacity is moderate, and permeability is moderate to moderately slow.

The major limitation in farming these soils is the severe hazard of erosion. The moderate depth to bedrock and the moderately eroded surface layer result in a moderate limitation of droughtiness. The main concerns of management are improving soil fertility, maintaining organic matter content and tilth, and controlling erosion. Conserving moisture to improve production is also a concern.

These soils are suited to most grain crops, and to hay and pasture plants commonly grown in the county. The cropping system should allow a large amount of crop residue to be returned to the soil. These soils are suited to use for early pasture.

CAPABILITY UNIT IIIe-4

Ritchey silt loam, 2 to 6 percent slopes, is the only soil in this unit. It is a gently sloping, well drained soil on uplands. It is shallow to limestone bedrock.

The rooting zone is shallow. Available water capacity is low, and permeability is moderate.

The main limitation to use of this soil is the severe hazard of erosion. Low available water capacity also limits production of farm crops. The main concerns of management are conserving moisture, maintaining fertility, organic matter content, and tilth, and controlling erosion.

This soil is suited to most grain crops and to hay and pasture plants commonly grown in the county. Because it is shallow and droughty, this soil is better suited to small grain and other early-maturing crops than to late-maturing crops. It is suited to drought-resistant hay or pasture plants and to use for early pasture.

CAPABILITY UNIT IIIw-1

Randolph silt loam, 0 to 2 percent slopes, is the only soil in this unit. It is a nearly level, somewhat poorly drained soil underlain by limestone bedrock at a depth of 20 to 40 inches.

The rooting zone is moderately deep. Available water capacity is moderate, and permeability is moderately slow. This soil is saturated with water for long periods in winter and in spring.

The major limitation to use of this soil is seasonal wetness. Surface crusting is a problem if this soil is cultivated. This soil can be artificially drained, but the underlying bedrock hinders placement of tile in places.

If adequately drained, this soil is suited to most grain, hay, and pasture crops commonly grown in the county. It can be cultivated frequently if management practices are used to maintain fertility, if a large amount of crop residue is incorporated, and if tilth is maintained. Undrained areas are suited to pasture, woodland, or wetland wildlife habitat.

CAPABILITY UNIT IIIw-2

Sloan silty clay loam is the only soil in this unit. It is a very poorly drained soil on flood plains. This soil is subject to flooding, mostly in winter and in spring. Flooding damage to summer crops is infrequent.

If this soil is artificially drained, the rooting zone is deep. Available water capacity is high, and permeability is moderate. This soil dries out slowly in the spring because it has a seasonal high water table.

Wetness is the major limitation to use of this soil. The soil can be drained if suitable drainage outlets are available. Cultivation when wet causes cloddy structure and poor tilth in the surface layer. Grazing pasture when wet causes soil compaction and damage to pasture plants.

This soil is suited to most row crops commonly grown in the county. It is not well suited to winter grain crops because of the hazard of flooding. It can be cultivated frequently if appropriate management practices are used. Areas that are not readily drainable or that are flooded frequently are better suited to water-tolerant grass or trees than to most other uses.

CAPABILITY UNIT IIIw-3

Millsdale silty clay loam is the only soil in this unit. It is a nearly level, very poorly drained soil underlain by limestone bedrock at a depth of 20 to 40 inches.

The rooting zone is moderately deep. Available water capacity is moderate to high, and permeability is moderately slow. This soil has a high water table for long periods in winter and in spring.

Severe wetness is the main limitation to use of this soil. If cropped, the main concerns of management are using artificial drainage and maintaining soil fertility and structure. Although the underlying bedrock interferes with placement of tile in places, this soil is suited to tile drainage. Surface drainage is needed in areas to remove ponded water.

If drained, this soil is suited to most crops commonly grown in the county. Row crops can be grown frequently if appropriate management practices are used. If this soil is not drained it dries out very slowly in the spring. Undrained areas are better suited to water-tolerant grasses, to trees, or to wetland wildlife habitat than to most other uses.

CAPABILITY UNIT IVe-1

This unit consists of sloping and moderately steep, well drained soils on uplands and terraces. These soils are moderately eroded or severely eroded. They are underlain by glacial till, sand and gravel, or bedrock at a depth of 20 to 40 inches.

The rooting zone is shallow to moderately deep. Available water capacity is low to moderate, and runoff is rapid. Permeability is moderate to moderately slow.

The main limitation to the use of these soils is a severe hazard of erosion. Therefore, the major concern of management is controlling erosion. Crusting of the surface layer is also a concern, particularly in the severely eroded areas. Management practices should provide for the addition of a large amount of organic matter to improve fertility and tilth.

These soils are suited to most field crops commonly grown in the county. They are not suited to frequent cultivation because of the severe hazard of erosion. These soils are suited to the commonly grown grasses for hay or pasture.

CAPABILITY UNIT IVe-2

Ritchey silt loam, 6 to 12 percent slopes, is the only soil in this unit. It is a sloping, well drained soil underlain by limestone bedrock at a shallow depth. This soil is moderately eroded in most areas.

The rooting zone is shallow. Available water capacity is low, and permeability is moderate.

This soil has a very severe hazard of erosion. The main concerns of management are controlling erosion and improving fertility, organic-matter content, tilth, and available water capacity.

This soil is better suited to crops that are tolerant of droughty conditions or that mature early in the season than to other crops. It is well suited to most commonly grown hay and pasture plants. Crop production is limited by the low available water capacity, particularly during droughty seasons. The soil is suited to use for early pasture.

CAPABILITY UNIT VIe-1

This unit consists of moderately steep, steep, and very steep, well drained soils on uplands. These soils are moderately eroded or severely eroded.

The rooting zone is shallow to moderately deep. Available water capacity is low to moderate, and runoff is medium to rapid. Permeability is moderately slow to rapid.

A severe hazard of erosion is the major limitation to the use of these soils for farming. Steep slopes also severely limit the use of these soils for cultivated crops.

These soils are well suited to meadow and pasture. Drought-tolerant grasses and legumes are better suited than most other plants. Control of erosion is essential when establishing meadow and pasture seedings. Maintaining soil fertility and regulating grazing on pasture stands are needed to maintain a dense cover and provide satisfactory production. These soils are well suited to trees and to upland wildlife habitat.

CAPABILITY UNIT VIe-2

This unit consists of moderately steep, well drained soils underlain by sand and gravel.

The rooting zone is shallow to moderately deep. Available water capacity is low to moderate, and runoff is rapid. Permeability is moderate.

The major limitation to use of these soils is the severe hazard of erosion. Droughtiness caused by the low to moderate available water capacity is also a limitation.

These soils are suited to permanent cover crops, such as grasses and legumes. When the soils are used for hay or pasture, drought-tolerant grasses and legumes suited to the area should be selected to establish a new seeding. Growth of hay and pasture plants begins early in the spring but is normally slow in summer. It is essential that a good vegetative cover be maintained on these soils to control erosion. These soils are also suited to trees and to upland wildlife habitat.

CAPABILITY UNIT VIe-3

This unit consists of moderately steep and steep soils that are shallow to bedrock.

The rooting zone is shallow. Available water capacity is low, and runoff is rapid. Permeability is moderate.

The major limitation to use of the soils in this unit is the severe hazard of erosion. In addition, low available water capacity and steep slopes limit the use of these soils for cultivated crops.

The soils are well suited to permanent cover crops, such as grasses and legumes. When the soils are used for permanent pasture, drought-tolerant grasses and legumes should be selected for seeding. Grazing should be regulated to provide a dense plant cover to control erosion. The soils in this unit are also suited to trees and to upland wildlife habitat.

CAPABILITY UNIT VIIe-1

This unit consists of steep and very steep soils that are well drained.

The rooting zone is shallow to moderately deep. Available water capacity is low to moderate, and runoff is rapid. Permeability is rapid to moderately slow.

The major limitation to use of these soils is a severe hazard of erosion. Steep slopes and droughtiness also limit these soils for farming.

The soils are too steep for cultivated crops and for most hay harvesting equipment. However, they are suited to woodland and pasture. Suited drought-tolerant grasses and legumes should be selected for seeding pasture. Total pasture production is commonly low because of the limited amount of water available to plants. The hazard of erosion is very severe and grazing should be regulated to maintain a dense plant cover. These soils are well suited to trees and to upland wildlife habitat.

CAPABILITY UNIT VIIe-2

This unit consists of very steep, well drained soils that are moderately deep to limestone bedrock. The surface layer and subsoil of some of these soils contain many limestone fragments.

The rooting zone is moderately deep. Available water capacity is moderate to low, and runoff is rapid. Permeability is moderate to moderately slow.

Very steep slopes and the channery texture are the major limitations to use of these soils. The soils have a severe hazard of erosion and a permanent plant cover should be maintained.

These soils are well suited to trees and to upland wildlife habitat. Most areas are in woodland. A few areas are in pasture.

Estimated Yields

Table 1 shows, for most 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 years under two levels of managment. Yields in columns A are those obtained under improved management, and those in columns B are obtained under optimum management. Yields are not estimated for complexes that include Urban land and are not used for farming.

An optimum level of management includes (1) using practices that increase the intake of water and the water holding capacity of the soils; (2) disposing of excess water by appropriate means; (3) using practices that help to control erosion; (4) adopting suitable methods of plowing, preparing the seedbed, and cultivating; (5) controlling weeds, diseases, and insects; (6) maintaining fertility and soil reaction at an optimum level; (7) applying the trace elements, such as zinc, cobalt, manganese, and copper, if they are needed; (8) selecting high-yielding crop varieties suited to the soil; and (9) conducting all farming operations at the proper time and in the proper way.

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

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

[Figures in columns A indicate yields under improved management; figures in columns B indicate yields under optimum management. Absence of figure indicates that the crop is not well suited to the soil or that it is not commonly grown]

Soil	Corn		Wheat		Oats		Soybeans		Grass-legume hay	
	A	B	A	B	A	B	A	B	A	B
	Bu	*Bu*	*Bu*	*Bu*	*Bu*	*Bu*	*Bu*	*Bu*	*Tons*	*Tons*
Algiers silt loam	76	106	28	40	50	80	25	40	3.0	4.5
Birkbeck silt loam, 1 to 4 percent slopes	75	110	32	45	52	78	25	40	2.8	5.0
Brookston silty clay loam	85	130	35	50	50	80	28	43	3.0	5.0
Casco-Eldean loams, 12 to 18 percent slopes, moderately eroded									2.0	3.0
Casco-Rodman loams, 18 to 50 percent slopes, moderately eroded									1.0	2.0
Celina silt loam, 0 to 2 percent slopes	75	108	35	45	55	80	24	36	2.8	5.0
Celina silt loam, 2 to 6 percent slopes	70	104	32	42	50	75	23	34	2.5	4.5
Crosby silt loam, 0 to 2 percent slopes	75	108	32	42	50	80	27	38	2.7	4.8
Crosby silt loam, 2 to 6 percent slopes	70	102	30	40	47	75	25	36	2.4	4.4
Edenton silt loam, 2 to 6 percent slopes	57	92	26	39	45	69	22	35	2.4	4.0
Edenton silt loam, 6 to 12 percent slopes, moderately eroded	44	78	24	35	40	66	18	30	2.0	3.7
Edenton silt loam, 12 to 18 percent slopes, moderately eroded	38	62	15	24	36	50			1.8	3.2
Eel loam	84	124	30	40	50	75	27	40	3.0	5.0
Eldean silt loam, 0 to 2 percent slopes	68	102	30	44	50	75	22	32	3.0	4.5
Eldean silt loam, 2 to 6 percent slopes	66	100	28	42	48	73	20	30	2.8	4.2
Eldean silt loam, 2 to 6 percent slopes, moderately eroded	60	94	26	40	44	70	18	27	2.5	4.0
Eldean silt loam, 6 to 12 percent slopes, moderately eroded	50	84	23	36	40	65	17	24	2.3	3.6
Eldean clay loam, 6 to 12 percent slopes, severely eroded	37	60	18	26	35	50	15	20	1.7	3.0
Fairmount silty clay loam, moderately deep variant, 25 to 50 percent slopes									1.5	2.5
Fincastle silt loam, 0 to 2 percent slopes	67	101	32	44	50	80	23	40	2.8	5.0
Genesee loam	86	126	30	40	55	80	30	40	3.1	5.0
Linwood muck	70	113								
Miamian silt loam, 0 to 2 percent slopes	75	105	31	43	52	80	28	38	3.4	4.8
Miamian silt loam, 2 to 6 percent slopes	66	100	28	41	50	78	25	34	3.2	4.6
Miamian silt loam, 2 to 6 percent slopes, moderately eroded	64	93	27	40	47	74	23	32	3.0	4.4
Miamian silt loam, 6 to 12 percent slopes, moderately eroded	50	83	25	38	40	65	19	28	2.6	4.0
Miamian silt loam, 12 to 18 percent slopes, moderately eroded	41	68	22	31	35	62	17	25	2.2	3.5
Miamian clay loam, 2 to 6 percent slopes, severely eroded	42	71	17	28	30	46	16	22	1.9	2.9
Miamian clay loam, 6 to 12 percent slopes, severely eroded	37	55	18	25	37	62	14	21	1.7	2.7
Miamian clay loam, 12 to 18 percent slopes, severely eroded					25	50			1.5	2.5
Miamian-Casco complex, 12 to 18 percent slopes, moderately eroded									2.0	3.2
Miamian-Casco complex, 18 to 35 percent slopes, moderately eroded									1.1	2.3
Miamian-Eldean silt loams, 2 to 6 percent slopes, moderately eroded	65	92	28	41	45	75	22	30	3.0	4.4
Miamian-Eldean silt loams, 6 to 12 percent slopes, moderately eroded	55	85	25	38	44	65	20	30	2.4	3.8
Miamian and Hennepin soils, 18 to 25 percent slopes									1.8	2.8
Miamian and Hennepin soils, 25 to 50 percent slopes									1.5	2.5
Millsdale silty clay loam	70	116	30	44	47	77	25	39	2.9	4.6
Milton silt loam, 0 to 2 percent slopes	59	91	27	39	45	74	21	30	2.5	3.8
Milton silt loam, 2 to 6 percent slopes	57	87	26	35	45	69	21	30	2.6	3.7
Milton silt loam, 6 to 12 percent slopes, moderately eroded	40	72	19	31	32	50	15	22	2.0	3.0
Milton soils, channery variant, 25 to 50 percent slopes										
Ockley silt loam, 0 to 2 percent slopes	76	108	35	45	52	85	26	37	3.1	4.8
Ockley silt loam, 2 to 6 percent slopes	71	104	32	42	50	82	24	35	3.1	4.6
Ockley silt loam, 2 to 6 percent slopes, moderately eroded	60	101	28	35	48	78	20	30	2.2	3.9
Odell silt loam, 2 to 6 percent slopes	78	110	35	45	50	80	28	38	2.7	4.8
Patton silty clay loam	82	128	33	46	50	80	28	34	3.0	4.7
Ragsdale silty clay loam	87	132	35	50	50	80	29	43	3.2	5.0
Randolph silt loam, 0 to 2 percent slopes	65	90	30	40	45	71	23	33	2.3	3.8

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

Soil	Corn		Wheat		Oats		Soybeans		Grass-legume hay	
	A	B	A	B	A	B	A	B	A	B
	Bu	*Bu*	*Bu*	*Bu*	*Bu*	*Bu*	*Bu*	*Bu*	*Tons*	*Tons*
Raub silt loam, 0 to 2 percent slopes	80	114	35	45	50	80	28	38	2.7	4.8
Raub silt loam, 2 to 6 percent slopes	75	108	32	42	46	78	25	36	2.4	4.4
Reesville silt loam, 0 to 2 percent slopes	78	110	32	42	50	80	27	40	2.8	4.8
Ritchey silt loam, 2 to 6 percent slopes	37	63	18	29	35	55	15	24	2.0	3.0
Ritchey silt loam, 6 to 12 percent slopes	25	46	15	25	30	45	8	15	1.1	2.2
Ritchey silt loam, 12 to 18 percent slopes									1.0	2.0
Ritchey silt loam, 18 to 25 percent slopes, moderately eroded									.8	1.6
Ross loam	86	134	30	45	50	80	28	42	3.3	5.0
Rush silt loam, 0 to 2 percent slopes	76	110	35	45	50	80	26	37	3.1	4.8
Rush silt loam, 2 to 6 percent slopes	71	106	30	42	48	78	24	35	3.0	4.6
Russell silt loam, 0 to 2 percent slopes	74	108	35	45	48	78	25	35	3.0	4.6
Russell-Miamian silt loams, 2 to 6 percent slopes	70	100	30	40	48	74	25	35	2.5	4.5
Russell-Miamian silt loams, 2 to 6 percent slopes, moderately eroded	60	95	30	38	40	70	23	30	2.5	4.4
Sleeth silt loam, 0 to 2 percent slopes	74	108	35	45	50	80	28	38	2.7	4.8
Sloan silty clay loam	84	128	30	40	40	75	26	40	2.4	5.0
Thackery silt loam, 0 to 2 percent slopes	76	108	35	45	50	82	26	37	3.0	4.8
Thackery silt loam, 2 to 6 percent slopes	71	104	32	42	48	80	24	35	3.0	4.6
Warsaw loam, 0 to 2 percent slopes	71	105	30	44	50	75	24	36	3.0	4.6
Wea silt loam, 1 to 3 percent slopes	80	118	35	50	60	85	29	42	3.5	5.0
Westland silty clay loam	82	128	33	50	50	80	26	42	3.2	5.0
Xenia silt loam, 0 to 2 percent slopes	76	110	36	46	55	80	24	36	2.6	4.8
Xenia silt loam, 2 to 6 percent slopes	70	104	32	40	50	76	23	33	2.6	4.6

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

Pasture yields in cow-acre-days, which is the estimated average number of days per year that one cow can graze an acre without damage to the pasture, are not given in table 1. These yields, however, can be determined by multiplying the tons of grass-legume hay by 2,000 to convert tons to pounds and then by dividing the number of pounds by 40 to determine cow-acre-days. For example, Brookston silty clay loam yields 5 tons of alfalfa-grass hay per acre under optimum management; 5 multiplied by 2000 equals 10,000, and that divided by 40 equals 250 cow-acre-days.

The estimates of yields given in table 1 are based primarily on information obtained from farmers and on observations and field trials made by the county agent and by the 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 team.

Woodland[2]

Before Greene County was settled, about 94 percent of the total land area was covered by hardwood forest, and the remaining 6 percent of the land was in prairie grass, freshwater marshes, and fens (*7*).[3] The hardwood forest types were beech, mixed oak, elm-ash swamp, and oak-maple. In 1970, according to Kingsley and Mayer (*8*), commercial and noncommercial forest covered about 19,300 acres, or slightly more than 7 percent of the total land area.

At the present time, woodland is mostly in widely scattered small woodlots. Because woodland management generally has a low priority in farm and land operations, production is below the potential of the individual soils supporting woodland.

Generally, remnants of the original forest are in small areas of soils that are least suited to other crops. These trees are often in undrained areas of Crosby, Fincastle, Brookston, Patton, and other seasonally wet soils. Wooded tracts are also on steep soils, some of which are shallow to bedrock. These soils include Fairmount, Ritchey, Milton variant, Casco, Rodman, Hennepin, and Miamian soils.

Woodland suitability groups

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

Each woodland group is identified by a three-part symbol, such as 1o1, 2w1, or 3s2. The potential productivity of the soils for indicator trees in the group is indicated by the first number in the symbol: 1 indicates excellent; 2, good; 3, fair; and 4, poor. These ratings are based on field determination of average site index. Site index of a given soil is the height, in feet, that the taller trees of a given species reach in a natural, essentially unmanaged stand in 50 years. Site index can be converted into approximate expected growth and yield per acre in cords and board feet. For a more complete discussion of site index and potential productivity the reader should see the latest literature available (*4, 9, 10, 12*).

The second part of the symbol identifying a woodland group is a letter. In this survey *w, d, s, f, r,* and *o* are used. Except for *o,* the letter indicates an important soil property that imposes a hazard or limitation in managing the soils of the group for trees. The letter *o* indicates that the soils have few limitations that restrict their use for trees. The letter *w* indicates excessive wetness, either seasonal or all year; restricted drainage; a high water table; or that the soils are subject to flooding. The letter *d* indicates a restricted rooting depth. The letter *s* indicates sandy soils that have little or no difference in texture between surface layer and subsoil (B horizon) or that have sand and gravel at a depth of less than 20 inches. These soils are moderately restricted to severely restricted for woodland use. They have low available water capacity and are low in available plant nutrients. The letter *f* means that the soils have limited available water capacity because of large amounts of coarse fragments within the soil profile. The letter *r* indicates that the main limitation is steep slopes and that there is hazard of erosion and a possible limitation to use of equipment. In Greene County, *r* is used if slopes are greater than 12 percent.

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

In table 2 each woodland suitability group in the county is rated for potential productivity and for various management concerns or limitations. The terms used in table 2 are explained in the following paragraphs.

Potential productivity refers to the relative expected capacity of a soil to produce wood for economic use. This capacity is expressed as a site index, which is the height of the dominant and codominant trees at age 50 years.

Erosion hazard refers to the potential hazard of soil loss if plant cover is disturbed or removed. The hazard is *slight* if expected soil losses are small; it is *moderate*

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[2] A. NORRIS QUAM, woodland conservationist, Soil Conservation Service, helped prepare this section.

[3] Italic numbers in parentheses refer to Literature Cited, p. 102.

TABLE 2.—*Potential productivity, management concerns,*

[Urban land (Ur), Soil-Urban land complexes (Bt, EpC, MrB, MrC, OdB, Sr, WcA, Wt), and Soil-Fill commercial tree production.

Woodland suitability groups, soil series, and map symbols	Potential productivity			Management concerns	
	Species	Site index	Adjective rating	Erosion hazard	Equipment limitations
Group 1o1: Birkbeck: BbB Eel: Ee Genesee: Gn Ockley: OcA, OcB, OcB2 Ross: Rs Rush: RtA, RtB Russell: RuA, RvB, RvB2 Thackery: ThA, ThB Wea: WeB Xenia: XeA, XeB	Upland oaks Yellow-poplar Sugar maple	>85 >95 >85	Excellent	Slight	Slight
Group 2o1: Celina: CeA, CeB Edenton: EdB, EdC2 Eldean: EmA, EmB, EmB2, EmC2, EnC3 Miamian: MhA, MhB, MhB2, MhC2, MlB3, MlC3, MoB2, MoC2 Milton: MtA, MtB, MtC2 Warsaw: WaA	Upland oaks	75–85	Good	Slight	Slight
Group 2r1: Edenton: EdD2 Miamian: MhD2, MlD3, MmD2, MmE2, MpE	Upland oaks	75–85	Good	Moderate	Moderate
Group 2r2: Miamian: MpF	Upland oaks	75–85	Good	Severe	Severe
Group 2w1: Brookston: Bs Millsdale: Ms Patton: Pa Ragsdale: Ra Sloan: So Westland: Ws	Pin oak	80–90	Good	Slight	Severe
Group 2w2: Algiers: Ag Fincastle: FnA Odell: OeB Raub: RdA, RdB Reesville: ReA Sleeth: SlA	Pin oak Upland oaks Yellow-poplar Sugar maple	80–90 75–85 85–95 75–85	Good	Slight	Moderate
Group 3w1: Crosby: CrA, CrB Randolph: RbA	Pin oak Upland oaks	75–85 65–75	Fair	Slight	Moderate
Group 3s1: Casco: CcD2	Upland oaks	65–75	Fair	Moderate	Moderate
Group 3s2: Casco: CdE2	Upland oaks	65–75	Fair	Moderate	Severe
Group 3f1: Milton variant: MUF	Upland oaks	65–75	Fair	Moderate	Severe

and preferred trees by woodland suitability groups

land complexes (Sp, WbA) are too variable to rate in this table. Linwood muck (Ln) is unsuited for
The symbol > means more than]

Management concerns—Cont.				Trees preferred—	
Seedling mortality	Plant competition for— Conifers	Plant competition for— Hardwoods	Windthrow hazard	In existing stands	For planting
Slight	Severe	Moderate	Slight	Northern red oak, white oak, black oak, yellow-poplar, black walnut, sugar maple, white ash, black cherry.	Eastern white pine, black walnut, yellow-poplar, white ash, Norway spruce.
Slight	Severe	Moderate	Slight	Yellow-poplar, black walnut, northern red oak, white oak.	Eastern white pine, black walnut, yellow-poplar.
Slight	Severe	Moderate	Slight	Yellow-poplar, black walnut, northern red oak, white oak.	Eastern white pine, black walnut, yellow-poplar.
Slight	Severe	Moderate	Slight	Yellow-poplar, black walnut, northern red oak, white oak.	Eastern white pine, black walnut, yellow-poplar.
Severe	Severe	Severe	Severe	Pin oak, white ash, red maple, swamp white oak.	Natural seeding.
Slight	Moderate	Severe	Slight	Northern red oak, yellow-poplar, white ash, sugar maple, black walnut, pin oak.	Eastern white pine, yellow-poplar, black walnut, Norway spruce, white ash.
Slight	Moderate	Slight	Slight	Northern red oak, pin oak, yellow-poplar, black walnut.	Eastern white pine, yellow-poplar, black walnut, Norway spruce.
Slight	Moderate	Slight	Slight	Northern red oak, white oak, black oak.	Eastern white pine, red pine, shortleaf pine.
Moderate	Moderate	Slight	Slight	Northern red oak, white oak, black oak, chestnut oak.	Eastern white pine, red pine, shortleaf pine.
Moderate	Moderate	Slight	Slight	Northern red oak, white oak, black oak, chestnut oak.	Eastern white pine, red pine, shortleaf pine.

TABLE 2.—*Potential productivity, management concerns,*

Woodland suitability groups, soil series, and map symbols	Potential productivity			Management concerns	
	Species	Site index	Adjective rating	Erosion hazard	Equipment limitations
Group 4d1: Ritchey: RhB, RhC	Upland oaks	55–65	Poor	Slight	Slight
Group 4d2: Ritchey: RhD, RhE2	Upland oaks	55–65	Poor	Severe	Moderate
Group 4d3: Fairmount variant: FaF	Upland oaks	55–65	Poor	Severe	Severe

if some soil losses are expected and care is needed during logging and construction to reduce losses; and it is *severe* if special methods of operation are necessary for preventing excessive soil losses.

Equipment limitations depend on soil characteristics that restrict or prohibit the use of harvesting equipment, either seasonally or continually. *Slight* indicates no restrictions in the kinds 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; and *severe* means that special equipment is needed and that its use is severely restricted for more than 3 months of the year.

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* indicates a loss of 0 to 25 percent; *moderate* indicates a loss of 25 to 50 percent; and *severe* indicates 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 undesirable plants invade openings in the tree canopy. Conifers and hardwoods are rated separately in table 2. Competition is *slight* if it does not prevent adequate natural regeneration and early growth or interfere with seedling development; it is *moderate* if it delays natural or artificial establishment and growth rate, but it does not prevent the development of fully stocked normal stands; and it is *severe* if it prevents adequate natural or artificial regeneration unless the site is prepared properly and proper maintenance practices are used.

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

Also listed in table 2 for each woodland suitability group are the trees that are preferred for management in existing stands and the trees that are preferred for planting.

Wildlife

Wildlife is an important natural resource in Greene County. Types of wildlife that are common in the county include pheasants, rabbits, quail, deer, waterfowl, and squirrels. Also numerous are raccoons, opossums, skunks, muskrats, woodchucks, fox, and many species of birds. Since the early settlement and clearing of the land, the kind, distribution, and quantity of wildlife has changed. Because of the changes in land use and the resulting changes in wildlife distribution, it is difficult to correlate the kinds and numbers of wildlife with specific soils.

The survival and extent of any kind of wildlife species depend on the presence and distribution of water and of plants that provide food and cover. If any of these habitat elements is lacking or inadequate, desired wildlife will be 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, the resulting kinds and patterns of vegetation, and the kinds and distribution of water. These, in turn are generally related to the kinds of soils.

Most wildlife habitat is created or improved by planting suitable vegetation, manipulating existing vegetation so as to increase or improve desirable plants, or by a combination of these measures. For this management, a knowledge of the soils is needed so that the growth of plants suitable for wildlife can be estimated. Water areas also can be established or improved for wetland wildlife. Specific information about managing wildlife areas can be obtained from the local game protector, the cooperative extension agent, or a representative of the Soil Conservation Service.

Information in this section can be used to aid in (1) broad-scale planning for wildlife land use, such as in parks, wildlife refuges, nature study areas, and other recreational developments; (2) selecting soil sites that are suitable for creating, improving, or maintaining specific kinds of wildlife habitat elements; (3) determining the relative degree of management intensity required for individual habitat elements; (4) eliminating sites on which management for specific kinds of wildlife is difficult or not feasible; and (5) de-

and preferred trees by woodland suitability groups—Continued

Management concerns—Cont.				Trees preferred—	
Seedling mortality	Plant competition for— Conifers	Plant competition for— Hardwoods	Windthrow hazard	In existing stands	For planting
Moderate	Slight	Slight	Moderate	Northern red oak, white oak, chestnut oak.	Eastern white pine, red pine, shortleaf pine, eastern redcedar.
Moderate	Slight	Slight	Moderate	Northern red oak, white oak, chestnut oak.	Eastern white pine, red pine, shortleaf pine, eastern redcedar.
Moderate	Slight	Slight	Slight	Northern red oak, white oak, chestnut oak.	Eastern white pine, red pine, shortleaf pine, eastern redcedar.

termining areas suitable for acquisition for wildlife use.

In table 3 most of the soils of Greene County are rated according to suitability for seven elements of wildlife habitat and for three broad classes of wildlife. The ratings are good, fair, poor, and very poor. On soils rated *good*, habitat is generally easily created, improved, or maintained. There are few or no soil limitations in habitat management and satisfactory results are well assured. On soils rated *fair*, habitat usually can be created, improved, or maintained, but the soils have moderate limitations that affect the creation, improvement, or maintenance of the habitat. A moderate intensity of management and fairly frequent attention may be required to assure satisfactory results. On soils rated *poor*, habitat can usually be created, improved, or maintained, but there are rather severe soil limitations. Habitat management may be difficult, expensive, and require intensive effort. Satisfactory results are questionable. On soils rated *very poor*, it is impractical to create, improve, or maintain habitat because of the very severe soil limitations. Unsatisfactory results are probable.

For further information about the rating system, the reader interested in wildlife habitat can refer to other literature available (*1*).

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. Not considered in the ratings are present land use, the location of a soil in relation to other soils, and the mobility of wildlife. All of the soils are rated on the basis of their natural drainage class. Artificial drainage can change the ratings indicated.

The seven elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops.—These crops include such seed producing annuals as corn, sorghum, wheat, barley, rye, oats, millet, sunflowers, 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.

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, bromegrass, 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.

Wild herbaceous plants.—In this group are native or introduced perennial grasses, and weeds that generally are established naturally. They include bluestem, foxtail, ragweed, wildrye, goldenrod, wild carrot, nightshade, dandelion, and native lespedeza. They provide food and cover principally to 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.

Hardwood trees.—This element includes 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 may be planted. Among the native kinds are oak, cherry, maple, beech, hackberry, apple, hawthorn, dogwood, persimmon, sumac, sassafras, hazelnut, black walnut, hickory, blackgum, blackhaw, viburnum, grape, and briers. The major soil properties affecting this habitat element are effective rooting depth, available water capacity, and natural drainage.

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 good. Hardwoods that are not available commercially can commonly be transplanted successfully.

TABLE 3.—*Suitability of the soils for elements of wildlife habitat and kinds of wildlife*

[Urban land (Ur), Soil-Urban land complexes (Bt, EpC, MrB, MrC, OdB, Sr, WcA, Wt), and Soil-Fill land complexes (Sp, WbA) are too variable to rate in this table]

Soil series and map symbols	Wildlife habitat elements							Kind of wildlife		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Open-land wildlife	Woodland wildlife	Wetland wildlife
Algiers: Ag	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
Birkbeck: BbB	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Brookston: Bs	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Casco:										
CcD2	Poor	Fair	Good	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
CdE2	Poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor.
Celina:										
CeA	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
CeB	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Crosby:										
CrA	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
CrB	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Edenton:										
EdB	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
EdC2	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
EdD2	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
Eel: Ee	Poor	Fair	Fair	Good	Good	Poor	Poor	Fair	Good	Poor.
Eldean:										
EmA, EmB, EmB2	Fair	Good	Good	Fair	Fair	Poor	Very poor	Good	Fair	Very poor.
EmC2, EnC3	Fair	Good	Good	Fair	Fair	Very poor	Very poor	Good	Fair	Very poor.
Fairmount: FaF	Very poor	Poor	Good	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor.
Fincastle: FnA	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Genesee: Gn	Poor	Fair	Fair	Good	Good	Poor	Very poor	Fair	Good	Very poor.
Linwood: Ln	Very poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Miamian:										
MhA, MhB, MhB2	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
MhC2	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
MhD2	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
MlB3	Fair	Good	Good	Fair	Fair	Poor	Very poor	Good	Fair	Very poor.
MlC3	Fair	Good	Good	Fair	Fair	Very poor	Very poor	Good	Fair	Very poor.
MlD3	Poor	Fair	Good	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
MmD2	Poor	Fair	Good	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
MmE2	Very poor	Fair	Good	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
MoB2, MoC2	Fair	Good	Good	Fair	Fair	Very poor	Very poor	Good	Fair	Very poor.
MpE	Poor	Fair	Good	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
MpF	Very poor	Poor	Good	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor.
Millsdale: Ms	Very poor	Poor	Poor	Poor	Poor	Good	Fair	Poor	Poor	Fair.
Milton:										
MtA, MtB	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
MtC2	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.

Milton variant: MUF	Very poor	Very poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor.
Ockley: OcA, OcB, OcB2	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Odell: OeB	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Patton: Pa	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Ragsdale: Ra	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Randolph: RbA	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Raub:										
RdA	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
RdB	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Reesville: ReA	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Ritchey: RhB, RhC, RhD, RhE2	Poor	Fair	Fair	Poor	Poor	Very poor	Very poor	Fair	Poor	Very poor.
Ross: Rs	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Rush: RtA, RtB	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Russell:										
RuA	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
RvB, RvB2	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Sleeth: SlA	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Sloan: So	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Thackery:										
ThA	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
ThB	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Warsaw: WaA	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Wea: WeB	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Westland: Ws	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Xenia:										
XeA	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
XeB	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.

Coniferous 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 them are Norway spruce, Virginia pine, shortleaf pine, Scotch pine, and eastern redcedar. The major soil properties affecting this habitat element are effective rooting depth, available water capacity, and natural drainage.

Wetland plants.—Making up this group are wild, herbaceous, annual, and perennial plants, exclusive of submerged or floating aquatics, that grow on moist to wet sites. They produce food and cover used mainly by wetland wildlife. They include smartweed, wild millet, bulrush, sedges, barnyardgrass, pondweed, arrow-arum, pickerelweed, and cattails. The major soil properties affecting this habitat element are natural drainage, surface stoniness, slope, and texture of the surface layer.

Shallow water areas.—These are areas of shallow water, generally not more than 5 feet deep, near food and cover for wetland wildlife. They may be natural wet areas, or those created by dams or levees or by water-control devices in marshes or streams. Examples of such developments are wildlife ponds, beaver ponds, muskrat marshes, waterfowl feeding areas, and wildlife watering developments. The major soil properties affecting this habitat element are depth to bedrock, natural drainage, slope, surface stoniness, and permeability. Natural wet areas that are aquifer fed are rated on the basis of drainage class without regard to permeability. Permeability of the soil would apply only for those non-aquifer areas with a potential for development, and water is assumed to be available offsite.

Kinds of wildlife

Ratings for kinds of wildlife are based on the ratings for the habitat elements. For openland wildlife the rating is based on grain and seed crops, grasses, and legumes, wild herbaceous upland plants, and either hardwood trees or coniferous plants. For woodland wildlife the rating is based on all the elements except grain and seed crops. For wetland wildlife the rating is based on wetland plants and shallow water areas.

The three general kinds of wildlife habitat in the county are described in the following paragraphs.

Open-land wildlife.—Examples of open-land wildlife are bobwhite quail, ring-necked pheasant, meadowlark, field sparrow, dove, cottontail rabbit, red fox, and woodchuck. These birds and mammals normally make their homes in areas of cropland, pasture, meadow, and lawns and in areas overgrown with grasses, herbs, shrubs, and vines. They are also found along the fence lines and borders associated with open land.

Woodland wildlife.—Birds and mammals that prefer woodland habitat are ruffed grouse, turkey, woodcock, thrush, vireo, scarlet tanager, red, gray, and fox squirrels, red and gray foxes, opossum, white-tailed deer, and raccoon. They obtain food and cover in stands of hardwoods, coniferous trees, shrubs, or a mixture of these plants.

Wetland wildlife.—Ducks, Canada geese, rails, herons, mink, and muskrat are familiar examples of birds and mammals that normally make their home in wet areas, such as ponds, marshes, and swamps.

Engineering Uses of the Soils[4]

This section is useful to those who need information about soils used as structural material or as foundation 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 properties of soils highly important in engineering are permeability, strength, compaction characteristics, soil drainage condition, shrink-swell potential, grain size, plasticity, and soil 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.

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, for the purpose of predicting performance of structures on the same or similar kinds of soils 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, which show, respectively, 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 additional interpretations, and it also can be used to make useful maps.

This information, however, does not eliminate need for further investigations at sites selected for engineering work. Inspection of sites is needed because many mapped areas of a given soil mapping unit may contain small areas of other kinds of soil that have

[4] KYLE L. MORAN, conservation engineer, and WILLIAM IRELAND, civil engineer, Soil Conservation Service, helped prepare this section.

strongly contrasting properties and different suitabilities or limitations for soil engineering.

Some of the terms used in this soil survey have different meanings in soil science and in engineering. The Glossary defines many of these terms as they are commonly used in soil science.

Engineering soil classification systems

The two systems most commonly used in classifying samples of soils for engineering are the Unified system (*3*), used by the SCS engineers, Department of Defense, and others, and the AASHTO system, adopted by the American Association of State Highway and Transportation Officials (*2*).

In the Unified system soils are classified according to particle size distribution, plasticity, liquid limit, and organic-matter content. Soils are grouped in 15 classes. There are 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 two classes are designated by symbols for both classes; for example, CL-ML.

The AASHTO system 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 that 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. As 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 AASHTO 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.

Engineering test data

Table 4 contains engineering test data for some of the major soil series in Greene County. These tests were made to help evaluate the soils for engineering purposes. The engineering classifications given are based on data obtained by mechanical analyses and by tests to determine liquid limits and plastic limits. The mechanical analyses were made by combined sieve and hydrometer methods.

Compaction (or moisture-density) data are important in earthwork. If a soil material is compacted at successively higher moisture content, assuming that the compactive effort remains constant, the density of the compacted material increases until optimum moisture content is reached. After that, density decreases with increase in moisture content. The highest dry density obtained in the compactive test is termed maximum dry density. As a rule, maximum strength of earthwork is obtained if the soil is compacted to the maximum dry density.

Tests to determine liquid limit and plastic limit measure the effect of water on the consistence of soil material, and are explained in the section "Soil properties significant to engineering."

Soil properties significant to engineering

Several estimated soil properties significant in engineering are given in table 5. These estimates are made of 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 counties. Following are explanations of some of the columns in table 5.

Depth to seasonal high water table is 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 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 U.S. Department of Agriculture (USDA). 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." "Sand," "silt," "clay,' and some of the other terms used in USDA textural classification are defined in the Glossary of this soil survey.

Permeability is that quality of a soil that enables it to transmit water or air. It is estimated on the basis of these 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 as pH. The pH value and terms used to describe soil reaction are explained in the Glossary.

Liquid limit and plasticity index indicate the effect of water on the strength and consistence of soil material. As the moisture content of a clayey soil is increased from a dry state, the material changes from a semisolid to a plastic state. If the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil material changes from the semisolid to plastic state; and the liquid limit, from a plastic to a liquid state. The plasticity index is

TABLE 4.—*Engineering*

Soil name and location	Parent material	Report number	Depth	Horizon	Moisture density[2]: Maximum dry density	Moisture density[2]: Optimum moisture
			In		*lb/ft³*	*Pct*
Birkbeck silt loam (GN-21): Ross Township; 1.9 miles north of Jamestown, 125 feet east of Brickel Road, and 200 yards north of farm lane. (Modal)	Loess	25848	16-30	B22t	102	20
		25849	30-42	B3t	112	16
		20301	42-45	IIC		
Crosby silt loam (GN-18): Jefferson Township; 2¾ miles northeast of Bowersville and about 2,000 feet southeast of the intersection of Garringer Road and Hargrave Road. (Modal)	Glacial till	20122	9-13	B1t		
		20123	23-24	B2t	98	19
		20125	28-36	C1	116	15
		20126	36-60	C2		
Fincastle silt loam (GN-25): Caesars Creek Township; 6 miles southeast of Xenia, 0.6 miles south of U.S. Route 68 and Eleazer Road, 50 feet east of Eleazer Road, and 25 feet south of driveway. (Loess mantle is thinner than modal)	Loess and glacial till	20651	34-38	IIB3	110	18
		20652	38-48	IIC1	122	12
		20653	60-78	IIC2	124	11
Miamian silt loam (GN-8): Xenia Township, NE¼ NW¼ sec. 35; 4 miles southwest of Yellow Springs, 2,000 feet east of West Enon Road, and 100 yards south of section line, behind Greene County Vocational School. (Modal)	Glacial till	19616	7-14	B1		
		19618	22-30	IIB22t		
		19620	38-42	IIC1		
		19621	52-56	IIC2		
Milton silt loam (GN-22): Miami Township; ½ mile east of village of Yellow Springs, and 100 yards northwest of Outdoor Education Center Office. (Modal)	Glacial till over limestone bedrock.	20305	10-19	B21t		
		20306	19-30	B22t		
Ragsdale silty clay loam (GN-11): Xenia Township; 2.9 miles south of Xenia, 250 feet west of State Route 380, and ½ mile south of intersection of Washington Road and State Route 380. (Modal)	Loess	19640	8-16	A1		
		19641	16-25	B21tg		
		19643	32-39	B3		
		19644	39-50	B3		
Randolph silt loam (GN-27): Miami Township; approximately ½ mile southwest of village of Clifton, ¼ mile west of Wilberforce-Clifton Road, and 160 feet north of Clifton Road. (Modal)	Glacial till over limestone bedrock.	57035	13-18	B1	105	19
		57036	18-37	B2t	107	18
Reesville silt loam (GN-13): Xenia Township; east side of U.S. Route 42, approximately 3.3 miles south of Xenia and 120 feet east of electrical tower. (Modal)	Loess	19898	12-17	B21t		
		19899	17-23	B22t		
		19905	54-60	C2		
		19906	60-66	C3		
Rodman loam (GN-24): Bath Township; NE¼ SW¼ sec. 9; 2 miles northeast of Fairborn and 150 yards south of Yellow Springs-Fairfield Road. (Modal)	Sand and gravel glacial outwash.	44001	6-10	B2	107	18
		44002	10-40	C	139	7
Rush silt loam (GN-16): Xenia Township; 200 yards west of State Route 35 bypass and 250 yards south of Upper Bellbrook Road. (Modal)	Loess over sand and gravel glacial outwash.	20269	21-28	B21t	105	19
		20271	38-47	IIB23t		
Sleeth silt loam (GN-29): Spring Valley Township; 100 yards south of Spring Valley-Paintersville Road and ¾ mile east of U.S. Route 42 and village of Spring Valley. (Modal)	Loess over sand and gravel glacial outwash.	57040	0-15	A	100	22
		57041	36-44	IIB23t	102	20
		57042	52-60	IIC	129	10
Westland silty clay loam (GN-28): Ross Township; about 3 miles east of Cedarville, 100 yards north of the South Fork of Massie Creek, and 25 feet west of Cummings Road. (Modal)	Loess over sand and gravel glacial outwash.	57037	0-10	Ap	97	23
		57038	24-38	B2	102	20
		57039	52-75	C	127	11

test data[1]

Mechanical analysis[3]									Liquid limit	Plasticity index	Classification	
Percentage passing sieve							Percentage smaller than—				AASHTO[4]	Unified[5]
¾ inch	⅜ inch	No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 60 (0.25 mm)	No. 200 (0.074 mm)	0.005 mm	0.002 mm				
									Pct			
			100	99		97	45		40	20	A-6(12)	CL
				100		99	26		30	12	A-6(9)	CL
			100	87		72	22		22	6	A-4(8)	CL-ML
			100	97		89	39		40	20	A-6(12)	CL
			100	97		89	50		56	32	A-7-6(19)	CH
			100	88		78	37		31	16	A-6(10)	CL
			100	86		75	35		34	19	A-6(12)	CL
			100	88		76	40		33	14	A-6(10)	CL
			100	90		72	29		26	10	A-4(7)	CL
			100	92		81	53		25	10	A-4(8)	CL
			100	96		89	47		45	19	A-7-6(13)	CL
			100	91		75	47		44	18	A-7-6(12)	CL
			100	84		66	26		22	7	A-4(6)	CL-ML
			100	83		64	24		20	6	A-4(6)	CL-ML
			100	95		89	43		46	26	A-7-6(15)	CL
			100	91		76	44		44	21	A-7-6(13)	CL
			100	98		95	38		46	15	A-7-5(11)	ML
			100	99		98	38		46	17	A-7-6(12)	ML
			100	99		98	30		40	15	A-6(10)	CL
			100	98		98	28		28	8	A-4(8)	CL
			100	99		97	43		45	20	A-7-6(13)	CL
			100	99		97	42		47	22	A-7-6(14)	CL
			100	98		97	41		48	19	A-7-6(13)	ML
			100	99		98	39		43	12	A-7-5(10)	ML
			100	99		96	16		27	8	A-4(8)	CL
			100	99		94	15		25	7	A-4(8)	CL-ML
	100	94	89	82		60	33		35	22	A-6(10)	CL
100	91	81	63	24		13	4			[6]NP	A-1(0)	SM
			100	99		99	39		44	20	A-7-6(13)	CL
			100	82		53	30		33	12	A-6(5)	CL
		100	98	93		82	21		26	5	A-4(8)	CL-ML
	100	96	90	77		62	19		52	29	A-7-6(14)	CH
[7]87	76	62	51	31		24	5		25	7	A-2-4(0)	GC-SC
			100	97		90	40		49	21	A-7-6(14)	CL-ML
100	97	97	93	88		75	40		47	24	A-7-6(15)	CL
[8]81	67	54	44	24		16	4			NP	A-1-b(0)	GM

TABLE 4.—*Engineering*

Soil name and location	Parent material	Report number	Depth	Horizon	Moisture density[2]	
					Maximum dry density	Optimum moisture
			In		*lb/ft³*	*Pct*
Xenia silt loam (GX-17): Sugar Creek Township; SW¼ NW¼ sec. 4; 4 miles south-southwest of Bellbrook, 0.1 mile south of Middle Run Road, and 75 feet east of Haines Road. (Modal)	Loess and glacial till	20279	28–34	IIB23t		
		20281	42–52	IIC1		

[1]Testing of Birkbeck, Rodman, Sleeth, and Westland soils was done by the Ohio Department of Highways Testing Laboratory. The remaining soils and the layer between the depths of 42 and 45 inches of the Birkbeck soil were tested by the Soil Physical Studies Laboratory, Ohio State University.
[2]Based on AASHTO Designation T 99-70, Method A (*2*).
[3]Mechanical analyses according to the AASHTO Designation T 88-70 (*2*) except all material coarser than 2 millimeters in diameter was excluded from samples tested at Ohio State University. Soils in this table that formed in glacial till commonly have 2 to 5 percent of material coarser than 2 millimeters. Results by this procedure may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the procedure used, the fine

TABLE 5.—*Estimated soil properties*

[An asterisk in the first column indicates that at least one mapping unit is made of two or more kinds of soil. The soils in such for referring to other series as indicated. Absence of data indicates that the soil is too variable to be rated

Soil series and map symbols	Depth to—		Depth from surface	USDA texture	Classification		Coarse fraction greater than 3 inches
	Seasonal high water table	Bedrock			Unified	AASHTO	
	Feet	*Feet*	*Inches*				*Percent*
Algiers: Ag	[1]0–1½	>5	0–16	Silt loam, loam	ML	A-4	0
			16–48	Silty clay loam, silt loam, clay loam.	CL, ML	A-6, A-7	0
			48–60	Loam	CL, ML	A-4, A-6	0
Birkbeck: BbB	1½–3	>5	0–11	Silt loam	ML	A-4	0
			11–42	Silty clay loam, silt loam.	CL, ML	A-6	0
			42–60	Loam, silt loam	ML, CL	A-4, A-6	0
Brookston: Bs, Bt. Urban land part of Bt not estimated.	0–1	>5	0–8	Silty clay loam	CL	A-6, A-7	0
			8–42	Silty clay loam, clay loam.	CL, CH	A-6, A-7	0
			42–78	Loam, silt loam	CL, ML	A-4, A-6	0
*Casco: CcD2, CdE2. For Eldean part of CcD2, see Eldean series. For Rodman part of CdE2, see Rodman series.	>6	>5	0–4	Loam	ML	A-4	0
			4–20	Clay loam, clay, sandy clay loam.	CL	A-7, A-6	0–5
			20–60	Sand and gravel	GM, SM, GP, SP	A-1, A-2	0–10
Celina: CeA, CeB	1½–3	>5	0–10	Silt loam	ML, CL-ML	A-4	0
			10–28	Clay, clay loam, silty clay loam.	CL	A-6, A-7	0
			28–60	Loam	CL, CL-ML	A-4, A-6	0
Crosby: CrA, CrB	½–1½	>5	0–9	Silt loam	ML, CL	A-4, A-6	0
			9–28	Silty clay loam, silty clay, clay loam.	CL, CH	A-6, A-7	0
			28–60	Loam	CL, CL-ML	A-4, A-6	0

test data[1]—Continued

Mechanical analysis[3]									Liquid limit	Plasticity index	Classification	
Percentage passing sieve							Percentage smaller than—				AASHTO[4]	Unified[5]
¾ inch	⅛ inch	No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.25 mm)	No. 60 (0.25 mm)	No. 200 (0.074 mm)	0.005 mm	0.002 mm				
									Pct			
			100	96		89	37		45	24	A-7-6(15)	CL
			100	84		66	29		24	10	A-4(6)	CL

material is analyzed by the hydrometer method. In the SCS soil survey procedure, the fine material is analyzed by the pipette method. The mechanical analyses used in this table may not be suitable for use in naming textural classes for soil.

[4]Based on AASHTO Designation M 145-66 (*2*).

[5]Based on the Unified soil classification system (*3*).

[6]NP means nonplastic.

[7]100 percent of material passed the 3-inch sieve, 97 percent passed the 2-inch sieve, and 90 percent passed the 1-inch sieve.

[8]100 percent of material passed the 2-inch sieve and 90 percent passed the 1-inch sieve.

significant to engineering

mapping units may have different properties and limitations, and for this reason its is necessary to follow carefully the instructions or that no estimate was made. The symbol > means greater than; the symbol < means less than]

Percentage passing sieve—				Permeability	Available water capacity	Reaction	Liquid limit	Plasticity index	Shrink-swell potential	Corrosivity to—	
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)							Uncoated steel	Concrete
				Inches per hour	*Inches per inch of soil*	*pH*	*Percent*				
100	90–100	80–95	70–85	0.6–2.0	0.18–0.22	6.1–7.3	30–40	4–10	Low	High	Low.
100	90–100	80–95	70–85	0.6–2.0	0.16–0.20	6.1–7.8	25–45	9–19	Low	High	Low.
90–100	85–100	75–90	70–85	0.6–2.0	0.15–0.19	6.1–7.8	20–35	5–15	Low	High	Low.
100	100	95–100	85–100	0.6–2.0	0.18–0.22	5.1–7.3	25–40	4–10	Low	Moderate	Moderate.
100	95–100	90–100	85–100	0.6–2.0	0.15–0.19	5.6–7.8	30–40	11–22	Moderate	High	Moderate.
90–100	85–95	70–95	60–90	0.2–0.6	0.07–0.12	7.4–8.4	22–40	4–16	Low	Moderate	Low.
100	95–100	90–100	75–95	0.6–2.0	0.20–0.24	6.1–7.3	35–45	15–20	Moderate	High	Low.
95–100	95–100	85–95	75–85	0.6–2.0	0.15–0.19	6.1–7.8	35–52	16–28	Moderate	High	Low.
90–100	85–95	75–90	55–70	0.2–0.6	0.07–0.12	7.4–8.4	25–40	4–16	Low	High	Low.
80–100	75–100	70–95	60–80	0.6–2.0	0.13–0.17	5.6–7.3	25–40	2–10	Low	Low	Low.
80–100	75–100	70–95	50–80	0.6–2.0	0.09–0.13	5.6–7.8	35–50	14–25	Moderate	Low	Low.
40–75	30–65	10–50	4–25	>6.0	0.02–0.06	7.4–8.4		[2]NP	Low	Low	Low.
100	90–100	90–100	70–90	0.6–2.0	0.17–0.20	5.6–7.3	26–40	5–10	Low	High	Moderate.
100	90–100	80–95	70–85	0.2–0.6	0.13–0.17	4.5–7.8	32–48	12–28	Moderate	High	Moderate.
75–90	70–90	65–85	55–75	0.2–0.6	0.06–0.10	7.4–8.4	20–36	4–16	Low	High	Low.
100	90–100	90–100	80–95	0.6–2.0	0.17–0.20	5.1–7.3	26–40	5–13	Low	High	Low.
100	90–100	80–100	70–90	0.2–0.6	0.13–0.17	5.1–7.8	32–56	12–32	Moderate	High	Moderate.
75–100	70–100	65–90	55–80	0.06–0.2	0.06–0.10	7.4–8.4	20–36	4–20	Low	High	Low.

TABLE 5.—*Estimated soil properties*

Soil series and map symbols	Depth to— Seasonal high water table	Depth to— Bedrock	Depth from surface	USDA texture	Classification: Unified	Classification: AASHTO	Coarse fraction greater than 3 inches
	Feet	*Feet*	*Inches*				*Percent*
Edenton: EdB, EdC2, EdD2	>6	1½–3½	0–7	Silt loam	ML, CL–ML	A–4	0
			7–33	Clay loam, silty clay loam, silty clay.	CL, CH	A–6, A–7	0–10
			33	Shale and limestone bedrock.			
Eel: Ee	[1] 1½–3	>5	0–8	Loam	ML	A–4	0
			8–24	Loam, silt loam	ML, CL	A–4, A–6	0
			24–60	Silt loam, loam, fine sandy loam.	ML, CL	A–4	0
Eldean: EmA, EmB, EmB2, EmC2, EnC3, EpC. Urban land part of EpC not estimated.	>6	>5	0–13	Silt loam	ML	A–4	0
			13–33	Silty clay loam, gravelly clay, gravelly clay loam.	CL	A–7, A–6	0–5
			33–38	Very gravelly sandy loam, gravelly loam.	SM, GC	A–4, A–6	0–10
			38–60	Sand and gravel	GM, SM, GP, SP	A–1, A–2	0–15
Fairmount variant: FaF	>6	1½–3½	0–6	Silty clay loam	CL	A–6, A–7	20–30
			6–29	Silty clay loam, channery silty clay.	CH	A–7	20–30
			29–60	Shale and limestone bedrock.			
Fincastle: FnA	½–1½	>5	0–11	Silt loam	ML	A–4	0
			11–40	Silty clay loam, clay loam.	CL	A–6, A–7	0
			40–60	Loam, silt loam	CL–ML, CL	A–4, A–6	0–5
Genesee: Gn	[1] >6	>5	0–10	Loam	ML	A–4	0
			10–36	Loam, silt loam	ML, CL	A–4, A–6	0
			36–66	Loam, silt loam, fine sandy loam.	ML	A–4	0
Hennepin. Mapped only with Miamian soils.	>6	>5	0–4	Loam	ML, CL	A–4, A–6	0
			4–12	Clay loam	CL	A–6, A–7	0
			12–60	Loam	ML, CL	A–4, A–6	0
Linwood: Ln	0–1	>5	0–35	Muck	Pt		
			35–60	Silt loam, loam	ML, CL	A–4, A–6	0
*Miamian: MhA, MhB, MhB2, MhC2, MhD2, MlB3, MlC3, MlD3, MmD2, MmE2, MoB2, MoC2, MpE, MpF, MrB, MrC. For Casco part of MmD2 and MmE2, see Casco series. For Eldean part of MoB2 and MoC2, see Eldean series. For Hennepin part of MpE and MpF, see Hennepin series. Urban land part of MrB and MrC not estimated.	>4	>5	0–7	Silt loam, clay loam	CL–ML, ML	A–4	0
			7–38	Silty clay loam, clay loam, clay.	CL	A–6, A–7	0
			38–60	Loam	CL, ML	A–4, A–6	0–5
Millsdale: Ms	0–1	1½–3½	0–8	Silty clay loam	CL	A–6, A–7	0
			8–26	Silty clay loam, clay loam, clay.	CH, CL	A–7, A–6	0–5
			26	Limestone bedrock.			
Milton: MtA, MtB, MtC2	>6	1½–3½	0–6	Silt loam	CL–ML, ML	A–4	0
			6–30	Silty clay loam, clay loam, clay.	CL, CH	A–6, A–7	0–5
			30	Limestone bedrock.			

significant to engineering—Continued

Percentage passing sieve—				Permeability	Available water capacity	Reaction	Liquid limit	Plasticity index	Shrink-swell potential	Corrosivity to—	
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.075 mm)							Uncoated steel	Concrete
				Inches per hour	*Inches per inch of soil*	*pH*	*Percent*				
100	100	85–95	80–90	0.6–2.0	0.16–0.20	6.1–7.3	24–38	4–10	Low	Moderate	Low.
95–100	80–100	75–95	60–95	0.2–0.6	0.12–0.16	6.1–7.8	32–55	12–35	Moderate	High	Low.
100	100	90–100	70–90	0.6–2.0	0.18–0.22	6.1–7.8	28–40	4–10	Low	Moderate	Low.
100	100	85–100	70–85	0.6–2.0	0.16–0.20	6.1–8.4	26–40	6–14	Low	Moderate	Low.
100	95–100	75–100	50–80	0.6–2.0	0.15–0.19	7.4–8.4	<30	[2]NP–8	Low	Moderate	Low.
80–100	75–100	65–100	60–95	0.6–2.0	0.13–0.17	5.6–7.3	25–40	4–10	Low	Low	Moderate.
80–100	75–100	65–95	55–90	0.6–2.0	0.09–0.13	5.6–7.8	35–50	14–25	Moderate	High	Moderate.
45–80	40–70	40–70	35–50	0.6–6.0	0.08–0.11	6.6–8.4	20–35	6–15	Low	Low	Low.
40–75	30–65	10–50	4–25	>6.0	0.02–0.06	6.6–8.4		[2]NP	Low	Low	Low.
80–100	70–95	65–90	60–85	0.2–0.6	0.14–0.18	6.6–7.3	35–45	14–25	Moderate	Moderate	Low.
70–95	65–90	60–90	55–85	0.2–0.6	0.10–0.16	6.6–7.8	50–65	28–40	Moderate	High	Low.
100	100	95–100	90–100	0.6–2.0	0.18–0.22	5.1–7.3	25–40	4–10	Low	High	Moderate.
100	90–100	85–100	75–100	0.2–0.6	0.14–0.18	5.1–7.3	25–50	11–28	Moderate	High	Moderate.
90–100	85–100	70–95	60–85	0.2–0.6	0.07–0.12	7.4–8.4	25–40	4–16	Low	High	Low.
100	100	90–100	70–90	0.6–2.0	0.18–0.22	7.4–7.8	28–40	4–10	Low	Low	Low.
100	100	85–100	70–85	0.6–2.0	0.16–0.20	7.4–8.4	26–40	6–14	Low	Low	Low.
100	95–100	75–100	50–80	0.6–2.0	0.15–0.19	7.4–8.4	<30	[2]NP–8	Low	Low	Low.
95–100	90–100	80–95	70–90	0.6–2.0	0.16–0.20	6.1–7.3	20–40	4–12	Low	Low	Low.
95–100	90–100	75–95	70–90	0.6–2.0	0.09–0.15	6.1–7.3	25–45	12–25	Low	Moderate	Low.
95–100	90–100	75–85	60–80	0.2–0.6	0.06–0.12	7.4–8.4	25–40	5–15	Low	Low	Low.
				>6.0	0.20–0.30	6.1–7.8				High	Low.
100	95–100	80–95	60–90	0.6–2.0	0.14–0.18	6.1–8.4	20–35	4–15	Low	High	Low.
95–100	90–100	90–100	70–90	0.6–2.0	0.17–0.20	5.1–6.5	26–40	4–10	Low	Low	Moderate.
90–100	85–100	75–100	70–90	0.2–0.6	0.13–0.17	5.1–6.5	32–50	14–30	Moderate	Moderate	Moderate.
75–100	70–100	65–85	55–75	0.2–0.6	0.06–0.10	7.4–8.4	20–36	4–16	Low	Low	Low.
95–100	90–100	85–100	80–95	0.6–2.0	0.15–0.18	6.1–7.3	32–50	12–25	Moderate	High	Low.
90–100	90–100	85–100	80–95	0.2–0.6	0.12–0.16	6.1–7.8	35–60	20–35	High	High	Low.
95–100	90–100	85–100	75–95	0.6–2.0	0.17–0.20	5.1–7.3	20–36	4–10	Low	Moderate	Moderate.
95–100	80–100	75–95	70–95	0.6–2.0	0.13–0.17	5.1–7.8	32–60	14–34	Moderate	Moderate	Moderate.

TABLE 5.—*Estimated soil properties*

Soil series and map symbols	Depth to—		Depth from surface	USDA texture	Classification		Coarse fraction greater than 3 inches
	Seasonal high water table	Bedrock			Unified	AASHTO	
	Feet	*Feet*	*Inches*				*Percent*
Milton variant: MUF	>6	1½–2½	0–12	Very channery silt loam.	ML, GM	A-4	5–10
			12–30	Very channery silty clay loam, very channery loam.	CL, ML, GM, GC	A-6, A-7	5–10
			30	Limestone bedrock.			
Ockley: OcA, OcB, OcB2, OdB. Urban land part of OdB not estimated.	>6	>5	0–10	Silt loam	ML	A-4	0
			10–22	Silty clay loam	CL	A-6	0
			22–45	Clay loam, gravelly sandy clay loam.	CL, SC	A-6	0–5
			45–60	Sand and gravel	GM, SM, GP, SP	A-1, A-2	0–15
Odell: OeB	½–1½	>5	0–11	Silt loam, silty clay loam.	CL-ML, ML	A-4, A-6	0
			11–24	Clay loam	CL	A-6, A-7	0
			24–60	Loam	CL-ML, CL	A-4, A-6	0–5
Patton: Pa	0–1	>5	0–8	Silty clay loam	CL	A-6, A-7	0
			8–32	Silty clay loam	CL	A-6, A-7	0
			32–60	Silt loam	CL-ML, CL	A-6, A-7, A-4	0
Ragsdale: Ra	0–1	>5	0–16	Silty clay loam	CL, ML	A-6, A-7	0
			16–39	Silty clay loam	CL, ML	A-6, A-7	0
			39–96	Silt loam	CL, ML	A-4, A-6	0
Randolph: RbA	½–1½	1½–3½	0–13	Silt loam	CL-ML, ML	A-4, A-6	0
			13–37	Silty clay loam, silty clay.	CL, CH	A-7, A-6	0–5
			37	Limestone bedrock.			
Raub: RdA, RdB	½–1½	>5	0–14	Silt loam, silty clay loam.	CL-ML, ML	A-4, A-6	0
			14–27	Silty clay loam	CL	A-6, A-7	0
			27–44	Clay loam	CL	A-6, A-7	0
			44–60	Loam, clay loam	CL, CL-ML	A-4	0–5
Reesville: ReA	½–1½	>5	0–12	Silt loam	ML, CL-ML	A-4	0
			12–42	Silty clay loam, silt loam.	CL, ML	A-6, A-7, A-4	0
			42–72	Loam	ML, CL	A-4, A-6	0
Ritchey: RhB, RhC, RhD, RhE2	>6	1–2	0–7	Silt loam	ML, CL-ML	A-4, A-6	0
			7–18	Silty clay loam, clay	CL, CH	A-6, A-7	2–5
			18	Limestone bedrock.			
Rodman. Mapped only with Casco soils.	>6	>5	0–10	Gravelly loam, gravelly sandy loam.	SM, ML, CL	A-4, A-6	0–2
			10–60	Very gravelly loam, coarse sand.	GM, SM, GP, SP	A-1, A-2	0–5
Ross: Rs	[1]4–6	>5	0–40	Loam	ML, CL-ML	A-4, A-6	0
			40–78	Loam, gravelly sand	ML, SM	A-4, A-2	0
Rush: RtA, RtB	>6	>5	0–13	Silt loam	ML, CL-ML	A-4	0
			13–38	Silty clay loam	CL	A-6, A-7	0
			38–60	Sandy clay loam, sandy clay, gravelly sandy loam.	CL, SC, SM	A-6, A-7, A-4	0–3
			60–75	Sand and gravel	GM, SM, GP, SP	A-1, A-2	0–5

significant to engineering—Continued

Percentage passing sieve— No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.075 mm)	Permeability	Available water capacity	Reaction	Liquid limit	Plasticity index	Shrink-swell potential	Corrosivity to— Uncoated steel	Concrete
				Inches per hour	*Inches per inch of soil*	*pH*	*Percent*				
45–85	40–80	35–75	35–70	0.6–2.0	0.10–0.14	6.6–7.3	26–40	4–10	Low	Low	Low.
45–75	40–70	35–65	30–60	0.6–2.0	0.08–0.12	6.6–7.8	35–48	12–22	Moderate	Moderate	Low.
100	95–100	90–100	75–100	0.6–2.0	0.18–0.22	5.1–6.5	25–40	4–10	Low	Low	Moderate.
100	90–100	85–100	80–95	0.6–2.0	0.15–0.19	5.1–6.5	25–40	11–18	Moderate	Moderate	Moderate.
75–100	70–100	65–90	45–75	0.6–2.0	0.12–0.15	5.6–7.3	30–40	14–25	Moderate	Moderate	Moderate.
40–75	30–65	10–50	4–25	>6.0	0.02–0.06	6.6–8.4		[2]NP	Low	Low	Low.
100	100	90–100	75–95	0.6–2.0	0.18–0.22	6.1–7.3	25–40	4–10	Low	High	Low.
95–100	90–100	80–100	70–85	0.6–2.0	0.15–0.19	6.1–7.8	30–45	12–28	Moderate	High	Low.
80–95	70–90	65–85	55–75	0.2–0.6	0.10–0.16	7.4–8.4	20–36	4–16	Low	High	Low.
100	100	95–100	85–100	0.6–2.0	0.15–0.20	6.1–7.3	30–45	11–22	Moderate	High	Low.
100	100	95–100	85–100	0.2–2.0	0.14–0.18	6.1–7.8	35–45	15–25	Moderate	High	Low.
100	100	95–100	80–100	0.2–0.6	0.12–0.16	7.4–7.8	25–42	6–20	Moderate	High	Low.
100	100	90–100	85–100	0.6–2.0	0.16–0.22	6.1–7.3	30–46	11–20	Low	High	Low.
100	100	90–100	85–100	0.06–0.2	0.14–0.18	6.1–7.8	30–48	11–22	Moderate	High	Low.
90–100	85–100	80–100	70–100	0.06–0.2	0.12–0.16	6.6–8.4	20–40	4–16	Low	High	Low.
95–100	95–100	90–100	75–100	0.6–2.0	0.16–0.20	5.1–6.5	22–40	4–12	Moderate	High	Moderate.
75–100	75–100	75–100	70–100	0.2–0.6	0.10–0.14	5.1–7.3	35–60	18–38	High	High	Moderate.
100	100	95–100	85–100	0.6–2.0	0.18–0.22	5.6–6.5	25–40	4–10	Low	High	Moderate.
100	100	95–100	90–100	0.6–2.0	0.15–0.19	5.6–6.5	30–45	11–25	Moderate	High	Moderate.
95–100	90–100	80–95	65–80	0.6–2.0	0.13–0.17	6.1–7.8	32–45	12–28	Moderate	High	Low.
85–95	80–95	70–85	55–70	0.06–0.2	0.06–0.10	7.4–8.4	20–36	4–16	Low	Moderate	Low.
100	90–100	90–100	85–100	0.6–2.0	0.17–0.22	5.6–6.5	22–40	4–10	Low	High	Moderate.
100	90–100	90–100	90–100	0.2–2.0	0.15–0.19	5.1–7.8	22–50	4–28	Moderate	High	Moderate.
80–100	75–100	70–100	60–100	0.2–2.0	0.08–0.12	7.4–8.4	22–36	4–16	Low	High	Low.
100	95–100	80–95	75–90	0.6–2.0	0.16–0.20	5.6–7.3	24–40	4–12	Low	Low	Moderate.
90–100	85–100	80–95	75–95	0.6–2.0	0.10–0.14	6.1–7.8	35–55	15–30	Moderate	Moderate	Low.
65–95	55–90	50–85	35–65	2.0–6.0	0.10–0.16	6.6–7.8	<40	4–22	Low	Low	Low.
40–85	30–65	10–50	4–25	>6.0	0.02–0.06	7.4–8.4		[2]NP	Low	Low	Low.
95–100	90–100	80–100	65–90	0.6–2.0	0.18–0.24	6.6–7.8	22–40	4–10	Low	Low	Low.
75–100	70–100	65–95	25–75	0.6–2.0	0.08–0.14	6.6–8.4	40	[2]NP–10	Low	Low	Low.
100	100	90–100	80–100	0.6–2.0	0.17–0.22	4.5–6.5	22–40	4–10	Low	Low	Moderate.
100	100	95–100	85–100	0.6–2.0	0.14–0.18	4.5–6.0	35–45	14–24	Moderate	Moderate	Moderate.
75–100	70–100	65–90	35–60	0.6–2.0	0.08–0.14	4.5–7.8	30–45	6–22	Moderate	Moderate	Moderate.
40–75	30–65	10–50	4–25	>6.0	0.02–0.06	7.4–8.4		[2]NP	Low	Low	Low.

TABLE 5.—*Estimated soil properties*

Soil series and map symbols	Depth to— Seasonal high water table	Depth to— Bedrock	Depth from surface	USDA texture	Classification Unified	Classification AASHTO	Coarse fraction greater than 3 inches
	Feet	*Feet*	*Inches*				*Percent*
*Russell: RuA, RvB, RvB2	>6	>5	0–13	Silt loam	ML, CL–ML	A–4	0
For Miamian part of RvB and RvB2, see Miamian series.			13–22	Silty clay loam	CL	A–6, A–7	0
			22–37	Clay loam, silty clay loam.	CL, CL–ML	A–4, A–6	0
			37–60	Loam	CL, CL–ML	A–4	0
Sleeth: SlA	½–1½	>5	0–10	Silt loam	ML, CL–ML	A–4	0
			10–24	Silty clay loam, silt loam.	CL	A–6	0
			24–52	Clay loam, gravelly clay loam, gravelly loam.	CL, CH	A–6, A–7	0–5
			52–60	Gravelly coarse sandy loam.	GM, SM, GP, SP, GC–SC	A–1, A–2	0–5
Sloan: So, Sp, Sr	[1]0–1	>5	0–24	Silty clay loam	CL	A–6, A–7	0
Fill land part of Sp and Urban land part of Sr not estimated.			24–45	Silty clay loam	CL	A–6, A–7	0
			45–60	Silt loam, clay loam, sandy loam.	ML, CL, SM	A–4, A–6	0
Thackery: ThA, ThB	1½–3	>5	0–12	Silt loam	ML	A–4	0
			12–18	Silt loam, silty clay loam.	CL, ML	A–6	0
			18–40	Clay loam	CL	A–6	0–2
			40–50	Very gravelly loam	GM, SM, SC	A–2, A–4, A–6	0–5
			50–72	Sand and gravel	GM, SM, GP, SP	A–1, A–2	0–5
Urban land: Ur. Properties too variable to estimate.							
Warsaw: WaA, WbA, WcA	>6	>5	0–11	Loam	ML, CL	A–4, A–6	0
Fill land part of WbA and Urban land part of WcA not estimated.			11–33	Clay loam, clay	CL	A–7, A–6	0–5
			33–60	Very gravelly loamy sand.	GM, SM, GP, SP	A–1, A–2	0–15
Wea: WeB	>6	>5	0–12	Silt loam	ML	A–4	0
			12–45	Silty clay loam, clay loam.	CL	A–6, A–7	0
			45–60	Gravelly loamy sand	GM, SM, GP, SP	A–1, A–2	0–10
Westland: Ws, Wt	0–1	>5	0–14	Silty clay loam	CL	A–6, A–7	0
Urban land part of Wt not estimated.			14–38	Clay loam	CL	A–6, A–7	0
			38–52	Gravelly loam, gravelly silt loam.	CL	A–6	0–5
			52–60	Stratified gravelly, loamy, and sandy material.	SP, GP, SM, GM	A–1, A–2	0–5
Xenia: XeA, XeB	2–3	>5	0–8	Silt loam	ML	A–4	0
			8–34	Silty clay loam	CL	A–6, A–7	0
			34–60	Loam	CL–ML, CL	A–4, A–6	0–5

[1]Subject to flooding.

the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is plastic. Liquid limit and plasticity index are estimated in table 5, but in table 4 the data on liquid limit and plasticity index are based on tests of soil samples.

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 and swelling is influenced by the amount and kind of clay in the soil. Shrinking and

significant to engineering—Continued

Percentage passing sieve—				Permeability	Available water capacity	Reaction	Liquid limit	Plasticity index	Shrink-swell potential	Corrosivity to—	
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.075 mm)							Uncoated steel	Concrete
				Inches per hour	*Inches per inch of soil*	*pH*	*Percent*				
100	100	90–100	75–95	0.6–2.0	0.18–0.22	5.1–6.5	22–40	4–10	Low	Low	Moderate.
100	100	90–100	85–95	0.6–2.0	0.14–0.18	5.1–6.0	25–50	11–28	Moderate	Moderate	Moderate.
90–100	85–100	80–90	65–85	0.2–0.6	0.12–0.16	6.1–7.3	25–40	5–24	Moderate	Moderate	Low.
80–95	75–95	65–85	55–75	0.2–0.6	0.06–0.12	7.4–8.4	22–36	4–16	Low	Low	Low.
95–100	90–100	85–95	70–90	0.6–2.0	0.16–0.22	5.1–6.5	22–40	4–10	Low	High	Moderate.
90–100	85–100	80–95	70–95	0.6–2.0	0.14–0.18	5.1–6.0	25–40	11–18	Moderate	High	Moderate.
70–100	60–95	55–90	50–75	0.6–2.0	0.10–0.14	6.1–7.8	30–52	14–29	Moderate	High	Low.
40–75	30–65	10–50	4–25	>6.0	0.02–0.06	7.4–8.4	<25	[2]NP–7	Low	High	Low.
100	95–100	85–100	70–95	0.6–2.0	0.20–0.24	6.1–7.8	25–40	8–16	Moderate	High	Low.
100	90–100	85–100	75–95	0.6–2.0	0.15–0.19	6.1–7.8	30–42	11–20	Moderate	High	Low.
95–100	90–100	80–95	45–85	0.6–2.0	0.13–0.18	6.6–7.8	25–40	6–15	Low	High	Low.
100	90–100	85–100	70–90	0.6–2.0	0.17–0.22	5.1–6.5	25–40	4–10	Low	Moderate	Moderate.
100	90–100	80–95	65–90	0.6–2.0	0.14–0.18	5.1–6.5	25–40	12–20	Low	Moderate	Moderate.
80–100	75–95	70–85	60–75	0.6–2.0	0.11–0.15	5.1–7.3	25–40	14–25	Moderate	Moderate	Moderate.
50–80	40–70	30–60	25–50	2.0–6.0	0.04–0.10	6.1–7.8	<35	[2]NP–12	Low	Moderate	Low.
40–75	30–65	10–50	4–25	>6.0	0.02–0.06	7.4–8.4		[2]NP	Low	Low	Low.
90–100	85–100	80–100	60–80	0.6–2.0	0.16–0.20	5.6–6.5	20–40	4–14	Low	Low	Moderate.
65–100	60–100	55–95	50–80	0.6–2.0	0.09–0.13	5.6–7.8	35–50	14–25	Moderate	Moderate	Moderate.
40–75	30–65	10–50	4–25	>6.0	0.02–0.06	6.6–8.4		[2]NP	Low	Low	Low.
100	90–100	80–95	70–90	0.6–2.0	0.18–0.24	5.6–6.5	25–40	4–10	Low	Low	Moderate.
90–100	80–100	75–95	65–90	0.6–2.0	0.15–0.19	5.6–7.3	30–45	14–25	Moderate	Moderate	Moderate.
40–75	30–65	10–50	4–25	>6.0	0.02–0.06	7.4–8.4		[2]NP	Low	Low	Low.
95–100	90–100	85–100	80–95	0.6–2.0	0.20–0.24	5.6–7.3	27–49	11–22	Moderate	High	Moderate.
95–100	90–100	85–95	65–80	0.2–0.6	0.14–0.18	5.6–7.8	25–47	14–25	Moderate	High	Moderate.
65–85	60–75	55–70	50–70	0.6–2.0	0.10–0.16	6.6–8.4	25–40	11–18	Low	High	Low.
40–75	30–65	10–50	4–25	>6.0	0.02–0.06	7.4–8.4		[2]NP	Low	High	Low.
100	100	90–100	70–100	0.6–2.0	0.18–0.22	5.6–6.5	25–40	4–10	Low	Moderate	Moderate.
95–100	90–100	90–100	80–95	0.6–2.0	0.14–0.18	5.6–7.8	25–50	11–28	Moderate	High	Moderate.
80–100	70–100	65–90	60–75	0.2–0.6	0.06–0.12	7.4–8.4	22–36	4–16	Low	Moderate	Low.

[2]NP means nonplastic.

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 soil properties such 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.

TABLE 6.—*Engineering*

[An asterisk in the first column indicates that at least one mapping unit is made of two or more kinds of soil. The soils in such for referring to other

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of—		
			Topsoil	Sand and gravel	Roadfill
Algiers: Ag	Poor: subject to flooding; seasonal high water table.	High	Good: subject to flooding.	Unsuited	Poor: moderately fine textured; high frost action.
Birkbeck: BbB	Poor: high silt content; moderately well drained.	High	Fair: thin layer.	Unsuited	Poor: high silt content; high frost action.
Brookston: Bs, Bt No interpretations made for Urban land part of Bt.	Poor: seasonal high water table; moderately fine textured material.	High	Poor: wetness	Unsuited	Poor: seasonal high water table; high frost action.
*Casco: CcD2, CdE2 For Eldean part of CcD2 see Eldean series. For Rodman part of CdE2 see Rodman series.	Good	Low	Poor: thin layer.	Good: below depth of 2 feet.	Good: sandy and gravelly material below depth of 2 feet.
Celina: CeA, CeB	Poor: moderately fine textured material.	Moderate	Fair: thin layer.	Unsuited	Moderately fine textured material.
Crosby: CrA, CrB	Poor: moderately fine textured subsoil; seasonal high water table.	High	Fair: thin layer.	Unsuited	Poor: moderately fine textured subsoil; high frost action.
Edenton: EdB, EdC2, EdD2	Poor: moderately fine textured to fine textured subsoil.	Moderate	Poor: thin layer; too clayey.	Unsuited	Poor: moderately fine textured to fine textured subsoil; limestone and shale at a depth of 20 to 40 inches.
Eel: Ee	Fair: subject to flooding.	High	Good	Unsuited	Poor: medium to high compressibility; high frost action.
Eldean: EmA, EmB, EmB2, EmC2, EnC3, EpC. No interpretations made for Urban land part of EpC.	Fair: to a depth of about 3 feet; good in substratum.	Low	Fair: thin layer.	Good below a depth of 2 to 3½ feet.	Fair above a depth of 3 feet; good in substratum.

interpretations

mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions series as indicated]

Soil features affecting—						
Highway location	Ponds: Reservoir area	Ponds: Embankment	Drainage	Sprinkler irrigation	Terraces or diversions	Grassed waterways
Seasonal high water table; subject to flooding and ponding; high frost action; low strength.	Possible seepage if excavated below a depth of 5 feet; subject to flooding; seasonal high water table.	Fair to poor stability and compaction; poor to fair resistance to piping.	Subject to flooding; seasonal high water table; poor outlets.	Seasonal high water table; subject to flooding.	Nearly level; subject to flooding; seasonal high water table.	Nearly level; seasonal high water table; subject to flooding.
Gently sloping; cutbanks are erodible; high frost action.	Moderately slow seepage in substratum; moderately permeable to depth of about 4 feet.	Fair compaction and stability; medium compressibility; poor resistance to piping.	Not needed; moderately well drained.	High available water capacity; moderate permeability to depth of about 4 feet; gentle slopes.	Erodes easily	Erodes easily.
Seasonal high water table; subject to ponding; high frost action.	Low seepage losses; seasonal high water table.	Fair to poor stability and compaction.	Moderate permeability; seasonal high water table; very poorly drained.	Seasonal high water table; high available water capacity.	Nearly level; very poorly drained.	Nearly level; very poorly drained.
Well drained; cut slopes are gravelly and droughty; moderately steep to steep slopes.	Excessive seepage.	Good stability; rapid permeability.	Not needed; well drained.	Low available water capacity; rapid infiltration; moderately steep to steep slopes.	Rapid permeability; cuts are gravelly and droughty; moderately steep to steep slopes.	Rapid permeability; cuts are gravelly and droughty; moderately steep to steep slopes.
Moderately slow permeability; moderately fine texture.	Slow seepage	Good stability and compaction; slowly permeable when compacted.	Moderately well drained; moderately slow permeability.	Moderately slow infiltration and permeability; moderate available water capacity.	Nearly level to gentle slopes.	Nearly level to gentle slopes.
Seasonal high water table; moderately fine subsoil; high frost action.	Slow seepage; seasonal high water table.	Fair to good stability; fair compaction; slow permeability when compacted.	Somewhat poorly drained; moderately slow permeability.	Moderately slow permeability; seasonal high water table.	Nearly level and gently sloping; seasonal high water table.	Nearly level and gently sloping; seasonal high water table.
Interbedded limestone and shale at a depth of 20 to 40 inches; well drained; some moderately steep slopes.	Bedrock at a depth of 20 to 40 inches.	Fair stability and compaction; medium compressibility.	Not needed; well drained.	Moderately slow permeability; moderate available water capacity; some moderately steep slopes.	Gently sloping to moderately steep; moderately erodible.	Moderately erodible; cut channels are droughty.
Subject to flooding; seasonal high frost action; low strength.	Subject to flooding; permeable material in substratum.	Fair stability; moderate permeability; medium to high compressibility; subject to piping.	Seasonal high water table for short periods; moderate permeability; subject to flooding.	High available water capacity; subject to flooding.	Subject to flooding; nearly level.	Subject to flooding; nearly level.
Cut slopes are droughty; well drained; stable substratum.	Pervious material in substratum; high seepage losses.	Good stability; high seepage.	Not needed; well drained.	Moderate available water capacity; moderate infiltration; moderate permeability.	Cut channels are droughty and difficult to vegetate.	Cut channels are droughty and difficult to vegetate.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of— Topsoil	Sand and gravel	Roadfill
Fairmount variant: FaF	Poor: steep slopes; clayey material.	Moderate	Poor: thin layer; too clayey.	Unsuited	Poor: channery material; bedrock at a depth of 20 to 40 inches.
Fincastle: FnA	Poor: seasonal high water table; moderately fine textured material.	High	Fair: thin layer.	Unsuited	Poor: moderately fine textured material; high frost action.
Genesee: Gn	Fair: well drained; subject to flooding.	Moderate	Good	Unsuited	Fair: poor compaction properties; subject to flooding.
Hennepin. Mapped only with Miamian soils.	Poor: steep to very steep slopes.	Moderate	Poor: thin layer.	Unsuited	Fair to poor: fair compaction properties; steep to very steep slopes.
Linwood: Ln	Poor: high water table; unstable organic soil.	High	Poor: high water table; oxidizes rapidly; good if mixed with mineral soil.	Unsuited	Poor: soft and unstable; subject to subsidence when drained; high water table.
*Miamian: MhA, MhB, MhB2, MhC2, MhD2, MlB3, MlC3, MlD3, MmD2, MmE2, MoB2, MoC2, MpE, MpF, MrB, MrC. For Casco part of MmD2 and MmE2, see Casco series. For Eldean part of MoB2 and MoC2, see Eldean series. For Hennepin part of MpE and MpF, see Hennepin series. No interpretations made for Urban land part of MrB and MrC.	Poor: moderately fine textured to fine textured material; some very steep slopes.	Moderate	Fair: thin layer; too clayey.	Unsuited	Fair to poor: clayey subsoil; some very steep slopes.
Millsdale: Ms	Poor: very poorly drained; moderately fine textured material.	High	Poor: wetness	Unsuited	Poor: moderately fine to fine subsoil; limestone at a depth of 20 to 40 inches; seasonal high water table.
Milton: MtA, MtB, MtC2	Poor: moderately fine textured to fine textured subsoil; well drained soil.	Moderate	Fair: thin layer.	Unsuited	Poor: moderately fine to fine subsoil; bedrock at a depth of 20 to 40 inches.
Milton variant: MUF	Poor: very steep slopes; channery texture.	Low	Poor: channery texture.	Unsuited	Poor: bedrock at a depth of 20 to 40 inches; channery texture.

interpretations—Continued

Soil features affecting—						
Highway location	Ponds		Drainage	Sprinkler irrigation	Terraces or diversions	Grassed waterways
	Reservoir area	Embankment				
Limestone and shale bedrock at a depth of 20 to 40 inches; steep slopes; clayey material.	Steep slopes; limestone and shale at a depth of 20 to 40 inches.	Limited material available; fair to poor stability and compaction.	Not needed; well drained; steep slopes.	Steep slopes; erosion hazard; slow intake.	Steep slopes; moderate depth to bedrock.	Steep slopes; moderate depth to bedrock.
Seasonal high water table; high frost action.	Slow seepage; seasonal high water table.	Fair stability and compaction; subject to piping.	Somewhat poorly drained; moderately slow permeability.	Seasonal high water table; moderately slow permeability; high available water capacity.	Nearly level; seasonal high water table.	Nearly level; seasonal high water table.
Well drained; subject to flooding; moderate frost action; low strength.	Possible seepage; subject to flooding.	Fair to poor stability and compaction; subject to piping.	Not needed; well drained.	Subject to flooding; high available water capacity; moderate infiltration.	Subject to flooding; nearly level.	Subject to flooding; nearly level.
Steep to very steep slopes; cut slopes are droughty; well drained.	Slow seepage; steep to very steep slopes.	Fair stability and compaction.	Not needed; well drained.	Steep to very steep slopes; moderate to low available water capacity.	Steep to very steep slopes; channel erosion hazard.	Steep to very steep slopes; channel erosion hazard.
Organic soil; subject to subsidence if drained; high water table; underlying mineral soil is more stable.	Organic soil; high water table; rapid seepage.	Organic soil; unstable.	Organic soil; high water table; subsides when drained.	High water table; rapid infiltration; high available water capacity.	Nearly level; high water table.	Nearly level; high water table.
Some very steep slopes; well drained.	Low seepage losses; most areas sloping to very steep.	Fair stability; slow permeability when compacted; good resistance to piping.	Not needed; well drained.	Moderate available water capacity; moderately slow permeability; erodible on steep slopes.	Well drained; moderately erodible; nearly level to very steep.	Well drained; moderately erodible; nearly level to very steep.
Very poorly drained; limestone bedrock at a depth of 20 to 40 inches.	Bedrock at a depth of 20 to 40 inches, fractured in places; seasonal high water table.	Poor stability and compaction; bedrock at a depth of 20 to 40 inches.	Very poorly drained; bedrock at a depth of 20 to 40 inches.	Moderately slow permeability; seasonal high water table.	Seasonal high water table; bedrock at a depth of 20 to 40 inches.	Seasonal high water table; bedrock at a depth of 20 to 40 inches.
Bedrock at a depth of 20 to 40 inches; well drained soil.	Bedrock at a depth of 20 to 40 inches, may be fractured.	Fair stability; bedrock at a depth of 20 to 40 inches.	Not needed; well drained.	Moderate permeability; moderate available water capacity.	Nearly level to sloping; bedrock at a depth of 20 to 40 inches.	Nearly level to sloping; bedrock at a depth of 20 to 40 inches.
Bedrock at a depth of 20 to 40 inches; very steep slopes.	Very steep slopes; bedrock at a depth of 20 to 40 inches.	Channery soil; very steep slopes.	Not needed; well drained.	Very steep slopes; low available water capacity.	Very steep slopes; bedrock at a depth of 20 to 40 inches.	Very steep slopes; bedrock at a depth of 20 to 40 inches.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of— Topsoil	Sand and gravel	Roadfill
Ockley: OcA, OcB, OcB2, OdB. No interpretations made for Urban land part of OdB.	Fair to a depth of about 5 feet; good in substratum.	Moderate	Fair: thin layer.	Good below a depth of about 5 feet.	Fair: moderately fine subsoil; good in substratum.
Odell: OeB	Poor: seasonal high water table; moderately fine textured material.	High	Fair: thin layer; too clayey.	Unsuited	Poor: moderately fine subsoil material; high frost action.
Patton: Pa	Poor: very poorly drained; moderately fine textured material.	High	Poor: wetness	Unsuited	Poor: seasonal high water table; high frost action.
Ragsdale: Ra	Poor: seasonal high water table; moderately fine textured material.	High	Poor: wetness	Unsuited	Poor: seasonal high water table; high frost action.
Randolph: RbA	Poor: somewhat poorly drained; moderately fine textured to fine textured material.	Moderate	Fair: thin layer.	Unsuited	Poor: bedrock at a depth of 20 to 40 inches; moderately fine textured to fine textured.
Raub: RdA, RdB	Poor: seasonal high water table; moderately fine textured material.	High	Fair: thin layer; too clayey.	Unsuited	Poor: moderately fine textured material; high frost action.
Reesville: ReA	Poor: seasonal high water table; high silt content.	High	Fair: thin layer.	Unsuited	Poor: high silt content; high frost action.
Ritchey: RhB, RhC, RhD, RhE2	Poor: moderately fine textured and fine textured subsoil; shallow to bedrock.	Moderate	Poor: thin layer.	Unsuited	Poor: bedrock at a depth of 10 to 20 inches.
Rodman. Mapped only with Casco soils.	Good: well drained; steep and very steep slopes.	Low	Poor: thin layer; gravelly material.	Good	Good
Ross: Rs	Fair: loamy material; subject to flooding.	Moderate	Good	Unsuited	Fair: loamy material; medium compressibility.

interpretations—Continued

Soil features affecting—						
Highway location	Ponds		Drainage	Sprinkler irrigation	Terraces or diversions	Grassed waterways
	Reservoir area	Embankment				
Well drained; no limiting features.	Excessive seepage in substratum.	Fair to good stability and compaction; permeable material in substratum.	Not needed; well drained.	Moderate permeability; high available water capacity.	Nearly level or gently sloping; moderately erodible on slopes.	Nearly level or gently sloping; moderately erodible on slopes.
Seasonal high water table; high frost action.	Slow rate of seepage; seasonal high water table.	Fair compaction and stability.	Somewhat poorly drained; all features favorable.	Moderately slow infiltration and permeability; high available water capacity.	Gently sloping; seasonal high water table.	Gently sloping; seasonal high water table.
Soft when wet; seasonal high water table; high frost action.	Low seepage losses; seasonal high water table.	Fair to poor stability and compaction.	Moderately slow permeability; seasonal high water table.	High available water capacity; seasonal high water table.	Nearly level; very poorly drained.	Nearly level; very poorly drained.
Seasonal high water table; soft and unstable when wet; high frost action.	Low seepage losses; seasonal high water table.	Fair to poor stability and compaction.	Seasonal high water table; slow permeability.	Seasonal high water table; slow permeability; high available water capacity.	Seasonal high water table; nearly level.	Seasonal high water table; nearly level.
Seasonal high water table; bedrock at a depth of 20 to 40 inches.	Bedrock at a depth of 20 to 40 inches, may be fractured; seasonal high water table.	Fair compaction and stability; bedrock at a depth of 20 to 40 inches.	Somewhat poorly drained; moderately slow permeability; bedrock at a depth of 20 to 40 inches.	Moderately slow permeability; seasonal high water table; moderate available water capacity.	Nearly level; bedrock at a depth of 20 to 40 inches; seasonal high water table.	Nearly level; bedrock at a depth of 20 to 40 inches; seasonal high water table.
Somewhat poorly drained; high frost action.	Slow rate of seepage; seasonal high water table.	Fair stability and compaction; subject to piping.	Somewhat poorly drained; moderate to moderately slow permeability.	High available water capacity; seasonal high water table.	Somewhat poorly drained; moderately erodible.	Somewhat poorly drained; moderately erodible.
Seasonal high water table; soft and unstable when wet; high frost action.	Moderately slow seepage; seasonal high water table.	Fair stability and compaction; medium compressibility; poor resistance to piping.	Somewhat poorly drained; all features favorable.	Seasonal high water table; high available water capacity.	Nearly level; seasonal high water table.	Nearly level; seasonal high water table.
Bedrock at a depth of 10 to 20 inches; some steep slopes.	Bedrock at a depth of 10 to 20 inches; some steep slopes.	Commonly not used; thin soil material over limestone.	Not needed; well drained.	Moderate permeability; low available water capacity; some steep slopes.	Gently sloping to steep; shallow to bedrock.	Gently sloping to steep; shallow to bedrock; droughty.
Steep and very steep slopes; well drained stable material.	Pervious material; high seepage.	Good stability; rapid permeability.	Not needed; well drained.	Steep and very steep slopes; low available water capacity; rapid infiltration.	Steep and very steep slopes; shallow to sand and gravel; droughty.	Steep and very steep slopes; shallow to sand and gravel; droughty.
Nearly level; subject to flooding; low strength.	Subject to flooding; excessive seepage in some areas.	Fair stability; medium compressibility.	Not needed; well drained.	Moderate permeability; high available water capacity.	Nearly level; subject to flooding.	Nearly level; subject to flooding.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of— Topsoil	Sand and gravel	Roadfill
Rush: RtA, RtB	Fair: moderately fine textured subsoil; well drained.	High	Fair: thin layer.	Good below a depth of 40 to 60 inches.	Poor: moderately fine textured subsoil; good in substratum; high frost action.
*Russell: RuA, RvB, RvB2. For Miamian part of RvB and RvB2, see Miamian series.	Poor: moderately fine textured subsoil.	Moderate	Fair: thin layer.	Unsuited	Fair: moderately fine textured subsoil.
Sleeth: SlA	Poor: seasonal high water table.	High	Fair: thin layer.	Good below a depth of about 5 feet.	Poor in subsoil: moderately fine textured subsoil, high frost action; good in substratum.
Sloan: So, Sp, Sr. No interpretations made for Fill land part of Sp or for Urban land part of Sr.	Poor: seasonal high water table; subject to flooding.	High	Poor: wetness	Unsuited	Poor: wetness; poor compaction properties; frost action.
Thackery: ThA, ThB	Poor: moderately fine textured material.	Moderate	Good	Good below a depth of about 5 feet.	Fair: moderately fine textured subsoil; good in substratum.
Urban land: Ur. No interpretations made.					
Warsaw: WaA, WbA, WcA. No interpretations made for Fill land part of WbA and for Urban land part of WcA.	Fair in upper layers; good below a depth of about 40 inches.	Moderate	Fair: thin layer.	Good below a depth of about 40 inches.	Fair: moderately fine textured to fine textured subsoil; good in substratum.
Wea: WeB	Fair in upper 4 to 5 feet: moderately fine textured material; good in substratum.	Moderate	Fair: thin layer.	Good below a depth of 4 to 5 feet.	Fair: moderately fine subsoil; good in substratum.
Westland: Ws, Wt. No interpretations made for Urban land part of Wt.	Poor: seasonal high water table; moderately fine textured subsoil.	High	Poor: wetness	Fair to good below a depth of 4 to 5 feet.	Poor: seasonal high water table.
Xenia: XeA, XeB	Poor: moderately fine textured.	High	Fair: thin layer.	Unsuited	Poor: moderately fine textured subsoil; high frost action.

interpretations—Continued

Soil features affecting—						
Highway location	Ponds		Drainage	Sprinkler irrigation	Terraces or diversions	Grassed waterways
	Reservoir area	Embankment				
Well drained; moderate permeability; high frost action.	Excessive seepage in substratum.	Fair to good stability and compaction; permeable material in substratum.	Not needed; well drained.	Moderate permeability; high available water capacity.	Nearly level to gently sloping; erodible on slopes.	Nearly level to gently sloping; erodible on slopes.
Well drained; erosive on cuts and fills; moderate frost action.	Slow seepage	Fair stability and compaction; subject to piping.	Not needed; well drained.	Moderately permeable in upper 2 feet; high available water capacity.	Nearly level to gently sloping; erodes easily.	Nearly level to gently sloping; erodes easily.
Seasonal high water table.	Excessive seepage in substratum; seasonal high water table.	Fair compaction and stability in upper layers; permeable in substratum.	Somewhat poorly drained; all features favorable.	Moderate permeability; high available water capacity; seasonal high water table.	Nearly level; seasonal high water table.	Nearly level; seasonal high water table.
Seasonal high water table subject to flooding; soft and unstable when wet; high frost action.	Subject to flooding; excessive seepage in substratum; seasonal high water table.	Fair compaction and stability.	Very poorly drained; moderate permeability.	Moderate permeability; subject to flooding; seasonal high water table; high available water capacity.	Nearly level; subject to flooding; very poorly drained.	Nearly level; subject to flooding; very poorly drained.
Moderately well drained.	Excessive seepage in substratum.	Fair to good compaction and stability; permeable in substratum.	Not needed; moderately well drained.	Moderate infiltration and permeability; high available water capacity.	Nearly level to gently sloping; erodible on slopes.	Nearly level to gently sloping; erodible on slopes.
Well drained; cut slopes are droughty.	Excessive seepage losses in substratum.	Pervious substratum; fair stability and compaction.	Not needed; well drained.	Moderate available water capacity; moderate infiltration.	Cut channels are gravelly and droughty.	Cut channels are gravelly and droughty.
Well drained; no limiting features.	Excessive seepage in substratum.	Pervious substratum; fair stability and compaction.	Not needed; well drained.	High available water capacity; moderate permeability.	Nearly level to gently sloping; well drained.	Nearly level to gently sloping; well drained.
Seasonal high water table; high frost action.	Moderate seepage in upper layers; high seepage in substratum; seasonal high water table.	Fair to good compaction and stability; permeable in substratum.	Very poorly drained; moderately slow permeability.	Moderately slow permeability; high available water capacity.	Nearly level; very poorly drained.	Very poorly drained; nearly level.
Seasonal high water table for short periods; high frost action.	Low seepage losses.	Fair stability and compaction; medium compressibility.	Not needed; moderately well drained.	High available water capacity; moderately slow permeability at a depth of about 3 feet.	Nearly level to sloping; moderately erodible.	Nearly level to gently sloping; moderately erodible.

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 there is a high probability of damage, so that protective measures for steel and more resistant concrete should be used to avoid or minimize damage.

Engineering interpretations of soils

The estimated interpretations in table 6 are based on the engineering properties of soils shown in table 5, on test data for soils in this survey area and others nearby or adjoining, and on the experience of engineers and soil scientists with the soils of Greene County.

In table 6, ratings are used to summarize limitations or suitability of the soils for all listed purposes other than for highway location, reservoir areas, embankments, drainage of cropland and pasture, irrigation, terraces or diversions, and grassed waterways. For these particular uses, table 6 lists those soil features not to be overlooked in planning installation and maintenance.

Following are explanations of some of the columns in table 6.

Winter grading is affected chiefly by soil features that are relevant to moving, mixing, and compacting soil in road building when temperatures are below freezing.

Soils most susceptible to damaging frost action are silt loam and fine sandy loam soils that are wet or saturated most of the winter. Such soils are rated *high*.

Topsoil is used for topdressing an area where vegetation is to be established and maintained. Suitability is affected mainly by ease of working and spreading the soil material, as for preparing a seedbed; natural fertility of the material, or the response of plants when fertilizer is applied; and absence of substances toxic to plants. Texture of the soil material and its content of stone fragments are characteristics that affect suitability, but also considered in the ratings is damage that will result at the area from which topsoil is taken.

Sand and gravel are used in great quantities in many kinds of construction. The ratings in table 6 provide guidance about where to look for probable sources. A soil rated as a *good* or *fair* source of sand or gravel generally has a layer at least 3 feet thick, the top of which is within a depth of 6 feet. The ratings do not take into account thickness of overburden, location of the water table, or other factors that affect mining of the materials, and neither do they indicate quality of the deposit.

Roadfill is soil material used in embankments for roads. The suitability ratings reflect (1) the predicted performance of soil after it has been placed in an embankment that has been properly compacted and provided with adequate drainage and (2) the relative ease of excavating the material at borrow areas.

Soil properties that most affect highway and road location are load supporting capacity and stability of the subgrade, and the workability and quantity of cut and fill material available. The AASHTO and Unified classifications of the soil material, and also the shrink-swell potential, indicate traffic supporting capacity. Wetness and flooding affect stability of the material. Slope, depth to hard rock, content of stones and rocks, and wetness affect ease of excavation and amount of cut and fill needed to reach an even grade.

Pond reservoir areas hold water behind a dam or embankment (fig. 2). Soils that are suitable for pond reservoir areas have low seepage, which is related to their permeability and depth to fractured or permeable bedrock or other permeable material.

Embankments require soil material resistant to seepage and piping and of favorable stability, shrink-swell potential, shear strength, and compactibility. Presence of stones or organic material in a soil are unfavorable.

Drainage of cropland and pasture is affected by such soil properties as permeability, texture, and structure; depth to claypan, rock, or other layers that influence rate of water movement; depth to the water table; slope; stability in ditchbanks; susceptibility to stream overflow; and availability of outlets for drainage.

Irrigation of soil is affected by such features as slope; susceptibility to stream overflow, water erosion, or soil blowing; soil texture; content of stones; depth of rooting zone; rate of water intake at the surface; permeability of soil layers below the surface layer and in fragipans or other layers that restrict movement of water; amount of water held available to plants; and need for drainage, or depth to water table or bedrock.

Terraces and diversions are embankments, or ridges, constructed across the slope to intercept runoff and seepage so that it soaks into the soils or flows slowly to a prepared outlet. Features that affect suitability of a soil for terraces are uniformity and steepness of slope; depth to bedrock or other unfavorable material; presence of stones; permeability; and resistance to water erosion, soil slipping, and soil blowing. A soil suitable for these structures provides outlets for runoff and is not difficult to vegetate.

Waterways layout and construction are affected by such properties as texture, depth, and erodibility of the soil material; presence of stones or rock outcrop; and the steepness of slopes. Other factors affecting waterways are seepage, natural soil drainage, available water capacity, susceptibility to siltation and the ease of establishing and maintaining vegetation.

Town and Country Planning

Greene County is only a few miles east of the expanding metropolitan area of Dayton, and expansion has already affected land use in the western part of the county. Competition for land is increasing. Most of the county is still used for crops, but there is a mixing of farm and nonfarm uses (fig. 3). The farming areas are being reduced as residential, industrial, and recreational facilities and areas used for transportation are developed.

Figure 2.—**These houses and ponds were constructed on Miamian soils. The properties of these soils generally are suited to this kind of development.**

The expansion of nonfarm uses of land can remove many acres from farming use in a short period of time. Shopping centers can easily displace 50 to 100 acres of farmland. Freeways and super highways can displace as much as 50 acres per mile. These uses permanently remove land from farming.

This section of the soil survey provides information on the properties of the soils and their effect on selected nonfarm use of land. It will help community planners and industrial users of land, who generally look for areas that are 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 degree and kinds of limitation of soils for some selected land 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. *Moderate* shows 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.

Figure 3.—This residential area was built mainly on Ockley soils. These soils have few limitations for farm and nonfarm uses.

Following are explanations of the uses rated in table 7.

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 when they consider whether or not farming is a sound land use.

Septic tank absorption fields.—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 a seasonal high water table prevent proper functioning of disposal fields for variable periods of time. All soils subject to flooding have been rated severe.

Many of the soils in the county have been rated severe because of moderately slow permeability to very slow permeability. 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 dense glacial till or bedrock, that interferes with adequate filtration and the movement of effluent. Some soils, even though rated severe, are better for use as septic tank absorption fields than other soils similarly rated.

If filter beds for septic tanks are located on soils that have slopes of more than 12 percent, erosion and seepage downslope can be a problem, or the soil might 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, there is a distinct hazard of polluting underground 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 to bedrock, permeability, coarse fragments, and organic-matter content.

Dwellings.—Major soil features that limit use of soils as homesites are limited depth to bedrock, flooding, poor natural drainage, and excessive slope. The method for disposing of sewage is not considered. The ratings in table 7 are for houses of 3 stories or less, with or without 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. While flooding may be infrequent, it is costly and damaging when it does occur. Homes on naturally wet soils have the hazard of wet basements if adequate drainage is not provided. Such soils as Crosby, Fincastle, and Sleeth soils have a hazard of wetness. In many areas tile drains or open ditches, or both, have been installed for farming. Excavations in these areas for structures, such as dwellings, can disrupt the established drainage system, and change it back to its natural condition of wetness.

Birkbeck soils and other soils that have a high silt content are not so suitable for supporting house foundations as Warsaw soils and other coarser textured soils. Soils having high shrink-swell properties are likely to heave and crack foundations unless precautions are observed. Also, high shrink-swell properties affect the alignment of sidewalks, patios, floors, and stone walls.

Excavating basements and installing underground utility lines is difficult and expensive in soils that have limited depth to bedrock. Soils that have a slope of more than 12 percent have a hazard of erosion as well as problems in excavation and leveling.

Local roads and streets.—The ratings in table 7 are for soils used for roads and streets in residential areas where traffic is not heavy. Considered in estimating the ratings were the hazard of flooding, slope, depth to bedrock 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, "Engineerng Uses of the Soils."

Shallow excavations are those that require digging or trenching to a depth of less than 6 feet, as for example, excavations for pipelines, sewerlines, phone and power transmission lines, basements, open ditches, and cemeteries. Desirable soil properties are good workability, moderate resistance to sloughing, gentle slopes, absence of rock outcrop or big stones, and freedom from flooding or a high water table.

Sanitary landfill is a method of disposing of refuse. The waste is spread in layers, compacted, and covered with soil throughout the disposal period. Landfill areas are subject to heavy vehicular traffic. Some soil properties that affect suitability for landfill are ease of excavation, hazard of polluting ground water, and trafficability. The best soils have moderately slow permeability, withstand heavy traffic, and are friable and easy to excavate. For trench type landfills, unless otherwise stated, the ratings in table 7 apply only to a depth of about 6 feet, and therefore limitation ratings of slight or moderate may not be valid if trenches are to be much deeper than that. Even though reliable predictions can be made to a depth of 10 or 15 feet for some soils, every site should be investigated before it is selected.

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 and should be saved. 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 saved and 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.

Playgrounds.—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 bedrock and kind of bedrock, permeability, degree of stoniness, the hazard of flooding, and the texture of the surface soil. The use of fill material from other areas was not considered in the ratings. Soils on flood plains can be used as ball diamonds 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.

Picnic areas.—Picnic 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 picnic areas and other extensive play areas were the hazard of flooding, degree of stoniness and rockiness, degree of slope, texture of the surface soil, and depth to the water table.

Camp areas.—Sites suitable 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 a hazard of flooding, a seasonal high water table, permeability, the degree of slope, and soil texture. Soils that have slopes

TABLE 7.—*Degree and kinds of limitations*

[An asterisk in the first column indicates that at least one mapping unit is made of two or more kinds of soil. The soils in such for referring to other

Soil series and map symbols	Farming (cultivated crops)	Septic tank absorption fields	Sewage lagoons	Dwellings with basements	Dwellings without basements	Local roads and streets
Algiers: Ag	Slight	Severe: seasonal high water table; subject to flooding.	Severe: seasonal high water table; subject to flooding.	Severe: subject to flooding; seasonal high water table.	Severe: subject to flooding.	Severe: subject to flooding; high frost action.
Birkbeck: BbB	Slight	Moderate: moderate permeability.	Moderate: moderate permeability; slope.	Moderate: seasonal high water table.	Slight	Severe: high frost action.
Brookston: Bs, Bt. No interpretations made for Urban land part of Bt.	Slight	Severe: seasonal high water table.	Slight	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table; high frost action.
Casco-Eldean: CcD2	Severe: slope; erosion.	Severe:[1] slope	Severe:[1] pervious substratum; slope.	Severe: slope	Severe: slope	Severe: slope
Casco-Rodman: CdE2	Severe: slope; erosion.	Severe:[1] slope	Severe:[1] pervious substratum; slope.	Severe: slope	Severe: slope	Severe: slope
Celina:						
CeA	Slight	Severe: moderately slow permeability.	Slight	Moderate: seasonal high water table.	Slight	Moderate: frost action.
CeB	Slight	Severe: moderately slow permeability.	Moderate: slope.	Moderate: seasonal high water table.	Slight	Moderate: frost action.
Crosby:						
CrA	Slight	Severe: moderately slow permeability to slow permeability; seasonal high water table.	Slight	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: high frost action.
CrB	Slight	Severe: moderately slow permeability to slow permeability; seasonal high water table.	Moderate: slope.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: frost action.
Edenton:						
EdB	Slight	Severe: depth to bedrock; moderately slow permeability.	Severe: depth to bedrock.	Severe: depth to bedrock.	Moderate: depth to bedrock.	Moderate: depth to bedrock.
EdC2	Moderate: slope; erosion.	Severe: depth to bedrock; moderately slow permeability.	Severe: depth to bedrock; slope.	Severe: depth to bedrock.	Moderate: depth to bedrock; slope.	Moderate: depth to bedrock; slope.
EdD2	Severe: slope; erosion.	Severe: depth to bedrock; moderately slow permeability; slope.	Severe: depth to bedrock; slope.	Severe: depth to bedrock; slope.	Severe: slope	Severe: slope
Eel: Ee	Slight	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding; high frost action.

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mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions series as indicated]

Shallow excavations	Sanitary landfill (trench)	Lawns, landscaping, and golf fairways	Playgrounds	Picnic areas	Camp areas	Paths and trails
Severe: subject to flooding; seasonal high water table.	Severe: subject to flooding; seasonal high water table.	Severe: subject to flooding.	Severe: subject to flooding; seasonal high water table.	Moderate: subject to flooding; seasonal high water table.	Severe: subject to flooding.	Moderate: seasonal high water table.
Moderate: seasonal high water table.	Slight	Slight	Moderate: seasonal high water table; slope.	Slight	Moderate: seasonal high water table.	Slight.
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.
Severe: slope	Severe:[1] pervious substratum.	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: slope.
Severe: slope	Severe:[1] pervious substratum; slope.	Severe: slope; droughty.	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Moderate: seasonal high water table.	Slight	Slight	Moderate: moderately slow permeability.	Slight	Moderate: moderately slow permeability.	Slight.
Moderate: seasonal high water table.	Slight	Slight	Moderate: moderately slow permeability.	Slight	Moderate: moderately slow permeability.	Slight.
Severe: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table; moderately slow permeability to slow permeability.	Moderate: seasonal high water table.	Moderate: seasonal high water table; moderately slow permeability to slow permeability.	Moderate: seasonal high water table.
Severe: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table; moderately slow permeability to slow permeability; slope.	Moderate: seasonal high water table.	Moderate: seasonal high water table; moderately slow permeability to slow permeability.	Moderate: seasonal high water table.
Severe: depth to bedrock.	Severe: depth to bedrock.	Moderate: depth to bedrock.	Moderate: moderately slow permeability; slope; depth to bedrock.	Slight	Moderate: moderately slow permeability.	Slight.
Severe: depth to bedrock.	Severe: depth to bedrock.	Moderate: depth to bedrock; slope.	Severe: slope	Moderate: slope	Moderate: moderately slow permeability; slope.	Slight.
Severe: depth to bedrock; slope.	Severe: depth to bedrock.	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: slope.
Severe: subject to flooding.	Severe: subject to flooding.	Moderate: subject to flooding.	Moderate: subject to flooding.	Moderate: subject to flooding.	Severe: subject to flooding.	Slight.

TABLE 7.—*Degree and kinds of limitations*

Soil series and map symbols	Farming (cultivated crops)	Septic tank absorption fields	Sewage lagoons	Dwellings with basements	Dwellings without basements	Local roads and streets
Eldean:						
EmA	Slight	Slight[1]	Severe:[1] pervious substratum.	Slight	Slight	Slight.
EmB, EmB2	Slight	Slight[1]	Severe:[1] pervious substratum.	Slight	Slight	Slight.
EmC2, EpC. No interpretations made for Urban land part of EpC.	Moderate: slope; erosion.	Moderate:[1] slope.	Severe:[1] pervious substratum; slope.	Moderate: slope.	Moderate: slope.	Moderate: slope.
EnC3	Severe: erosion	Moderate:[1] slope.	Severe:[1] pervious substratum; slope.	Moderate: slope.	Moderate: slope.	Moderate: slope.
Fairmount variant: FaF.	Severe: slope	Severe: slope; depth to bedrock.	Severe: slope; depth to bedrock.	Severe: slope; depth to bedrock.	Severe: slope	Severe: slope.
Fincastle: FnA	Slight	Severe: moderately slow permeability; seasonal high water table.	Slight	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: high frost action.
Genesee: Gn	Slight	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
Linwood: Ln	Slight	Severe: high water table; subject to ponding.	Severe: high organic matter content; subject to ponding; high water table.	Severe: high water table; unstable organic soil; subject to ponding.	Severe: high water table; unstable organic soil; subject to ponding.	Severe: high water table; subject to ponding.
Miamian:						
MhA	Slight	Severe: moderately slow permeability.	Slight	Slight	Slight	Moderate: clayey subsoil.
MhB, MhB2, MrB. No interpretations made for Urban land part of MrB.	Slight	Severe: moderately slow permeability.	Moderate: slope.	Slight	Slight	Moderate: clayey subsoil.
MhC2, MrC. No interpretations made for Urban land part of MrC.	Moderate: slope; erosion.	Severe: moderately slow permeability.	Severe: slope	Moderate: slope.	Moderate: slope.	Moderate: clayey subsoil; slope.
MhD2	Severe: slope; erosion.	Severe: moderately slow permeability; slope.	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
MlB3	Moderate: erosion.	Severe: moderately slow permeability.	Moderate: slope.	Slight	Slight	Moderate: clayey subsoil.
MlC3	Severe: erosion	Severe: moderately slow permeability.	Severe: slope	Moderate: slope.	Moderate: slope.	Moderate: clayey subsoil; slope.
MlD3	Severe: slope; erosion.	Severe: moderately slow permeability; slope.	Severe: slope	Severe: slope	Severe: slope	Severe: slope.

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Shallow excavations	Sanitary landfill (trench)	Lawns, landscaping, and golf fairways	Playgrounds	Picnic areas	Camp areas	Paths and trails
Moderate: gravelly textured.	Severe:[1] pervious substratum.	Moderate: droughty.	Slight	Slight	Slight	Slight.
Moderate: gravelly textured.	Severe:[1] pervious substratum.	Moderate: droughty.	Moderate: slope	Slight	Slight	Slight.
Moderate: gravelly textured; slope.	Severe:[1] pervious substratum.	Moderate: droughty; slope.	Severe: slope	Moderate: slope	Moderate: slope	Slight.
Moderate: gravelly textured; slope.	Severe:[1] pervious substratum.	Moderate: droughty; slope.	Severe: slope	Moderate: slope; clay loam surface layer.	Moderate: slope; clay loam surface layer.	Moderate: clay loam surface layer.
Severe: slope; depth to bedrock.	Severe: slope; depth to bedrock.	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table; moderately slow permeability.	Moderate: seasonal high water table.	Moderate: seasonal high water table; moderately slow permeability.	Moderate: seasonal high water table.
Severe: subject to flooding.	Severe: subject to flooding.	Moderate: subject to flooding.	Moderate: subject to flooding.	Moderate: subject to flooding.	Severe: subject to flooding.	Slight.
Severe: high water table; subject to ponding.	Severe: high water table; subject to ponding.	Severe: high water table.	Severe: high water table; organic soil; subject to ponding.	Severe: high water table; organic soil; subject to ponding.	Severe: high water table; organic soil; subject to ponding.	Severe: high water table; organic soil; subject to ponding.
Slight	Slight	Slight	Moderate: moderately slow permeability.	Slight	Moderate: moderately slow permeability.	Slight.
Slight	Slight	Slight	Moderate: modately slow permeability; slope.	Slight	Moderate: modately slow permeability.	Slight.
Moderate: slope.	Slight	Moderate: slope	Severe: slope	Moderate: slope	Moderate: moderately slow permeability; slope.	Slight.
Severe: slope	Moderate: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: slope.
Slight	Slight	Moderate: clay loam surface layer.	Moderate: moderately slow permeability; slope; clay loam surface layer.	Moderate: clay loam surface layer.	Moderate: moderately slow permeability; clay loam surface layer.	Moderate: clay loam surface layer.
Moderate: slope.	Slight	Moderate: slope; clay loam surface layer.	Severe: slope	Moderate: clay loam surface layer; slope.	Moderate: moderately slow permeability; clay loam surface layer; slope.	Moderate: clay loam surface layer.
Severe: slope	Moderate: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: clay loam surface layer; slope.

TABLE 7.—*Degree and kinds of limitations*

Soil series and map symbols	Farming (cultivated crops)	Septic tank absorption fields	Sewage lagoons	Dwellings with basements	Dwellings without basements	Local roads and streets
*Miamian:						
MmD2, MmE2, MpE. For Casco part of MmD2 and MmE2, see Casco series. For Hennepin part of MpE, see Hennepin series.	Severe: slope; erosion.	Severe: moderately slow permeability; slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
MoB2. For Eldean part of MoB2, see Eldean series.	Slight.	Severe: moderately slow permeability.	Moderate: slope.	Slight.	Slight.	Moderate: clayey subsoil.
MoC2. For Eldean part of MoC2, see Eldean series.	Moderate: slope; erosion.	Severe: moderately slow permeability.	Severe: slope.	Moderate: slope.	Moderate: slope.	Moderate: clayey subsoil; slope.
MpF. For Hennepin part of MpF, see Hennepin series.	Severe: slope; erosion.	Severe: moderately slow permeability; slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Millsdale: Ms.	Moderate: wetness.	Severe: moderately slow permeability; seasonal high water table; depth to bedrock.	Severe: depth to bedrock; seasonal high water table.	Severe: seasonal high water table; depth to bedrock.	Severe: seasonal high water table; high shrink-swell.	Severe: seasonal high water table; high frost action.
Milton:						
MtA.	Slight.	Severe: depth to bedrock.	Severe: depth to bedrock.	Severe: depth to bedrock.	Moderate: depth to bedrock.	Moderate: depth to bedrock.
MtB.	Slight.	Severe: depth to bedrock.	Severe: depth to bedrock.	Severe: depth to bedrock.	Moderate: depth to bedrock.	Moderate: depth to bedrock.
MtC2.	Moderate: slope; erosion.	Severe: depth to bedrock.	Severe: depth to bedrock; slope.	Severe: depth to bedrock.	Moderate: depth to bedrock; slope.	Moderate: depth to bedrock; slope.
Milton variant: MUF.	Severe: slope; coarse fragments on surface.	Severe: slope; depth to bedrock.	Severe: depth to bedrock; slope.	Severe: depth to bedrock; slope.	Severe: slope.	Severe: slope.
Ockley:						
OcA.	Slight.	Slight[1]	Severe:[1] pervious substratum.	Slight.	Slight.	Moderate: moderately fine textured subsoil; subject to frost action.
OcB, OcB2, OdB. No interpretations made for Urban land part of OdB.	Slight.	Slight[1]	Severe:[1] pervious substratum.	Slight.	Slight.	Moderate: moderately fine textured subsoil; subject to frost action.
Odell: OeB.	Slight.	Severe: seasonal high water table.	Moderate: moderate permeability; slope.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: high frost action.
Patton: Pa.	Slight.	Severe: moderately slow permeability; seasonal high water table.	Slight.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table; high frost action.

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Shallow excavations	Sanitary landfill (trench)	Lawns, landscaping, and golf fairways	Playgrounds	Picnic areas	Camp areas	Paths and trails
Severe: slope	Moderate: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: slope.
Slight	Slight	Slight	Moderate: moderately slow permeability; slope.	Slight	Moderate: moderately slow permeability.	Slight.
Moderate: slope.	Slight	Moderate: slope	Severe: slope	Moderate: slope	Moderate: moderately slow permeability; slope.	Slight.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: seasonal high water table; depth to bedrock.	Severe: seasonal high water table; depth to bedrock.	Severe: seasonal high water table.	Severe: seasonal high water table; depth to bedrock.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.
Severe: depth to bedrock.	Severe: depth to bedrock.	Moderate: depth to bedrock.	Moderate: depth to bedrock.	Slight	Slight	Slight.
Severe: depth to bedrock.	Severe: depth to bedrock.	Moderate: depth to bedrock.	Moderate: slope; depth to bedrock.	Slight	Slight	Slight.
Severe: depth to bedrock.	Severe: depth to bedrock.	Moderate: depth to bedrock; slope.	Severe: slope	Moderate: slope	Moderate: slope	Slight.
Severe: slope, depth to bedrock.	Severe: slope; depth to bedrock.	Severe: slope	Severe: slope; coarse fragments on surface.	Severe: slope; coarse fragments on surface.	Severe: slope; coarse fragments on surface.	Severe: slope; coarse fragments on surface.
Slight	Severe:[1] pervious substratum.	Slight	Slight	Slight	Slight	Slight.
Slight	Severe:[1] pervious substratum.	Slight	Moderate: slope	Slight	Slight	Slight.
Severe: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table; slope.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Moderate: 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.	Severe: seasonal high water table.

TABLE 7.—*Degree and kinds of limitations*

Soil series and map symbols	Farming (cultivated crops)	Septic tank absorption fields	Sewage lagoons	Dwellings with basements	Dwellings without basements	Local roads and streets
Ragsdale: Ra	Slight	Severe: slow permeability; seasonal high water table.	Slight	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table; high frost action.
Randolph: RbA	Moderate: wetness.	Severe: moderately slow permeability; seasonal high water table; depth to bedrock.	Severe: depth to bedrock; seasonal high water table.	Severe: seasonal high water table; depth to bedrock.	Severe: high shrink-swell.	Severe: clayey textured subsoil; high shrink-swell.
Raub:						
RdA	Slight	Severe: slow permeability; seasonal high water table.	Slight	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: high frost action.
RdB	Slight	Severe: slow permeability; seasonal high water table.	Moderate: slope.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: high frost action.
Reesville: ReA	Slight	Severe: seasonal high water table; moderate permeability to moderately slow permeability.	Severe: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: high frost action.
Ritchey:						
RhB	Moderate: shallow depth to bedrock; slope; erosion.	Severe:[1] shallow depth to bedrock.	Severe:[1] shallow depth to bedrock.	Severe: shallow depth to bedrock.	Severe: shallow depth to bedrock.	Severe: shallow depth to bedrock.
RhC	Severe: slope; erosion.	Severe:[1] shallow depth to bedrock.	Severe:[1] shallow depth to bedrock; slope.	Severe: shallow depth to bedrock.	Severe: shallow depth to bedrock.	Severe: shallow depth to bedrock.
RhD, RhE2	Severe: slope; erosion.	Severe:[1] shallow depth to bedrock; slope.	Severe:[1] shallow depth to bedrock; slope.	Severe: shallow depth to bedrock; slope.	Severe: shallow depth to bedrock; slope.	Severe: shallow depth to bedrock; slope.
Ross: Rs	Slight	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
Rush:						
RtA	Slight	Slight[1]	Severe:[1] pervious substratum.	Slight	Slight	Moderate: moderately fine textured subsoil; subject to frost action.
RtB	Slight	Slight[1]	Severe:[1] pervious substratum.	Slight	Slight	Moderate: moderately fine textured subsoil; subject to frost action.
Russell:						
RuA	Slight	Severe: moderate permeability to moderately slow permeability.	Slight	Slight	Slight	Moderate: moderately fine textured subsoil; subject to frost action.

of soils for town and country planning—Continued

Shallow excavations	Sanitary landfill (trench)	Lawns, landscaping, and golf fairways	Playgrounds	Picnic areas	Camp areas	Paths and trails
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.
Severe: seasonal high water table; depth to bedrock.	Severe: depth to bedrock.	Moderate: seasonal high water table; depth to bedrock.	Moderate: seasonal high water table; moderately slow permeability.	Moderate: seasonal high water table.	Moderate: seasonal high water table; moderately slow permeability.	Moderate: seasonal high water table.
Severe: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table; slow permeability.	Moderate: seasonal high water table.	Moderate: seasonal high water table; slow permeability.	Moderate: seasonal high water table.
Severe: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table; slow permeability; slope.	Moderate: seasonal high water table.	Moderate: seasonal high water table; slow permeability.	Moderate: seasonal high water table.
Severe: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table; moderate permeability to moderately slow permeability.	Moderate: seasonal high water table.	Moderate: seasonal high water table; moderate permeability to moderately slow permeability.	Moderate: seasonal high water table.
Severe: shallow depth to bedrock.	Severe:[1] shallow depth to bedrock.	Severe: shallow depth to bedrock; low available water capacity.	Severe: shallow depth to bedrock.	Slight.	Slight.	Slight.
Severe: shallow depth to bedrock.	Severe:[1] shallow depth to bedrock.	Severe: shallow depth to bedrock; low available water capacity.	Severe: slope; shallow depth to bedrock.	Moderate: slope.	Moderate: slope.	Slight.
Severe: shallow depth to bedrock; slope.	Severe:[1] shallow depth to bedrock.	Severe: slope; shallow depth to bedrock; low available water capacity.	Severe: slope; shallow depth to bedrock.	Severe: slope.	Severe: slope.	Moderate: slope.
Severe: subject to flooding.	Severe: subject to flooding.	Moderate: subject to flooding.	Moderate: subject to flooding.	Moderate: subject to flooding.	Severe: subject to flooding.	Slight.
Slight.	Severe:[1] pervious substratum.	Slight.	Slight.	Slight.	Slight.	Slight.
Slight.	Severe:[1] pervious substratum.	Slight.	Moderate: slope.	Slight.	Slight.	Slight.
Slight.	Slight.	Slight.	Moderate: moderate permeability to moderately slow permeability.	Slight.	Moderate: moderate permeability to moderately slow permeability.	Slight.

TABLE 7.—*Degree and kinds of limitations*

Soil series and map symbols	Farming (cultivated crops)	Septic tank absorption fields	Sewage lagoons	Dwellings with basements	Dwellings without basements	Local roads and streets
Russell:						
RvB, RvB2. For Miamian part of RvB and RvB2, see Miamian series.	Slight	Severe: moderate permeability to moderately slow permeability.	Moderate: slope.	Slight	Slight	Moderate: moderately fine textured subsoil; subject to frost action.
Sleeth: SlA	Slight	Severe:[1] seasonal high water table.	Severe:[1] seasonal high water table; pervious substratum.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: high frost action.
Sloan: So, Sp, Sr. No interpretations made for Fill land part of Sp and for Urban land part of Sr.	Moderate: wetness.	Severe: subject to flooding; seasonal high water table.	Severe: seasonal high water table; subject to flooding.	Severe: seasonal high water table; subject to flooding.	Severe: seasonal high water table; subject to flooding.	Severe: seasonal high water table; subject to flooding; high frost action.
Thackery:						
ThA	Slight	Moderate:[1] seasonal high water table for short periods; moderate permeability.	Severe:[1] pervious substratum.	Moderate: seasonal high water table for short periods.	Slight	Moderate: moderately fine textured subsoil; subject to frost action.
ThB	Slight	Moderate:[1] seasonal high water table for short periods; moderate permeability.	Severe:[1] pervious substratum.	Moderate: seasonal high water table for short periods.	Slight	Moderate: moderately fine textured subsoil; subject to frost action.
Urban land: Ur. No interpretations made.						
Warsaw: WaA, WbA, WcA. No interpretations made for Fill land part of WbA and for Urban land part of WcA.	Slight	Slight[1]	Severe:[1] pervious substratum.	Slight	Slight	Slight
Wea: WeB	Slight	Slight[1]	Severe:[1] pervious substratum.	Slight	Slight	Moderate: moderately fine textured subsoil.
Westland: Ws, Wt. No interpretations made for Urban land part of Wt.	Slight	Severe:[1] seasonal high water table; moderately slow permeability.	Severe:[1] pervious substratum.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table; high frost action.
Xenia:						
XeA	Slight	Severe: moderately slow permeability.	Slight	Moderate: seasonal high water table for short periods.	Slight	Severe: high frost action.
XeB	Slight	Severe: moderately slow permeability.	Moderate: slope.	Moderate: seasonal high water table for short periods.	Slight	Severe: high frost action.

[1]Danger of pollution of underground water supplies, springs, and nearby streams because of inadequate filtration.

of soils for town and country planning—Continued

Shallow excavations	Sanitary landfill (trench)	Lawns, landscaping, and golf fairways	Playgrounds	Picnic areas	Camp areas	Paths and trails
Slight	Slight	Slight	Moderate: moderate permeability to moderately slow permeability.	Slight	Moderate: moderate permeability to moderately slow permeability.	Slight.
Severe: seasonal high water table.	Severe:[1] pervious substratum; seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table.
Severe: seasonal high water table; subject to flooding.	Severe: seasonal high water table; subject to flooding.	Severe: seasonal high water table; subject to flooding.	Severe: seasonal high water table; subject to flooding.	Severe: seasonal high water table.	Severe: seasonal high water table; subject to flooding.	Severe: seasonal high water table.
Moderate: seasonal high water table for short periods.	Severe:[1] pervious substratum.	Slight	Slight	Slight	Slight	Slight.
Moderate: seasonal high water table for short periods.	Severe:[1] pervious substratum.	Slight	Moderate: slope	Slight	Slight	Slight.
Slight	Severe:[1] pervious substratum.	Slight	Slight	Slight	Slight	Slight.
Slight	Severe:[1] pervious substratum.	Slight	Slight	Slight	Slight	Slight.
Severe: seasonal high water table.	Severe:[1] seasonal high water table; pervious substratum.	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: seasonal high water table for short periods.	Slight	Slight	Moderate: moderately slow permeability.	Slight	Moderate: moderately slow permeability.	Slight.
Moderate: seasonal high water table for short periods.	Slight	Slight	Moderate: moderately slow permeability.	Slight	Moderate: moderately slow permeability.	Slight.

of less than 12 percent are the most desirable for use as tent campsites, but trailers require less sloping soils than tents. Soils having a medium-textured surface layer have fewer limitations to use as campsites than the very clayey or very sandy soils.

Paths and trails.—This rating applies to soils to be used for local and cross-country footpaths and trails and for bridle paths. It is assumed that these areas will be used as they are and that little or no soil will be moved. Soil properties considered in rating the soils for this use were the presence of a seasonal high water table, hazard of flooding, slope, surface soil texture, and rockiness or stoniness.

Descriptions of the Soils

In this section the soils of Greene County are described in detail and their use and management are discussed. Each soil series is described in detail, and then, briefly, the mapping units 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 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 soil series is representative for mapping units in that series. If a given mapping unit has a profile in some ways different from the one described in the series, these differences are stated in the description of the mapping unit, or they are apparent in the name of the mapping unit. The description of each mapping unit contains suggestions on how the soil can be managed.

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

Preceding the name of each mapping unit is a symbol. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit are the capability unit and woodland suitability group in which the mapping unit has been placed. The page on which each capability unit is described and the woodland suitability group in which each soil has been placed 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*).

Algiers Series

The Algiers series consists of nearly level, somewhat poorly drained soils that formed in 14 to 30 inches of recent alluvium and in the older underlying alluvial or lacustrine sediments. These soils are on flood plains along streams, on alluvial fans, or in depressions on uplands. The upper layers of the very poorly drained buried soil are darker colored than the overlying recent alluvium.

In a representative profile the surface layer is dark grayish brown silt loam 8 inches thick. Below this is 8 inches of dark grayish brown and brown silt loam, 11 inches of very dark gray silty clay loam, and 21 inches of dark gray, and gray, mottled silty clay loam. Below this, to a depth of 60 inches, is brown loam.

Available water capacity is high, and permeability is moderate. These soils have a seasonal high water table. They are subject to frequent flooding. The rooting zone is deep when the water table is low.

Most areas of Algiers soils are used for cultivated crops. The main crops are corn and soybeans. These soils are well suited to row crops if optimum management practices are used. Fall sown crops such as wheat are more likely to be damaged by flooding. Some areas of these soils are used for grass-legume meadow or for pasture. A few areas are in woodland.

Representative profile for Algiers silt loam, in Beavercreek Township, NE¼SW¼ sec. 16; 600 feet west of Beaver Creek, and 650 feet south of quarter section line and farm boundary:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; common roots; very dark grayish brown (10YR 3/2) coatings on peds; neutral; abrupt smooth boundary.

C1—8 to 11 inches; dark grayish brown (10YR 4/2) silt loam; massive; friable; common roots; neutral; clear smooth boundary.

C2—11 to 16 inches; brown (10YR 4/3) silt loam; massive; showing thin platy deposition planes; friable; common roots; black (10YR 2/1) and dark grayish brown (10YR 4/2) fillings in worm holes or root channels, making up about 15 percent of volume; neutral; abrupt smooth boundary.

IIAb—16 to 27 inches; very dark gray (10YR 3/1) heavy silty clay loam; moderate medium angular blocky structure; firm; few roots; black (10YR 2/1) coatings on ped exteriors; neutral; clear smooth boundary.

IIB21bg—27 to 33 inches; dark gray (10YR 4/1) silty clay loam; many medium distinct brown (7.5YR 4/4) mottles; weak fine subangular blocky structure; firm, slightly sticky; few roots; neutral; gradual wavy boundary.

IIB22bg—33 to 37 inches; gray (10YR 5/1) silty clay loam; many coarse distinct dark yellowish brown (10YR 4/4) mottles; weak coarse subangular blocky structure; firm; few roots; neutral; gradual wavy boundary.

IIB23bg—37 to 48 inches; gray (10YR 5/1) silty clay loam; common medium distinct light olive brown (2.5YR 5/4) mottles; weak coarse subangular blocky structure; firm, slightly plastic; neutral; gradual wavy boundary.

IIC—48 to 60 inches; brown (10YR 5/3) loam; massive; very firm; mildly alkaline.

The recent alluvium ranges from 14 to 30 inches in

TABLE 8.—*Acreage and proportionate extent of the soils*

Soil	Acres	Percent	Soil	Acres	Percent
Algiers silt loam	2,241	0.9	Miamian and Hennepin soils, 25 to 50 percent slopes	1,717	0.6
Birkbeck silt loam, 1 to 4 percent slopes	2,207	.8	Miamian-Urban land complex, undulating	6,519	2.5
Brookston silty clay loam	18,812	7.1	Miamian-Urban land complex, rolling	2,400	.9
Brookston-Urban land complex	157	(1)	Millsdale silty clay loam	564	.2
Casco-Eldean loams, 12 to 18 percent slopes, moderately eroded	1,247	.5	Milton silt loam, 0 to 2 percent slopes	355	.1
Casco-Rodman loam, 18 to 50 percent slopes, moderately eroded	2,337	.9	Milton silt loam, 2 to 6 percent slopes	1,940	.7
Celina silt loam, 0 to 2 percent slopes	2,129	.8	Milton silt loam, 6 to 12 percent slopes, moderately eroded	624	.2
Celina silt loam, 2 to 6 percent slopes	8,068	3.0	Milton soils, channery variant, 25 to 50 percent slopes	839	.3
Crosby silt loam, 0 to 2 percent slopes	4,657	1.8	Ockley silt loam, 0 to 2 percent slopes	2,767	1.0
Crosby silt loam, 2 to 6 percent slopes	242	(1)	Ockley silt loam, 2 to 6 percent slopes	3,904	1.5
Edenton silt loam, 2 to 6 percent slopes	86	(1)	Ockley silt loam, 2 to 6 percent slopes, moderately eroded	539	.2
Edenton silt loam, 6 to 12 percent slopes, moderately eroded	89	(1)	Ockley-Urban land complex, undulating	2,133	.8
Edenton silt loam, 12 to 18 percent slopes, moderately eroded	180	(1)	Odell silt loam, 2 to 6 percent slopes	237	(1)
Eel loam	1,231	.5	Patton silty clay loam	367	.1
Eldean silt loam, 0 to 2 percent slopes	1,565	.6	Ragsdale silty clay loam	26,624	10.0
Eldean silt loam, 2 to 6 percent slopes	3,561	1.3	Randolph silt loam, 0 to 2 percent slopes	164	(1)
Eldean silt loam, 2 to 6 percent slopes, moderately eroded	1,237	.5	Raub silt loam, 0 to 2 percent slopes	215	(1)
Eldean silt loam, 6 to 12 percent slopes, moderately eroded	3,080	1.2	Raub silt loam, 2 to 6 percent slopes	1,350	.5
Eldean clay loam, 6 to 12 percent slopes, severely eroded	278	.1	Reesville silt loam, 0 to 2 percent slopes	15,941	6.0
Eldean-Urban land complex, rolling	188	(1)	Ritchey silt loam, 2 to 6 percent slopes	304	.1
Fairmount silty clay loam, moderately deep variant, 25 to 50 percent slopes	550	.2	Ritchey silt loam, 6 to 12 percent slopes	219	(1)
Fincastle silt loam, 0 to 2 percent slopes	6,034	2.3	Ritchey silt loam, 12 to 18 percent slopes	367	.1
Genesee loam	1,831	.7	Ritchey silt loam, 18 to 25 percent slopes, moderately eroded	261	(1)
Linwood muck	1,083	.4	Ross loam	3,601	1.4
Miamian silt loam, 0 to 2 percent slopes	368	.1	Rush silt loam, 0 to 2 percent slopes	2,036	.8
Miamian silt loam, 2 to 6 percent slopes	17,454	6.6	Rush silt loam, 2 to 6 percent slopes	1,932	.7
Miamian silt loam, 2 to 6 percent slopes, moderately eroded	12,089	4.5	Russell silt loam, 0 to 2 percent slopes	112	(1)
Miamian silt loam, 6 to 12 percent slopes, moderately eroded	19,188	7.2	Russell-Miamian silt loams, 2 to 6 percent slopes	15,633	5.9
Miamian silt loam, 12 to 18 percent slopes, moderately eroded	4,090	1.5	Russell-Miamian silt loams, 2 to 6 percent slopes, moderately eroded	3,602	1.4
Miamian clay loam, 2 to 6 percent slopes, severely eroded	361	.1	Sleeth silt loam, 0 to 2 percent slopes	623	.2
Miamian clay loam, 6 to 12 percent slopes, severely eroded	2,993	1.1	Sloan silty clay loam	8,824	3.3
Miamian clay loam, 12 to 18 percent slopes, severely eroded	1,110	.4	Sloan-Fill land complex	1,240	.5
Miamian-Casco complex, 12 to 18 percent slopes, moderately eroded	785	.3	Sloan-Urban land complex	326	.1
Miamian-Casco complex, 18 to 35 percent slopes, moderately eroded	1,474	.6	Thackery silt loam, 0 to 2 percent slopes	919	.3
Miamian-Eldean silt loams, 2 to 6 percent slopes, moderately eroded	514	.2	Thackery silt loam, 2 to 6 percent slopes	475	.2
Miamian-Eldean silt loams, 6 to 12 percent slopes, moderately eroded	1,747	.7	Urban land	89	(1)
Miamian and Hennepin soils, 18 to 25 percent slopes	1,811	.7	Warsaw loam, 0 to 2 percent slopes	148	(1)
			Warsaw-Fill land complex, nearly level	1,240	.5
			Warsaw-Urban land complex, nearly level	1,392	.5
			Wea silt loam, 1 to 3 percent slopes	1,187	.4
			Westland silty clay loam	6,063	2.3
			Westland-Urban land complex	720	.3
			Xenia silt loam, 0 to 2 percent slopes	2,956	1.1
			Xenia silt loam, 2 to 6 percent slopes	12,106	4.6
			Cut and fill land	469	.2
			Gravel pits	894	.3
			Made land	137	(1)
			Quarries	1,055	.4
			Water	589	.2
			Total	265,792	100.0

[1]Less than 0.1 percent.

thickness. Reaction of the recent alluvium ranges from slightly acid to neutral and of the underlying soil horizons from slightly acid to mildly alkaline.

The Ap horizon is dark grayish brown (10YR 4/2) or brown (10YR 4/3). The C horizon above the buried horizon is brown (10YR 4/3) and dark grayish brown (10YR 4/2). This horizon is free of mottles above a depth of 20 inches. It is silt loam or loam. The IIAb horizon ranges from very dark gray (10YR 3/1) to black (10YR 2/1). It is silty clay loam, silt loam, or clay loam. The IIB2g horizon matrix has hue of 10YR through 5Y, value of 4 or 5, and chroma of 1 or 2. This horizon has common to many mottles. The IIB horizon is heavy loam, silty clay loam, and clay loam.

Algiers soils are commonly adjacent to Sloan and Eel soils. They have a lighter colored surface layer and are better drained than Sloan soils. They are more poorly drained than Eel soils.

Ag—Algiers silt loam. This soil is mainly in narrow strips on the flood plains of streams and waterways throughout the county. In some places it is in small, fan-shaped areas where recent alluvium has washed onto larger flood plains. A few areas of this soil are in depressions on uplands.

Included with this soil in mapping are small areas of Eel and Sloan soils.

This soil has a seasonal high water table and is subject to frequent flooding. These are severe limitations for both farm and nonfarm uses. Capability unit IIw-1; woodland suitability group 2w2.

Birkbeck Series

The Birkbeck series consists of nearly level to gently sloping, moderately well drained soils that formed in loess 3 to 5 feet thick over glacial till. These soils are on uplands, mostly in the eastern part of the county.

In a representative profile the surface layer is brown silt loam 8 inches thick. The subsoil is 34 inches of yellowish brown silty clay loam and silt loam that has mottled yellowish brown silt loam to a depth of 60 inches.

Available water capacity is high, and permeability is moderate in the subsoil, but moderately slow in the underlying glacial till. Runoff is moderate. Water generally does not pond on the surface for prolonged periods. These soils have a perched water table for short periods in winter and in spring. The rooting zone is deep.

Most areas of Birkbeck soils are cultivated. These soils are well suited to farming. The main crops are corn, soybeans, and grass-legume meadow.

Representative profile of Birkbeck silt loam, 1 to 4 percent slopes, in Ross Township, 1.9 miles north of Jamestown, 125 feet east of Brickel Road, and 200 yards north of farm lane (Sample GN-21 in Laboratory Data Section):

Ap—0 to 8 inches; brown (10YR 5/3) silt loam; weak fine granular structure; friable; many roots; strongly acid; abrupt smooth boundary.

B1—8 to 11 inches; yellowish brown (10YR 5/4) silt loam; moderate fine subangular blocky structure; friable; many roots; pale brown (10YR 6/3) silty ped coatings with light gray (10YR 7/2) and light brownish gray (10YR 6/2) silt grains on ped faces; medium acid; clear wavy boundary.

B21t—11 to 16 inches; yellowish brown (10YR 5/4) silty clay loam; strong medium and fine subangular blocky structure; firm; many roots; thin patchy brown (10YR 5/3) clay films on ped faces; few light brownish gray (10YR 6/2) silty coatings; slightly acid; gradual wavy boundary.

B22t—16 to 30 inches; yellowish brown (10YR 5/4) silty clay loam; few fine faint yellowish brown (10YR 5/6) mottles in ped interiors; moderate coarse subangular blocky structure parting to strong medium subangular blocky; firm; many roots; thick continuous dark brown (10YR 3/3) clay films on vertical and horizontal ped faces; neutral; clear irregular boundary.

B3t—30 to 42 inches; yellowish brown (10YR 5/4) silt loam; common coarse faint yellowish brown (10YR 5/6) mottles and common coarse distinct grayish brown (10YR 5/2) mottles; weak very coarse subangular blocky structure; friable; common roots; thin continuous dark brown (10YR 3/3) and dark grayish brown (10YR 4/2) clay films on vertical faces and patchy on horizon faces; common lime concretions ¼ to 1 inch in diameter; mildly alkaline, calcareous in ped interiors; abrupt irregular boundary.

IIC—42 to 60 inches; yellowish brown (10YR 5/4) silt loam; common coarse faint yellowish brown (10YR 5/6) mottles and common medium and coarse distinct grayish brown (10YR 5/2) mottles; massive; firm; 5 to 10 percent coarse fragments; moderately alkaline, calcareous.

The solum ranges from 30 to 48 inches in thickness. Depth to calcareous material ranges from 30 to 40 inches. The loess or silt mantle is 36 to 60 inches thick. Reaction of the A horizon ranges from strongly acid to neutral; the B1 and B2 horizons are medium acid to neutral, and the B3 horizon is neutral to mildly alkaline.

The Ap horizon is dark grayish brown (10YR 4/2), grayish brown (10YR 5/2), and brown (10YR 4/3 or 5/3). The B horizon commonly has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Faint to distinct mottles are in the lower part. This horizon is silty clay loam or silt loam. The IIC horizon is loam or silt loam. It is yellowish brown (10YR 5/4) or brown (10YR 4/3).

Birkbeck soils in Greene County have a thinner solum and are less acid throughout than other Birkbeck soils. This difference does not affect the use and management of these soils.

Birkbeck soils are the moderately well drained member of a drainage sequence that includes the somewhat poorly drained Reesville soils and the very poorly drained Ragsdale soils. Birkbeck soils are similar to Xenia soils, but they formed entirely in loess, whereas Xenia soils formed partly in the underlying glacial till.

BbB—Birkbeck silt loam, 1 to 4 percent slopes. This nearly level to gently sloping soil is in the east-central part of the county. Most slopes are slightly convex. Areas are irregular in shape and less than 50 acres in size.

Included with this soil in mapping are small areas of Xenia soils on knolls. Also included are small areas of wetter Reesville soils in less sloping areas, and a few areas of well drained soils that have gentle slopes.

Except for the moderate hazard of erosion in the gently sloping areas this soil has few limitations for farming. The moderately slow permeability in the substratum is a limitation for some nonfarm uses. Capability unit IIe-1; woodland suitability group 1o1.

Brookston Series

The Brookston series consists of nearly level and depressional, very poorly drained soils that formed in glacial till. These soils are in upland areas. They are mostly in the eastern part of the county, east of the Reesville glacial moraine, but they are also in the northwestern part of the county, west of Little Miami River and north of Little Beaver Creek.

In a representative profile the surface layer is black silty clay loam 8 inches thick. The subsoil is mottled, mostly dark gray and dark grayish brown silty clay loam 34 inches thick. The substratum is yellowish brown silt loam and loam to a depth of 78 inches.

Available water capacity is high, and runoff is slow and sometimes ponded. Permeability is moderate in the subsoil and moderately slow in the underlying glacial till. These soils are saturated with water for long periods in winter and in spring, and they are slow to dry out in the summer unless artificially drained. The rooting zone during the growing season is deep.

Brookston soils are used mainly for cultivated crops. Many areas have been artificially drained.

Representative profile of Brookston silty clay loam, in Jefferson Township; 2¾ miles northeast of Bowersville, 1,920 feet southeast of Hargrave Road, ⅛ mile northeast of the end of Garringer Road, 4280 feet southeast of farm lane fence, and 330 feet southwest of fence along woodlot (Sample GN-12 in Laboratory Data Section):

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam; weak fine granular structure; friable; many roots; few fine faint dark concretions; neutral; abrupt smooth boundary.

B1g—8 to 11 inches; very dark gray (10YR 3/1) silty clay loam; weak coarse angular blocky structure; friable; many roots; continuous black (10YR 2/1) organic coatings on peds; few pebbles less than ¼ inch in diameter; neutral; clear smooth boundary.

B21tg—11 to 16 inches; dark gray (10YR 4/1) silty clay loam; many medium distinct olive brown (2.5Y 4/4) mottles; strong coarse angular blocky structure parting to strong medium and fine angular blocky; firm; many roots; continuous very dark gray (10YR 3/1) organic coatings on peds; common fine yellowish brown (10YR 5/6) concretions; thin patchy clay films on ped faces; 5 percent pebbles less than ¼ inch in diameter; mildly alkaline; many roots; clear smooth boundary.

B22tg—16 to 22 inches; dark gray (10YR 4/1) silty clay loam; many medium distinct olive brown (2.5Y 4/4) mottles; moderate medium and coarse prismatic structure parting to moderate medium subangular blocky; firm; common roots; dark gray (10YR 4/1) and very dark gray (10YR 3/1) coatings on ped surfaces; thin very patchy dark gray (10YR 4/1) clay films in pores; 5 percent coarse fragments; mildly alkaline; clear smooth boundary.

B23g—22 to 42 inches; dark grayish brown (2.5Y 4/2) silty clay loam; many medium distinct olive brown (2.5Y 4/4) silty clay loam; many medium distinct olive brown (2.5Y 4/4) mottles and common medium distinct yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; firm; few roots; medium, continuous, gray (10YR 5/1) and dark gray (10YR 4/1) coatings on ped surfaces; 2 to 5 percent coarse fragments; many black (10YR 2/1) and very dark brown (10YR 2/2) concretions, 1 to 3 millimeters in diameter; mildly alkaline; gradual irregular boundary.

C1—42 to 55 inches; yellowish brown (10YR 5/4) silt loam; massive; very firm; moderately alkaline, calcareous; gradual wavy boundary.

C2—55 to 67 inches; yellowish brown (10YR 5/4) loam; massive; very firm; moderately alkaline, calcareous; gradual wavy boundary.

C3—67 to 78 inches; yellowish brown (10YR 5/4) loam; massive; very firm; 15 to 20 percent coarse fragments; moderately alkaline, calcareous.

The solum ranges from 36 to 50 inches in thickness. Reaction of the solum is most commonly slightly acid or neutral, but it is mildly alkaline in places.

The dark material (combined A and B horizons) ranges from 10 to 18 inches in thickness and is black (10YR 2/1) or very dark gray (10YR 3/1). The B2 horizon below the surface layer is dark gray (10YR 4/1, N 4/0) and dark grayish brown (10YR 4/2 and 2.5Y 4/2). It contains few to many distinct mottles. It is silty clay loam or clay loam. The C horizon has hue of 10YR or 2.5Y, value of 5 through 7, and chroma of 3 or 4. It is mainly loam but has thin layers of silt loam in places.

Brookston soils in Greene County contain slightly more clay than other Brookston soils. This difference does not affect the use and management of these soils.

Brookston soils are the very poorly drained member of a drainage sequence that includes the well drained Miamian soils, the moderately well drained Celina soils, and the somewhat poorly drained Crosby soils. They are similar to Odell soils but have a more grayish subsoil. In a few areas they are near Millsdale, Patton, Ragsdale, and Westland soils and are similar to these soils. They differ from Millsdale soils in having no limestone bedrock within a depth of 40 inches. They are underlain by glacial till, whereas Patton soils are underlain by lacustrine sediment. They formed in glacial till, whereas Ragsdale soils formed in loess. They lack the underlying sand and gravel of Westland soils.

Bs—Brookston silty clay loam. This level or slightly depressional, very poorly drained soil is in upland areas in the eastern and northwestern parts of the county. The size and shape of the areas vary widely. Areas 100 acres or more in size are common in the eastern part of the county, and areas 2 to 5 acres in size are common in the northwestern part of the county. This soil has the profile described as representative of the series.

Included with this soil in mapping in some of the larger areas are slight rises of Crosby soils. Also included, along intermittent waterways, are areas of soils covered by overwash of lighter colored silt loam material.

Runoff is slow to ponded. The main limitation to the use of this soil for farming is a seasonal high water table. In drained areas, however, this soil is well suited to field crops commonly grown in the county. Wetness is also a limitation for many nonfarm uses. Capability unit IIw-3; woodland suitability group 2w1.

Bt—Brookston-Urban land complex. This complex consists of areas of nearly level Brookston soil where much of the soil has been altered or covered by grading and digging operations. Most areas are used for urban development. About 25 to 50 percent of this complex is fill area; 15 to 30 percent is covered by buildings, driveways, and streets; and 20 to 60 percent is undisturbed Brookston soil in undeveloped lots and parts of developed areas.

Fill areas have about 1 foot to 3 feet of fill material over undisturbed Brookston soil. The fill material is Brookston subsoil material and, in a few places, limy material from the substratum.

This complex is not used for farming. The surface layer in disturbed areas commonly has low organic matter content and poor tilth. It has a narrow range of moisture content in which it is suitable for tillage. Wetness is a severe limitation to the use of the Brookston soil. Both surface and subsurface drainage are generally needed to remove the excess water. Not assigned to a capability unit and woodland suitability group.

Casco Series

The Casco series consists of moderately steep to very steep, well drained soils that formed in gravel and sandy glacial outwash. These soils are in small, irregularly shaped areas along outwash terrace escarpments, along streams that have dissected outwash terraces, and on kames. Most areas are in the western and northern parts of the county.

In a representative profile the surface layer is dark brown loam 4 inches thick. The subsoil is brown clay loam, clay, and sandy clay loam 16 inches thick. The substratum is brown, stratified, calcareous sand and gravel to a depth of 60 inches.

Available water capacity is low. Permeability is moderate in the subsoil and rapid in the underlying sand and gravel.

Casco soils are generally not suited to cultivated crops because they are droughty and because they have slopes that are mostly too steep for farm machinery. Most areas are wooded or are used for pasture. Where the soils are not so steep, some areas are used for growing alfalfa.

Representative profile of Casco loam, from an area of Casco-Rodman loams, 18 to 50 percent slopes, moderately eroded, in Beavercreek Township, NW¼ sec. 7; 3½ miles northwest of Xenia, 400 feet east of New Germany-Tremein Road, and 100 yards north of farm lane:

Ap—0 to 4 inches; dark brown (10YR 4/3) loam; weak fine granular structure; friable; many roots; mildly alkaline; abrupt smooth boundary.

B21t—4 to 9 inches; brown (7.5YR 4/4) heavy clay loam; strong very fine and fine subangular blocky structure; firm; common roots; thin continuous dark brown (7.5YR 4/4) clay films; 5 percent coarse fragments; medium acid; gradual smooth boundary.

B22t—9 to 17 inches; brown (7.5YR 4/4) clay; moderate coarse subangular blocky structure; firm; common roots; thin continuous dark brown (7.5YR 4/2) clay films; 5 percent coarse fragments; medium acid; gradual smooth boundary.

B3t—17 to 20 inches; brown (7.5YR 4/4) sandy clay loam; weak coarse subangular blocky structure; friable; dark brown (7.5YR 4/2) clay bridging between some sand grains; 10 to 15 percent coarse fragments and weathered remnants of limestone; mildly alkaline, calcareous; clear irregular boundary.

C—20 to 60 inches; brown (10YR 5/3) stratified sand and gravel; massive; loose; 30 to 40 percent gravel; moderately alkaline, calcareous.

The solum ranges from 10 to 24 inches in thickness. Locally the soil has a silt mantle less than 12 inches thick. Unless limed, the upper part of the solum ranges from neutral to medium acid. In places the lower part of the solum is mildly alkaline.

The A horizon is dark grayish brown (10YR 4/2) or dark brown (10YR 4/3) and in places has a thin dark brown (10YR 3/3) or very dark grayish brown (10YR 3/2) layer in wooded areas. The B horizon commonly has hue of 7.5YR (but ranges from 10YR to 5YR), value of 4 or 5, and chroma of 3 or 4. The B1 and B2 horizons are dominantly clay loam or clay, but they have a thin layer of silty clay loam near the surface in places. The amount and size of coarse fragments in the B horizon are variable, depending on the nature of the outwash material from which the soil formed. The C horizon is stratified and ranges from sand to coarse gravel. It has thin lenses of fine silty or clayey material, cobbles, and boulders. In kames, the strata of outwash material are often discontinuous, frequently distorted, and quite variable over short distances.

Casco soils in Greene County contain slightly more clay in the solum than other Casco soils. However, this difference does not affect the use and management of these soils.

Casco soils are mostly near Eldean, Rodman, and Miamian soils. They are shallower to sand and gravel than Eldean soils and are deeper to sand and gravel than Rodman soils. They also have a lighter colored surface layer than Rodman soils. They are underlain by sand and gravel, whereas Miamian soils are underlain by glacial till.

CcD2—Casco-Eldean loams, 12 to 18 percent slopes, moderately eroded. The moderately steep soils of this complex are on long, narrow breaks between the bottomlands and the higher lying, less sloping soils on stream terraces. These soils are also on gravelly knolls and ridges of the uplands. This complex is about 50 percent Casco soils, 35 percent Eldean soils, and 15 percent included soils.

These soils are moderately eroded. Much of the original surface layer has been removed through erosion. In some spots the present surface layer is 20 to 30 percent gravel.

Included with these soils in mapping are a few areas of soils that have a surface layer of silt loam or gravelly loam.

The soils in this complex are used mainly for pasture or woodland. Runoff is rapid. The hazard of erosion is very severe. The hazard of drought is severe. The surface layer is low in organic matter content. Establishing plants is very difficult. Slope and droughtiness are the dominant limitations for most farm and nonfarm uses. Capability unit VIe-2; woodland suitability group 3s1.

CdE2—Casco-Rodman loams, 18 to 50 percent slopes, moderately eroded. The steep to very steep soils in this complex are in bands on side slopes of kames and terrace escarpments, mainly in the western and northwestern parts of the county. This complex is about 50 percent Casco soils, 35 percent Rodman soils, and 15 percent included soils. The Casco soil in this complex has the profile described as representative of the Casco series. Rodman soils are mostly on the lower two-thirds of the slopes.

Included with these soils in mapping are small scattered areas of Eldean soils. Also included are a few areas of eroded soils where calcareous sand and gravel are exposed at the surface and a few areas of soils that have a surface layer of silt loam or gravelly loam.

These soils have a severe hazard of drought and a very severe hazard of erosion if used for farming. Slope is the main limitation for nonfarm uses. Capability unit VIIe-1; woodland suitability group 3s2.

Celina Series

The Celina series consists of nearly level or gently sloping moderately well drained soils that formed in loam glacial till. These soils are on uplands, mostly in the eastern and northwestern parts of the county. Most areas are irregular in shape.

In a representative profile the surface layer is dark grayish brown silt loam 10 inches thick. The subsoil is 18 inches of yellowish brown clay loam and clay that has grayish brown mottles in the lower 14 inches. The substratum is mottled yellowish brown and brown loam glacial till to a depth of 60 inches.

Available water capacity is moderate, and permeability is moderately slow. Runoff is slow to medium depending on slope. Water generally does not pond on the surface for prolonged periods. Celina soils have a seasonal high water table for short periods in winter and in spring. The rooting zone is moderately deep.

Celina soils are generally suited to cultivated crops. Corn, soybeans, wheat, oats, and grass-legume meadow are the main crops.

Representative profile of Celina silt loam, 2 to 6 percent slopes, in Jefferson Township; 1¾ miles east of Bowersville, 75 feet south of Hargrave Road, 0.1 mile west of intersection of Smith Road:

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

B21t—10 to 14 inches; yellowish brown (10YR 5/4) heavy clay loam; moderate medium and fine subangular blocky structure; friable; many roots; thin very patchy brown (10YR 5/3) clay films; 3 percent coarse fragments; slightly acid; clear smooth boundary.

B22t—14 to 21 inches; yellowish brown (10YR 5/4) clay; common medium distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; many roots; thin continuous dark brown (10YR 4/3) clay films on horizontal and vertical ped faces; 2 percent dark concretions; 2 to 3 percent coarse fragments; medium acid; clear smooth boundary.

B3t—21 to 28 inches; yellowish brown (10YR 5/4) clay loam; common medium distinct grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; firm; common roots; thin patchy brown (10YR 4/3) clay films on vertical ped faces; 3 to 4 percent coarse fragments; mildly alkaline, weak effervescence; clear wavy boundary.

C1—28 to 36 inches; yellowish brown (10YR 5/4) loam; common medium distinct grayish brown (10YR 5/2) mottles; massive; firm; 3 to 4 percent coarse fragments; moderately alkaline, calcareous; gradual wavy boundary.

C2—36 to 60 inches; brown (10YR 5/3) loam; common medium faint grayish brown (10YR 5/2) mottles; massive; very firm; 3 to 4 percent coarse fragments; moderately alkaline, calcareous.

The solum ranges from 20 to 40 inches in thickness. Depth to carbonates is 18 to 32 inches. A silty mantle less than 18 inches thick is in most areas. Below the silty mantle the material is 2 to 15 percent coarse fragments. Reaction of the A horizon ranges from medium acid to neutral. The upper part of the B horizon is very strongly acid to neutral, and the lower part is slightly acid to mildly alkaline.

The Ap horizon is dark grayish brown (10YR 4/2) or brown (10YR 5/3). The B2 horizon ranges from brown (10YR 4/3) to yellowish brown (10YR 5/6) and has mottles that range from high to low in chroma. The B2 horizon is heavy clay loam, heavy silty clay loam, or clay. The B3 horizon is clay loam or heavy loam. The C horizon is brown (10YR 5/3) or yellowish brown (10YR 5/4) and is generally mottled.

Celina soils are the moderately well drained member of a drainage sequence that includes the well drained Miamian soils, the somewhat poorly drained Crosby soils, and the very poorly drained Brookston soils.

Celina soils are similar to Xenia soils but have a thinner silt mantle than those soils.

CeA—Celina silt loam, 0 to 2 percent slopes. This nearly level soil is on low, smooth ridgetops and in upland areas bordering streams. Areas are 5 to 30 acres in size. This soil has a profile similar to the one described as representative of the series, but it is slightly deeper to calcareous till.

Included with this soil in mapping are small areas of wetter Crosby soils.

This soil has few limitations for farming. It is suited to all crops commonly grown in the county. Runoff is slow. There is little or no evidence of erosion on this soil. Moderately slow permeability is a limitation for some nonfarm uses. Capability unit I-1; woodland suitability group 2o1.

CeB—Celina silt loam, 2 to 6 percent slopes. This gently sloping soil is on low knolls and ridges on the till plains. It is commonly surrounded by larger areas of wetter Crosby or Brookston soils. Most areas are 2 to 25 acres in size. This soil has the profile described as representative of the series.

Included with this soil in mapping are small spots of soils that are moderately eroded, and small areas of wetter Crosby soils.

This soil is used for all crops commonly grown in the county. Runoff is medium. Erosion is the main limitation to the use of this soil for farming. Moderately slow permeability is a limitation for some nonfarm uses. Capability unit IIe-1; woodland suitability group 2o1.

Crosby Series

The Crosby series consists of nearly level to gently sloping, somewhat poorly drained soils that formed in loam glacial till. These soils are on uplands in the eastern and northwestern parts of the county.

In a representative profile the surface layer is dark grayish brown silt loam 9 inches thick. The subsoil is mottled mostly dark grayish brown and yellowish brown silty clay loam and silty clay 19 inches thick. The substratum is mottled, yellowish brown loam glacial till to a depth of 60 inches.

Available water capacity is moderate. Permeability is moderately slow in the subsoil and slow in the underlying glacial till. Runoff is slow to medium, and water sometimes ponds on the surface. There is a perched water table in winter and in spring. The rooting zone is moderately deep.

Most areas of Crosby soils are cultivated. Corn, soybeans, and grass-legume meadow are the main crops. These soils are well suited to cultivated crops if they are drained. In undrained areas, cultivation is sometimes delayed in spring because of wetness.

Representative profile of Crosby silt loam, 0 to 2 percent slopes, in Jefferson Township; 2¾ miles northeast of Bowersville, and about 2,000 feet southeast of the intersection of Garringer Road and Hargrave Road (Sample GN-18 in Laboratory Data Section):

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; many roots; strongly acid; abrupt smooth boundary.

B1t—9 to 13 inches; brown (10YR 5/3) silty clay loam; many fine distinct dark grayish brown (10YR 4/2) mottles and few fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure parting to weak fine subangular blocky; firm; common roots; thin very patchy brown (10YR 4/3) clay films; strongly acid; clear smooth boundary.

B2t—13 to 24 inches; mixed dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/4) silty clay; common fine distinct dark gray (10YR 4/1) mottles; moderate medium subangular blocky structure; firm;

common roots; medium continuous dark grayish brown (10YR 4/2) clay films on both vertical and horizontal ped faces; a few very dark grayish brown (10YR 3/2) concretions; 1 to 2 percent coarse fragments; medium acid; clear irregular boundary.

B3t—24 to 28 inches; yellowish brown (10YR 5/4) silty clay loam; common medium faint yellowish brown (10YR 5/6) mottles and common medium and fine distinct dark grayish brown (10YR 4/2) mottles; weak medium and fine subangular blocky structure; friable; few roots; medium continuous brown (10YR 5/3) clay films; few light gray (10YR 7/1) weathered remnants of limestone; 1 to 2 percent coarse fragments; neutral; gradual wavy boundary.

C1—28 to 36 inches; yellowish brown (10YR 5/4) loam; common fine faint grayish brown (10YR 5/2) mottles; weak medium and thick platy structure; firm; 2 to 5 percent coarse fragments; moderately alkaline, calcareous; gradual smooth boundary.

C2—36 to 60 inches; yellowish brown (10YR 5/4) loam; common to fine faint yellowish brown (10YR 5/6) mottles and few fine and medium distinct very dark brown (10YR 2/2) and gray (10YR 6/1) mottles; massive; firm; 2 to 5 percent coarse fragments; moderately alkaline, calcareous.

The solum ranges from 20 to 40 inches in thickness. Depth to carbonates ranges from 18 to 36 inches. The silt mantle is 5 to 18 inches thick. Coarse fragments are few to common in the lower part of the profile. Unless limed, the solum is mainly strongly acid to neutral, but is mildly alkaline in the lower part in places.

The Ap horizon is dominantly dark grayish brown (10YR 4/2) but is grayish brown (10YR 5/2) in places. The A2 horizon is present in some places. It is silt loam as much as 6 inches thick and is generally grayish brown (10YR 5/2) to light grayish brown (10YR 6/2). In most places the A2 horizon has been mixed with the Ap horizon by cultivation and is absent. The B2 horizon has hue of 10YR or 2.5Y, value of 4 through 6, and chroma of 2 through 6. Mottles are common to many. The B2 horizon is heavy silty clay loam, heavy clay loam, silty clay, or clay. The B3 horizon is clay loam, silty clay loam, or loam. The C horizon is loam glacial till.

Crosby soils are the somewhat poorly drained member of a drainage sequence that includes the well drained Miamian soils, the moderately well drained Celina soils, and the very poorly drained Brookston soils. Crosby soils are similar to Fincastle soils but have a thinner silt mantle. They have a lighter colored surface layer than the nearby Odell soils, and they differ from the nearby Randolph soils in lacking bedrock within a depth of 20 to 40 inches.

CrA—Crosby silt loam, 0 to 2 percent slopes. This nearly level soil is in broad areas surrounding Brookston soils in depressions. The areas are 5 to 15 acres or more in size. This soil has the profile described as representative of the series.

Included with this soil in mapping are small, narrow areas of Brookston soils in drainageways. Also included are a few small areas of gently sloping Celina soils.

This soil is used mostly for crops. Runoff is slow. Seasonal wetness is the main limitation to use of this soil for crops. If artificially drained, this soil is suited to most commonly grown crops in the county. The seasonal high water table and moderately slow permeability are limitations for many nonfarm uses. Capability unit IIw-2; woodland suitability group 3w1.

CrB—Crosby silt loam, 2 to 6 percent slopes. This gently sloping, mostly convex soil is on low knolls and in areas along drainageways. Areas of this soil are adjacent to the Brookston, Celina, and Miamian soils.

Included with this soil in mapping are small areas of Brookston and Celina soils. Also included are a few spots of soils that are moderately eroded.

This soil is used mostly for crops if artificially drained. It is suited to most commonly grown crops. Runoff is medium. Both seasonal wetness and the hazard of erosion are limitations to use of this soil for farming. The gentle slopes make the design of a drainage system more difficult than in nearly level areas. The seasonal high water table and moderately slow permeability are limitations for many nonfarm uses. Capability unit IIw-2; woodland suitability group 3w1.

Edenton Series

The Edenton series consists of gently sloping to moderately steep, well drained, moderately deep soils that formed partly in a thin layer of loess and partly in the underlying loam glacial till and residuum of shale and limestone bedrock. These soils are in convex areas in partly dissected landscapes where relatively thin layers of loess and till overlie bedrock.

In a representative profile the surface layer is brown and yellowish brown silt loam 7 inches thick. The subsoil extends to a depth of 33 inches. The upper 4 inches is dark yellowish brown silty clay loam, the next 11 inches is dark yellowish brown and yellowish brown clay loam. Below that is 7 inches of yellowish brown silty clay and 4 inches of olive silty clay loam. Brownish yellow clay shale and limestone bedrock are at a depth of 33 inches.

Available water capacity is moderate, and permeability is moderately slow. The rooting zone is moderately deep over bedrock.

The areas of less sloping Edenton soils are used mostly for cultivated crops. The areas of steeper soils are used mainly for pasture.

Representative profile of Edenton silt loam, 6 to 12 percent slopes, moderately eroded, in Sugar Creek Township, NE¼NW¼ sec. 35; 1,300 feet east of Waynesville Road and 900 feet south of Centerville Road:

Ap1—0 to 3 inches; brown (10YR 4/3) silt loam; moderate fine granular structure; friable; slightly acid; clear smooth boundary.

Ap2—3 to 7 inches; yellowish brown (10YR 5/4) silt loam; weak thin platy structure parting to moderate fine granular; friable; common brown (10YR 4/3) zones; neutral; clear smooth boundary.

B1—7 to 11 inches; dark yellowish brown (10YR 4/4) light silty clay loam; moderate medium subangular blocky structure; friable; thin very patchy brown (10YR 4/3) clay films on ped surfaces; neutral; clear smooth boundary.

IIB21t—11 to 16 inches; dark yellowish brown (10YR 4/4) heavy clay loam; moderate medium subangular blocky structure; firm; thin patchy dark brown (10YR 4/3) clay films on ped surfaces; 2 to 3 percent coarse fragments; neutral; clear smooth boundary.

IIB22t—16 to 22 inches; yellowish brown (10YR 5/4) heavy clay loam; moderate coarse subangular blocky structure; firm; brown (10YR 5/3) ped surfaces; thin patchy dark brown (10YR 4/3) clay films on ped faces; 2 to 3 percent coarse fragments; neutral; abrupt wavy boundary.

IIIB23t—22 to 29 inches; yellowish brown (10YR 5/4) silty clay; moderate coarse subangular blocky structure; firm; brown (10YR 5/3) ped surfaces; medium patchy brown (10YR 4/3) clay films on ped surfaces; neutral; clear wavy boundary.

IIIB3—29 to 33 inches; olive (5Y 5/3) heavy silty clay loam; weak coarse angular blocky structure; firm; thin very patchy brown (10YR 4/3) clay films on vertical ped surfaces and in pores; mildly alkaline; abrupt wavy boundary.

IIIC—33 inches; brownish yellow (10YR 6/6) clay shale and thin bedded limestone.

Thickness of the solum and the depth to soft clay shale and limestone range from 20 to 40 inches. Reaction of the solum is slightly acid or neutral in the upper part and neutral or mildly alkaline in the lower part.

The A horizon is brown (10YR 4/3), yellowish brown (10YR 5/4), or dark grayish brown (10YR 4/2) silt loam or light silty clay loam. The B2 horizon is dark yellowish brown (10YR 4/4) or yellowish brown (10YR 5/4). The B2 and B3 horizons are heavy silty clay loam, heavy clay loam, or silty clay. The C horizon is interbedded clay shale and thin jointed strata of limestone, and shale predominates.

Edenton soils are commonly adjacent to Russell soils, Fairmount variant soils, Miamian soils, and Raub soils. They have bedrock within a depth of 40 inches, whereas Raub, Miamian, and Russell soils have no bedrock within a depth of 40 inches. Edenton soils have a lighter colored surface layer than Fairmount variant soils.

EdB—Edenton silt loam, 2 to 6 percent slopes. This gently sloping soil is on small, scattered strips around the crests of limestone hills. The areas vary in size, averaging about 5 to 15 acres.

Included with this soil in mapping are small areas of Russell and Raub soils. Also included are a few small spots of soils that have bedrock at a depth of less than 20 inches.

Runoff is medium to high. Erosion is the main hazard for farming this soil. The moderate depth to bedrock and moderately slow permeability are limitations for some nonfarm uses. Capability unit IIe-4; woodland suitability group 2o1.

EdC2—Edenton silt loam, 6 to 12 percent slopes, moderately eroded. This soil is in strips around the upper slopes of limestone bedrock hills. Most areas are 2 to 30 acres in size. Moderate erosion has reduced the organic-matter content and tilth of this soil. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Russell, Miamian, and Raub soils all of which are deeper than 40 inches to bedrock. Also included are a few areas of soils where bedrock is at a depth of less than 20 inches and a few areas of soils that have a surface layer of silty clay loam.

This soil is highly susceptible to erosion and suited to only limited use for cultivated crops. Runoff is rapid. This soil has a severe hazard of erosion for farming. Depth to bedrock, moderately slow permeability, and slope are limitations for many nonfarm uses. Capability unit IIIe-3; woodland suitability group 2o1.

EdD2—Edenton silt loam, 12 to 18 percent slopes, moderately eroded. This soil is in strips adjacent to the larger drainageways in sloping areas. Most areas are 5 to 30 acres in size. Erosion and subsequent plowing have reduced the surface layer and incorporated material from the subsoil into the plow layer. This has lowered the organic matter content and tilth.

Included with this soil in mapping are small areas of Russell and Miamian soils, which are deeper than 40 inches to bedrock. Also included are a few areas of soils that have bedrock at a depth of less than 20 inches and a few areas of soils that have a surface layer of silty clay loam.

Because runoff is rapid, the hazard of erosion is very severe if this soil is used for cultivated crops. Slope, moderately slow permeability, and depth to bedrock are limitations for many nonfarm uses. Capability unit IVe-1; woodland suitability group 2r1.

Eel Series

The Eel series consists of nearly level, moderately well drained soils that formed in loamy alluvium washed mainly from nearby uplands where soils formed in glacial till. These soils are on flood plains throughout the county.

In a representative profile the surface layer is dark grayish brown loam 8 inches thick. The upper part of the subsoil is 10 inches of mottled brown loam and the lower part is 6 inches of mottled brown silt loam. The substratum is mottled dark grayish brown and dark gray silt loam to a depth of 60 inches.

Available water capacity is high, and permeability is moderate. These soils are subject to frequent flooding. The rooting zone is deep.

Eel soils are used for pasture and cultivated crops. Corn and soybeans are the main cultivated crops.

Representative profile of Eel loam, in Beavercreek Township, 0.5 mile northeast of intersection of Xenia Road and Valley Road, and 200 feet east of Little Miami River:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) loam; weak fine granular structure; friable; common roots; neutral; clear smooth boundary.

B1—8 to 18 inches; brown (10YR 4/3) loam; common medium faint grayish brown (10YR 5/2) mottles; moderate fine granular structure; friable; common roots; neutral; clear smooth boundary.

B2—18 to 24 inches; brown (10YR 4/3 to 5/3) silt loam; common medium faint dark grayish brown (10YR 4/2) mottles; weak medium granular structure; friable; few roots; thin lenses of brown (10YR 5/3) very fine sand; mildly alkaline, weakly calcareous; gradual smooth boundary.

C1—24 to 40 inches; dark grayish brown (10YR 4/2) silt loam; many medium faint dark gray (10YR 4/1) and common fine distinct yellowish brown (10YR 5/4) mottles; massive; stratified; friable; thin lenses of very fine sand; moderately alkaline, calcareous; abrupt smooth boundary.

C2—40 to 60 inches; dark gray (10YR 4/1) silt loam; massive; friable; moderately alkaline, calcareous.

The solum ranges from 20 to 40 inches in thickness. Reaction of the solum ranges from slightly acid to moderately alkaline.

The Ap horizon is dark grayish brown (10YR 4/2) or grayish brown (10YR 5/2). The B horizon is brown (10YR 4/3 to 5/3), yellowish brown (10YR 5/4), or dark yellowish brown (10YR 4/4). Mottles are common to many. The B horizon is typically silt loam or loam but individual subhorizons are sandy loam. The C horizon is dark grayish brown (10YR 4/2) or dark gray (10YR 4/1). It is commonly stratified, and ranges from loam or silt loam to loamy sand, but strata of loamy sand are less than 6 inches thick.

Eel soils are the moderately well drained member of a drainage sequence that includes the well drained Genesee soils and the very poorly drained Sloan soils. Eel soils are near Algiers and Ross soils. They are better drained than Algiers soils and not so well drained and lighter colored than Ross soils.

Ee—Eel loam. This soil is on flood plains along the major streams in the county.

Included with most areas of this soil in mapping are spots of Genesee soils. Also included are a few areas of soils that have a surface layer of silt loam and a few areas of wetter soils in slight depressions or swales.

The hazard of flooding is the main limitation to use of this soil for farming. Flooding is also a severe limitation for most nonfarm uses. This soil has low bearing strength for structures. Capability unit IIw-5; woodland suitability group 1o1.

Eldean Series

The Eldean series consists of nearly level to moderately steep, well drained soils that formed in glacial outwash deposits. These soils are on valley train terraces along Little Miami River and Mad River and their tributaries. The terraces are in an intermediate position slightly above the recent alluvial soils and generally below the upland till soils. Eldean soils also are in a complex with other soils on kames, mostly in the western part of the county, and on some parts of a silted outwash plain in the west-central part in the county.

In a representative profile the surface layer is dark grayish brown silt loam 8 inches thick. Below this is 5 inches of dark brown silt loam. The subsoil is dark brown. The upper 6 inches is silty clay loam, the middle 14 inches is gravelly clay loam and gravelly clay, and the lower 5 inches is very gravelly coarse sandy loam. The substratum is brown very gravelly loamy coarse sand to a depth of 60 inches.

Available water capacity is moderate, and permeability is moderate in the subsoil and rapid in the underlying stratified sand and gravel. The rooting zone is deep. Eldean soils dry out early in the spring. They are sometimes droughty during prolonged dry periods.

The larger areas of Eldean soils along the larger stream valleys are most commonly used for cultivated crops. The main crops are corn, soybeans, and grass-legume meadow. Some areas are used as a source of gravel and sand for construction.

Representative profile of Eldean silt loam, 2 to 6 percent slopes, in Spring Valley Township NW¼NE¼ sec. 23; 0.9 mile southwest of the village of Spring Valley, 200 feet south of Centerville Road, and 1,500 feet west of intersection with U.S. Route 42 (Sample GN-19 in Laboratory Data Section):

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; many roots; common worm holes; few rounded pebbles; slightly acid; abrupt smooth boundary.

A&B—8 to 13 inches; dark brown (10YR 4/3) silt loam; moderate fine and medium subangular blocky structure; friable; common roots; dark yellowish brown (10YR 4/4) silty ped coatings; common worm holes; few pebbles; medium acid; clear wavy boundary.

B1t—13 to 19 inches; dark brown (7.5YR 4/4) silty clay loam; strong coarse and medium subangular blocky structure parting to fine subangular blocky; firm; few roots; thin patchy dark brown (7.5YR 3/2) clay films; few worm holes; 5 to 10 percent coarse fragments; strongly acid; clear wavy boundary.

IIB21t—19 to 24 inches; dark brown (7.5YR 4/4) gravelly clay loam; moderate coarse subangular blocky structure parting to strong medium and fine angular blocky; firm; few roots; medium continuous dark brown (7.5YR 3/2) clay films; 15 to 20 percent coarse fragments mostly of chert, granite, and quartz; medium acid; clear wavy boundary.

IIB22t—24 to 33 inches; dark brown (7.5YR 4/4) gravelly clay; weak coarse angular blocky structure; firm; few roots; medium to thick continuous dark reddish brown (5YR 3/3) clay films; 25 to 30 percent coarse fragments; medium acid; abrupt wavy boundary.

IIB3t—33 to 38 inches; dark brown (7.5YR 3/2) very gravelly coarse sandy loam; weak coarse subangular blocky structure; firm; few roots; medium to thick continuous dark brown (7.5YR 3/2), pale brown (10YR 6/3), and light gray (10YR 7/1) coatings and weathered remnants of limestone; about 60 percent coarse fragments dominated by limestone; mildly alkaline; weathered remnants of limestone are calcareous; abrupt wavy boundary.

IIC—38 to 60 inches; brown (10YR 4/3) very gravelly loamy coarse sand; loose; weakly stratified; about 70 percent coarse fragments 1 inch to 3 inches in diameter; mildly alkaline, calcareous.

The solum ranges from 24 to 40 inches in thickness. Depth to calcareous material ranges from 18 to 36 inches. Some areas have a loess mantle as much as 18 inches thick. Reaction of the solum is dominantly medium acid to neutral in the upper part but thin subhorizons range to strongly acid. The lower part is neutral to mildly alkaline. Gravel content ranges from 0 to 20 percent in upper horizons and from 10 to 60 percent in lower B2 and B3 horizons.

The Ap horizon is brown (10YR 4/3 or 5/3) or dark grayish brown (10YR 4/2). It commonly is silt loam and loam but ranges to gravelly loam and clay loam in severely eroded areas. The B1 horizon is dark brown (10YR 4/3 or 7.5YR 4/4) silt loam to clay loam. The B2t horizon has hue of 10YR through 5YR, value of 3 through 5, and chroma of 4 or 5. It is clay, sandy clay, heavy clay loam, or gravelly classes of these textures. The B3 horizon is gravelly or very gravelly sandy loam, loam, or clay loam. The B3 horizon is calcareous in most profiles and contains remnants of weathered limestone pebbles.

Eldean soils are adjacent to Casco, Miamian, Ockley, Thackery, Warsaw, and Wea soils. Eldean soils are deeper to sand and gravel than Casco soils. They are underlain by sand and gravel whereas Miamian soils are underlain by glacial fill. They are not so deep to sand and gravel as Ockley, Thackery, and Wea soils. They have a lighter colored surface layer than Warsaw and Wea soils.

EmA—Eldean silt loam, 0 to 2 percent slopes. This nearly level soil is on terraces along Little Miami River and some of its tributaries. Areas of this soil are about 5 to 35 acres in size.

Included with this soil in mapping are a few small areas of Ockley soils. Also included are a few areas of Eldean soils that have a surface layer of loam and areas of this soil that are in low-lying positions and subject to infrequent flooding.

This soil is used mostly for crops. Runoff is slow, and there is little or no evidence of erosion. The surface layer generally has good tilth, but is subject to crusting and sealing after rains. This soil has few limitations for farming, except that it is moderately droughty. It is suited to irrigation. It has few limitations for most nonfarm uses. Capability unit IIs-1; woodland suitability group 2o1.

EmB—Eldean silt loam, 2 to 6 percent slopes. This gently sloping soil is along drainageways on stream terraces and on gravel knolls on the uplands. Most areas are 2 to 30 acres in size. There is little or no evidence of erosion. This soil has the profile described as representative of the series.

Included with this soil in mapping are spots of moderately eroded Eldean soils and a few small areas of Ockley soils. Also included are areas of soils that have a surface layer of loam.

This soil is most commonly used for crops. The surface layer generally has good tilth, but is subject to crusting and sealing after rains. This soil has a moderate hazard of erosion and is droughty for summer crops. It has few limitations for most nonfarm uses. Capability unit IIe-3; woodland suitability group 2o1.

EmB2—Eldean silt loam, 2 to 6 percent slopes, moderately eroded. This soil is mainly at the heads of drainageways on terraces, commonly adjacent to larger, less eroded areas of Eldean soils. Most areas are less than 25 acres in size. This soil has a profile similar to the one described as representative of the series, but the surface layer is thinner. Surface soil losses through erosion and subsequent mixing of material from the surface and subsoil layers by plowing have reduced the tilth and available water capacity of this soil.

Included with this soil in mapping are areas of soils that have a surface layer of loam and a few areas of gravelly loam.

Surface crusting and droughtiness are the main concerns of management in farming. Runoff is moderate to rapid. The hazard of erosion and droughtiness are the dominant limitations to use of this soil for cultivated crops. This soil has few limitations for most nonfarm uses. Capability unit IIe-3; woodland suitability group 2o1.

EmC2—Eldean silt loam, 6 to 12 percent slopes, moderately eroded. This soil is on kames and terrace escarpments. Most areas are about 2 to 30 acres in size. Slopes are short, generally 60 to 100 feet in length. The plow layer of this soil contains varying amounts of material from the subsoil that has been incorporated by plowing and cultivating. This has reduced the tilth and available water capacity of this soil.

Included with this soil in mapping are areas of Casco soils and a few areas of soils that have a surface layer of loam or gravelly loam. Also included are some spots of severely eroded soils where gravel is exposed at the surface.

The hazard of erosion is severe where this soil is used for cultivated crops. Droughtiness is also a concern of management. Slope is the dominant limitation for most nonfarm uses. Capability unit IIIe-2; woodland suitability group 2o1.

EnC3—Eldean clay loam, 6 to 12 percent slopes, severely eroded. This soil is in long narrow breaks at the heads of drainageways on outwash terraces and on rounded knolls on the uplands. Most areas are about 4 to 15 acres in size. This soil has a profile similar to the one described as representative of the series, but the surface layer is thinner and the depth to sand and gravel is shallower. The surface soil is sticky and difficult to till. Gravel is exposed at the surface in many places. This soil is droughty.

Included with this soil in mapping are areas of Casco soils and a few acres of soils that have a surface layer of loam. Also included are spots of soils that are only moderately eroded.

The hazard of erosion is severe if this soil is used for cultivated crops. Slope is the dominant limitation for most nonfarm uses. Capability unit IVe-1; woodland suitability group 2o1.

EpC—Eldean-Urban land complex, rolling. This complex consists of rolling land where Eldean soils have been largely altered or covered by grading and digging operations. Slopes are dominantly between 6 and 12 percent. Most areas are used for urban development. About 15 to 30 percent of this complex is covered by buildings, driveways, and streets; 25 to 50 percent is borrow or fill areas; and 20 to 60 percent is undisturbed areas of Eldean soils in undeveloped lots, in parts of developed areas, and in small patches of woodland.

Fill areas have 1 foot to 3 feet of fill material over undisturbed Eldean soils. The fill material is gravelly clay material from the Eldean subsoil and in some places, gravelly material from the substratum. The borrow areas are exposed gravelly material from the substratum and subsoil typical of the Eldean soils.

This complex is not used for farming. The surface layer of the disturbed soil commonly has a low organic matter content and poor tilth. It is droughty and seed germination is usually poor. There is a severe hazard of erosion, particularly when the soil is bare of vegetation during construction periods. Slope is the dominant limitation to most nonfarm uses. Not assigned to a capability unit and woodland suitability group.

Fairmount Variant

The Fairmount variant consists of moderately deep, well drained soils that formed in residuum of thin bedded limestone and clay shale bedrock. These soils are mostly very steep, and they are on upland slopes along the major streams in the county.

In a representative profile the surface layer is very dark grayish brown silty clay loam 6 inches thick. The upper part of the subsoil is 6 inches of olive brown silty clay loam; the lower part is 11 inches of light olive brown and light yellowish brown channery silty clay. Below the subsoil is 6 inches of light yellowish brown channery silty clay. Limestone and soft shale bedrock is at a depth of 29 inches.

Available water capacity is moderate, and permeability is moderately slow. The rooting zone is moderately deep.

Fairmount variant soils are used mainly for pasture or woodland.

Representative profile of Fairmount silty clay loam, moderately deep variant, 25 to 50 percent slopes, in

Sugar Creek Township, SE¼SE¼ sec. 31; 1¼ mile southeast of Bellbrook and 50 feet northeast of Pennewit Road:

A1—0 to 6 inches; very dark grayish brown (10YR 3/2) silty clay loam; moderate medium granular structure; friable; many fine roots; 5 percent limestone fragments 1 inch to 3 inches in diameter; neutral; clear smooth boundary.

B2—6 to 12 inches; olive brown (2.5Y 4/4) heavy silty clay loam; moderate medium subangular blocky structure; firm; common fine roots; 10 percent limestone fragments 1 inch to 3 inches in diameter; neutral; clear smooth boundary.

B31—12 to 17 inches; light olive brown (2.5Y 5/4) channery silty clay; weak medium subangular blocky structure; firm; few fine roots; thin patchy dark grayish brown (10YR 4/2) coatings on ped faces; 25 percent fragments 1 inch to 3 inches in diameter; mildly alkaline, weakly calcareous; gradual smooth boundary.

B32—17 to 23 inches; light yellowish brown (2.5Y 6/4) channery silty clay; weak coarse subangular blocky structure; firm; few fine roots; thin patchy light olive brown (2.5Y 5/4) coatings on ped faces; 30 percent limestone fragments 1 inch to 3 inches in diameter; mildly alkaline, calcareous; gradual smooth boundary.

C—23 to 29 inches; light yellowish brown (2.5Y 6/4) channery silty clay; massive; firm; few fine roots; 30 percent limestone fragments 1 inch to 3 inches in diameter; mildly alkaline, calcareous; abrupt smooth boundary.

R—29 inches; pale olive (5Y 6/3) interbedded limestone and soft shale bedrock; mildly alkaline.

The solum ranges from 18 to 24 inches in thickness. Depth to bedrock is 20 to 40 inches. Reaction of the solum ranges from neutral to mildly alkaline.

The A horizon ranges from very dark grayish brown (10YR 3/2) to black (10YR 2/1). The B horizon is olive brown (2.5Y 4/4), grayish brown (2.5Y 5/2), light olive brown (2.5Y 5/4), and light yellowish brown (2.5Y 6/4). It is silty clay loam, silty clay, or clay and is channery in places.

Fairmount variant soils are commonly adjacent to Edenton soils. They have a darker colored surface layer than Edenton soils.

FaF—Fairmount silty clay loam, moderately deep variant, 25 to 50 percent slopes. This soil is in narrow bands along the valley walls of Little Miami River and some of its larger tributaries in the southern part of the county. Slopes are generally irregular. Limestone fragments as much as 12 inches in diameter are commonly on the surface of this soil. Fragments tend to accumulate at the base of slopes.

Included with this soil in mapping are areas of soils that are moderately eroded, a few areas of soils that have slopes of 18 to 25 percent, and a few areas of soils that have a surface layer of silty loam. Also included are spots of soils which are slightly deeper than this Fairmount soil to the interbedded limestone and shale.

Runoff is rapid, and the hazard of erosion is a severe limitation to the use of this soil for farming. The very steep slopes are a severe limitation for most nonfarm uses. Capability unit VIIe-2; woodland suitability group 4d3.

Fill Land

Fill land consists of miscellaneous areas that are covered by 2 to 5 feet of fill material. The fill material is generally from various sources. It commonly is made up of mineral and organic soil material, other organic and inorganic debris, or a mixture of all of these. Properties of Fill land can vary considerably in short distances.

In Greene County, Fill land is mapped only in complexes with Sloan and Warsaw soils. For descriptions of these complexes, see the Sloan and Warsaw series.

Fincastle Series

The Fincastle series consists of nearly level, somewhat poorly drained soils that formed in 18 to 40 inches of loess and in the underlying glacial till. These soils are on uplands in the east-central and southern parts of the county.

In a representative profile the surface layer is dark grayish brown silt loam 9 inches thick. Below that is 2 inches of grayish brown silt loam. The subsoil extends to a depth of 40 inches. The upper 25 inches is mostly mottled, grayish brown and brown silty clay loam, and the lower 4 inches is yellowish brown clay loam. The substratum is yellowish brown loam to a depth of 60 inches.

Available water capacity is high, and permeability is moderately slow. Runoff is slow, and water ponds on some more level areas for short periods. These soils have a seasonal high water table for long periods in winter and early in spring. They are slow to dry out in spring unless they are drained. The rooting zone is deep when the water table is low.

These soils are used mostly for cultivated crops.

A representative profile of Fincastle silt loam, 0 to 2 percent slopes, in Caesers Creek Township; 7½ miles southeast of Xenia, 150 feet east of Eleazer Road, and ½ mile south of intersection with U.S. Route 68:

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.

A2—9 to 11 inches; grayish brown (10YR 5/2) silt loam; moderate medium granular structure; friable; many roots; strongly acid; clear smooth boundary.

B1t—11 to 14 inches; grayish brown (10YR 5/2) silty clay loam; common fine faint dark grayish brown (10YR 4/2) and brown (10YR 5/3) mottles; moderate; medium subangular blocky structure; firm; many roots; strongly acid; clear smooth boundary.

B21t—14 to 17 inches; grayish brown (10YR 5/2) silty clay loam; common fine faint dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; common roots; thin and medium dark grayish brown (10YR 4/2) clay films; medium acid; gradual wavy boundary.

B22t—17 to 30 inches; brown (10YR 5/3) silty clay loam; common fine faint grayish brown (10YR 5/2), dark grayish brown (10YR 4/2), and yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; few roots; medium continuous dark grayish brown (10YR 4/2) clay films; medium acid; gradual wavy boundary.

B3t—30 to 36 inches; brown (10YR 5/3) silty clay loam; weak medium and coarse subangular blocky structure; firm; few roots; thin patchy dark grayish brown (10YR 4/2) clay films; slightly acid; abrupt wavy boundary.

IIB3t—36 to 40 inches; yellowish brown (10YR 5/4) clay loam; weak coarse subangular blocky structure; firm;

few roots; thin patchy grayish brown (10YR 5/2) clay films; 2 percent coarse fragments consisting of limestone pebbles and igneous glacial pebbles; neutral; gradual smooth boundary.

IIC1—40 to 48 inches; yellowish brown (10YR 5/4) loam; massive; firm; 10 percent coarse fragments; mildly alkaline; gradual smooth boundary.

IIC2—48 to 60 inches; yellowish brown (10YR 5/4) loam; massive; very firm; 10 percent coarse fragments; moderately alkaline, calcareous.

The solum ranges from 36 to 48 inches in thickness. Unless limed, the solum ranges from strongly acid to medium acid in the upper part, and in most profiles increases to slightly acid or neutral in the lower part.

The Ap horizon is dark grayish brown (10YR 4/2) or grayish brown (10YR 5/2). The A2 horizon is light brownish gray (10YR 6/2) or grayish brown (10YR 5/2). The B2 horizon has hue of 10YR, value of 4 through 6, and chroma of 1 through 4. Mottles are common to many. The B horizon is silty clay loam or silt loam and the IIB horizon, which formed in glacial till, typically is clay loam. The C horizon typically is brown (10YR 5/3) or yellowish brown (10YR 5/4) loam or silt loam.

Fincastle soils are the somewhat poorly drained member of a drainage sequence that includes the well drained Russell soils, the moderately well drained Xenia soils, and the very poorly drained Ragsdale soils. Fincastle soils are commonly adjacent to Xenia and Ragsdale soils. They are similar to Crosby and Reeseville soils. They have a thicker loess mantle than Crosby soils. The lower part of the subsoil in Fincastle soils formed in glacial till, whereas the Reesville soils formed entirely in loess. Fincastle soils are near Randolph soils. They differ from Randolph soils in having no bedrock at a depth of 20 to 40 inches.

FnA—Fincastle silt loam, 0 to 2 percent slopes. This nearly level soil is on uplands in the east-central and southern parts of the county. Most areas are irregular in shape and range from 10 to 100 acres in size.

Included with this soil in mapping are small areas of Xenia soils on slight rises. Also included are spots of Ragsdale soils in small, narrow depressions, and a few areas of soils that have slopes ranging from 2 to 4 percent.

Wetness in spring is the dominant limitation to the use of this soil for farming. Drainage is needed for optimum crop production. The seasonal high water table is also a limitation for many nonfarm uses. Capability unit IIw-2; woodland suitability group 2w2.

Genesee Series

The Genesee series consists of well drained, nearly level soils that formed in loamy alluvium. These soils are on flood plains along the major streams in the county. They are subject to flooding.

In a representative profile the surface layer is dark grayish brown loam 10 inches thick. The subsoil is 26 inches of dark brown loam and silt loam. Below that, to a depth of 66 inches, is stratified alluvium that is loam, silt loam, and fine sandy loam.

Available water capacity is high, and permeability is moderate. Flooding is a particular hazard in winter and in spring. The rooting zone is deep.

Genesee soils are used mainly for row crops where areas of these soils are large enough to farm. Small areas generally are wooded.

Representative profile of Genesee loam, in Spring Valley Township, NW¼ sec. 17; 250 feet west of Little Miami River:

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) loam; weak coarse granular structure; friable; mildly alkaline, calcareous; clear smooth boundary.

B21—10 to 19 inches; dark brown (10YR 4/3) loam; weak coarse subangular blocky structure; friable; dark grayish brown (10YR 4/2) coatings on ped faces; few worm channels; thin sandy loam strata 1 inch thick; mildly alkaline, calcareous; clear smooth boundary.

B22—19 to 36 inches; dark brown (10YR 4/3) silt loam; weak coarse subangular blocky structure; friable; patchy dark grayish brown (10YR 4/2) coatings on ped faces; few worm channels; mildly alkaline, calcareous; gradual smooth boundary.

C1—36 to 44 inches; dark yellowish brown (10YR 4/4) loam; massive; friable; sandy loam strata 1 inch thick; mildly alkaline, calcareous; clear smooth boundary.

C2—44 to 55 inches; dark grayish brown (10YR 4/2) silt loam; massive; friable; mildly alkaline, calcareous; clear smooth boundary.

C3—55 to 66 inches; very dark grayish brown (10YR 3/2) fine sandy loam; massive; friable; mildly alkaline, calcareous.

The solum ranges from 30 to 40 inches in thickness. Reaction of the soil is mildly alkaline or moderately alkaline throughout, and the soil is calcareous. The solum is loam or silt loam but in some profiles ranges to light silty clay loam or clay loam in the B horizon. The Ap horizon is dark brown (10YR 3/3), dark grayish brown (10YR 4/2), or brown (10YR 5/3). The B horizon is dark yellowish brown (10YR 4/4) to yellowish brown (10YR 5/4) and dark brown (10YR 4/3). The C horizon is loam, silt loam, and fine sandy loam.

Genesee soils in Greene County differ from other Genesee soils in having carbonates throughout the solum. This difference does not affect the use and management of these soils.

Genesee soils are the well drained member of a drainage sequence that includes the moderately well drained Eel soils and the very poorly drained Sloan soils. Genesee soils are similar to well drained Ross soils. They are lighter colored than Ross soils.

Gn—Genesee loam. This nearly level soil is in areas along the flood plains of Little Miami River and its tributaries. Flooding is frequent.

Included with this soil in mapping are a few small areas of Eel and Ross soils. Also included are a few areas of soils that are more sandy than is described in the range for the series, and areas of soils that have a surface layer of silt loam.

This soil is used mostly for crops. Corn is the main crop. Flooding is the main limitation to use of this soil for both farm and nonfarm uses. Low strength is also a limitation for supporting structures. Capability unit IIw-5; woodland suitability group 1o1.

Hennepin Series

The Hennepin series consists of steep and very steep, well drained soils that are shallow to glacial till. These soils are throughout the county, mainly in long narrow areas adjacent to drainageways.

In a representative profile the surface layer is dark grayish brown loam 4 inches thick. The subsoil is 8 inches of a brown clay loam. The substratum is brown loam glacial till to a depth of 60 inches.

Available water capacity is moderate to low. Permeability is moderate in the upper 12 inches and moderately slow in the substratum below a depth of 12 inches. Runoff is rapid to very rapid. The rooting zone is shallow over firm glacial till.

Most areas of Hennepin soils are too steep to be suited to farming. These soils are mostly wooded.

Representative profile of Hennepin loam, from an area of Miamian and Hennepin soils, 25 to 50 percent slopes, in New Jasper Township; 4½ miles southeast of Xenia, 150 yards east of Gultice Road, and 0.7 mile northeast of intersection of Stone Road:

A1—0 to 4 inches; dark grayish brown (10YR 4/2) loam; moderate fine and medium granular structure; friable; many roots; neutral; clear smooth boundary.

B2—4 to 12 inches; brown (10YR 4/3) clay loam; moderate medium subangular blocky structure; firm; common roots; thin very patchy brown (10YR 4/3) clay films and organic stains on ped faces; 2 to 5 percent coarse fragments; neutral; gradual wavy boundary.

C—12 to 60 inches; brown (10YR 5/3) loam; massive; firm; 2 to 5 percent coarse fragments; moderately alkaline, calcareous.

The solum ranges from 12 to 18 inches in thickness. Reaction of the solum is slightly acid to mildly alkaline, and the soil is calcareous in the lower part in places.

The A horizon is commonly loam, but in places it is silt loam. It is dark grayish brown (10YR 4/2) or brown (10YR 4/3). The B horizon is brown (10YR 5/3 or 4/3) loam and clay loam. The C horizon is calcareous loam or light clay loam.

Hennepen soils are commonly associated with Miamian soils. They are thinner over glacial till than Miamian soils. They are near Ritchey soils, but have no limestone bedrock at a depth of 10 to 20 inches, which Ritchey soils have.

In Greene County, Hennepin soils are mapped only with Miamian soils. For descriptions of Miamian and Hennepin soils, see the Miamian series.

Linwood Series

The Linwood series consists of black, very poorly drained organic soils 16 to 50 inches thick over mineral material. These soils are in depressions in the flood plains or at the margins of glacial outwash valleys below upland seeps. A few areas are in depressions on the uplands.

In a representative profile black organic material extends to a depth of 35 inches. Below this is dark gray, calcareous silt loam to a depth of 60 inches.

Available water capacity is high, and permeability is rapid in the organic layer and moderate in the mineral material. These soils have a high water table for most of the year and are commonly ponded. Many areas are kept saturated by water from springs or seeps from adjacent uplands or from underground aquifers. The rooting zone is moderately deep or deep in areas that have been drained.

Artificially drained areas of Linwood soils are used for crops. Corn is the main crop. Undrained areas are in sedges and water-tolerant trees.

Representative profile of Linwood muck, in Cedarville Township; 1¾ miles northeast of Cedarville and 0.4 mile northeast of intersection of Fishworm and Cortsville Roads:

Oap—0 to 7 inches; black (N 2/0) rubbed sapric material less than 5 percent fiber rubbed; 40 percent mineral; moderate medium granular structure; friable; neutral; abrupt smooth boundary.

Oa2—7 to 16 inches; black (10YR 2/1) rubbed sapric material; 12 to 15 percent dark brown (10YR 4/3) fiber, none rubbed; 15 percent mineral; weak medium angular blocky structure; firm, slightly brittle; neutral; gradual smooth boundary.

Oa3—16 to 22 inches; black (10YR 2/1) sapric material; 30 to 40 percent dark yellowish brown (10YR 4/4) fiber, none rubbed; 10 percent mineral; massive; friable; few calcite shells; neutral; gradual smooth boundary.

Oa4—22 to 25 inches; black (10YR 2/1) sapric material; 12 to 15 percent dark brown (7.5YR 4/4) fiber, 9 percent rubbed; 5 percent mineral; massive; thin olive gray (5Y 5/2) silt strata; many white 2 to 3 millimeter snail shells; friable; neutral; gradual smooth boundary.

Oa5—25 to 30 inches; black (10YR 2/1) sapric material; 15 percent fiber, 2 percent rubbed; weak medium and fine subangular blocky structure; friable; neutral; gradual smooth boundary.

Oa6—30 to 35 inches; black (10YR 2/1) sapric material; 5 percent fiber; 10 percent mineral content in bottom 1 inch; massive; friable; neutral; gradual smooth boundary.

IICg—35 to 60 inches; dark gray (10YR 4/1) silt loam; massive; firm; mildly alkaline, calcareous.

Depth to the IIC horizon ranges from 16 to 50 inches. Reaction throughout the solum ranges from slightly acid to mildly alkaline. The surface tier is black (10YR 2/1) or very dark brown (10YR 2/2). The organic part of the subsurface and bottom tiers has hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 1 or 2 or broken face and rubbed. The subsurface and bottom tiers are from 0 to 10 percent coarse woody fragments. The IICg horizon has hue of 10YR through 5Y, value of 4 through 6, and chroma of 1 or 2. It is silt loam, loam, and silty clay loam. Snail shells are commonly in the organic part of the subsurface and bottom tiers.

Linwood soils are commonly adjacent to Westland soils. They have organic layers, whereas Westland soils have none.

Ln—Linwood muck. This soil is mainly in areas of depressions and swales on flood plains and low terraces. These areas commonly receive water from springs and seeps in the nearby uplands or from underground aquifers. A few areas of these soils are in depressions on the uplands.

Included with this soil in mapping are small areas of soils underlain by marl or travertine. Also included are a few areas of soils where the organic layer is thinner than 16 inches or thicker than 50 inches. The included areas where organic layer is thick are mainly in Spring Valley Township near the Warren County line. A few areas near Mad River in Bath Township have lost most of the organic layer as a result of burning.

This soil is in low positions in relation to surrounding soils, and some areas are difficult to drain because they lack outlets. Linwood muck is subject to subsidence if it is drained. It is also subject to soil blowing, especially in open areas when the surface is dry and is not protected by a cover of plants. Wetness is the main limitation to use of this soil for farming. A high water table and low strength are severe limitations for most nonfarm uses. Capability unit IIw-4; not assigned to a woodland suitability group.

Miamian Series

The Miamian series consists of nearly level to very steep, well drained soils that formed in medium-textured glacial till. These soils are on uplands throughout the county.

In a representative profile the surface layer is brown silt loam about 7 inches thick. The subsoil extends to a depth of 38 inches. The upper 7 inches is brown silty clay loam, the middle 16 inches is yellowish brown and brown clay and clay loam, and the lower 8 inches is brown loam. The substratum is yellowish brown loam to a depth of 60 inches.

Available water capacity is moderate, and permeability is moderately slow. The compact till tends to limit roots to a moderate depth.

Miamian soils are used mainly for crops. The main crops are corn, wheat, oats, soybeans, and grass-legume meadow. Some areas, especially those in which the soils are steeper or are severely eroded, are in permanent pasture or woodland.

Representative profile of Miamian silt loam, 2 to 6 percent slopes, in Xenia Township, NE¼NW¼ sec. 35; 4 miles southwest of Yellow Springs, 2,000 feet east of West Enon Road, and 100 yards south of section line, behind Greene County Vocational School (Sample GN-8 in Laboratory Data Section):

Ap—0 to 7 inches; brown (10YR 5/3) silt loam; weak medium and fine granular structure; friable; many roots; strongly acid; abrupt smooth boundary.

B1—7 to 14 inches; brown (7.5YR 5/4) silty clay loam; moderate medium subangular blocky structure; friable; many roots; very strongly acid; clear wavy boundary.

IIB21t—14 to 22 inches; brown (7.5YR 5/4) clay; strong medium prismatic structure parting to strong medium subangular blocky; firm; many roots; medium patchy dark brown (7.5YR 4/4) clay films on vertical and horizontal faces; 2 to 5 percent coarse fragments; strongly acid; gradual wavy boundary.

IIB22t—22 to 30 inches; yellowish brown (10YR 5/4) clay loam; moderate medium prismatic structure parting to strong coarse subangular blocky; firm; common roots; thick patchy brown (10YR 4/3) clay films on vertical and horizontal ped faces; 2 to 5 percent coarse fragments; neutral; clear wavy boundary.

IIB3t—30 to 38 inches; brown (10YR 4/3) loam; weak coarse subangular blocky structure; firm; few roots; thin patchy dark yellowish brown (10YR 3/4) clay films on vertical ped faces; light gray (10YR 7/2) remnants of weathered calcite on matrix; about 5 percent coarse fragments; mildly alkaline; diffuse irregular boundary.

IIC1—38 to 42 inches; yellowish brown (10YR 5/4) loam; massive; firm; about 10 percent coarse fragments; mildly alkaline; calcareous; clear smooth boundary.

IIC2—42 to 60 inches; dark yellowish brown (10YR 4/4) loam; massive; firm; about 10 percent coarse fragments; mildly alkaline, calcareous.

The solum ranges from 20 to 40 inches in thickness. A loess mantle, less than 18 inches thick, is in uneroded areas. Reaction of the solum ranges from very strongly acid to moderately alkaline in the lower part.

The Ap horizon is dark grayish brown (10YR 4/2) or brown (10YR 5/3). It is commonly silt loam but is clay loam in places. The B1 horizon is brown (7.5YR 5/4 or 10YR 5/3) or yellowish brown (10YR 5/4). It is heavy silt loam or silty clay loam. The B2 horizon is dark yellowish brown (10YR 4/4), yellowish brown (10YR 5/4), or brown (7.5YR 4/4 or 5/4). It is silty clay loam, clay loam, and clay. The B3 horizon commonly is clay loam or loam. The C horizon is brown (10YR 5/3), yellowish brown (10YR 5/4), or dark yellowish brown (10YR 4/4). It is loam or silt loam and is 5 to 15 percent coarse fragments.

Miamian soils are the well drained member of a drainage sequence that includes the moderately well drained Celina soils, the somewhat poorly drained Crosby soils, and the very poorly drained Brookston soils. They are commonly adjacent to Hennepin, Casco, Russell, Eldean, Edenton, and Milton soils. They are thicker over glacial till than Hennepin soils. They have a thinner loess mantle than Russell soils and differ from Milton and Edenton soils in lacking bedrock at a depth of 20 to 40 inches. They differ from Casco and Eldean soils in lacking sand and gravel below the subsoil.

MhA—Miamian silt loam, 0 to 2 percent slopes. This nearly level soil is on uplands mostly in the northwestern part of the county. It is commonly in small areas, 10 to 20 acres in size, near the higher part of the landscape. Slopes are strong enough to allow rainfall to run off without ponding.

Included with this soil in mapping are spots of Celina and Crosby soils along drainageways and in depressions.

This soil is suited to all crops commonly grown in the county. It has few limitations for farming. Moderately slow permeability is a limitation for some nonfarm uses. Capability unit I-1; woodland suitability group 2o1.

MhB—Miamian silt loam, 2 to 6 percent slopes. This gently sloping soil is on low knolls and in undulating areas on uplands. It has the profile described as representative of the series.

Included with this soil in mapping are spots of Celina soils. Also included are a few spots of soils that are moderately eroded.

Runoff is medium. There is little or no evidence of erosion on this soil, but erosion is a moderate hazard to farming. Slope and moderately slow permeability are limitations for some nonfarm uses. Capability unit IIe-1; woodland suitability group 2o1.

MhB2—Miamian silt loam, 2 to 6 percent slopes, moderately eroded. This gently sloping soil is on low knolls and ridges on the uplands and on side slopes at the heads of drainageways. It has a profile similar to the one described as representative of the series, but it has lost part of the original surface layer through erosion. The plow layer consists of a mixture of material from the original surface layer and from the subsoil.

Included with this soil in mapping are a few spots of soils where the plow layer is severely eroded and contains mostly subsoil. Also included are a few small areas of Celina soils.

This soil is suited to most crops commonly grown in the county, but it is highly susceptible to erosion. The plow layer is lower in organic matter content than that in uneroded Miamian soils; therefore, this soil has reduced available water capacity and poorer tilth. Also, seeds germinate less readily and it is more difficult to establish plants, such as grasses, on this soil than on uneroded Miamian soils.

Erosion is the main limitation for farming. Slope and moderately slow permeability are limitations for some nonfarm uses. Capability unit IIe-2; woodland suitability group 2o1.

MhC2—Miamian silt loam, 6 to 12 percent slopes, moderately eroded. This sloping soil is on moraines and on side slopes adjacent to drainageways. It has a profile similar to the one described as representative of the series, but the plow layer is a mixture of material from the original surface layer and from the subsoil. A moderate degree of erosion has slightly lowered the organic matter content, available water capacity, and tilth.

Included with this soil in mapping are a few spots of severely eroded soils and a few areas of soils that have shallow gullies. Also included are a few slightly eroded areas of Russell soils and a few areas of Celina soils.

This soil is subject to a severe hazard of erosion when used for farming. Slope and moderately slow permeability are limitations for many nonfarm uses. Capability unit IIIe-1; woodland suitability group 2o1.

MhD2—Miamian silt loam, 12 to 18 percent slopes, moderately eroded. This moderately steep soil is on sides of valleys that parallel drainageways. It has a profile similar to the one described as representative of the series, but the depth to till is 20 to 30 inches.

This soil has lost part of the original surface layer through erosion. Subsequent plowing has mixed material from the subsoil with that from the remaining surface layer. This has slightly lowered the organic matter content, available water capacity, and tilth.

Included in mapping are a few areas of Hennepin soils and Russell soils.

Runoff is rapid. The hazard of erosion is severe unless a thick cover of vegetation is maintained. Slope is a severe limitation for most nonfarm uses. Capability unit IVe-1; woodland suitability group 2r1.

MlB3—Miamian clay loam, 2 to 6 percent slopes, severely eroded. This soil is commonly on knolls and side slopes where erosion has been severe. This soil has a profile similar to the one described as representative of the series, but the plow layer consists mostly of moderately fine textured material. In most areas spots of subsoil are exposed at the surface, and in some areas gullies are common. In a few areas calcareous till is at or very near the surface.

Included with this soil in mapping are a few spots of soils that are slightly eroded or moderately eroded.

The plow layer commonly is very low in organic matter content and has poor tilth. If it is bare of a plant cover, the soil surface is subject to crusting. This crust slows the infiltration of water. Both crusting and a reduced available water content make seedlings difficult to establish. The erosion hazard is severe where this soil is used for crops. The moderately slow permeability and sticky surface layer are limitations for some nonfarm uses. Capability unit IIIe-1; woodland suitability group 2o1.

MlC3—Miamian clay loam, 6 to 12 percent slopes, severely eroded. This sloping soil is commonly on knolls and convex side slopes. Erosion has been severe. This soil has a profile similar to the one described as representative of the series, but the plow layer consists mostly of moderately fine textured material. It is shallow to till in some places, and in other places the till is exposed at the surface. Gullies are common in some areas.

Included with this soil in mapping are a few spots of Hennepin and Russell soils.

The plow layer is commonly very low in organic matter content and has poor tilth. Surface crusting slows the infiltration of water. Grass seedings are difficult to establish on this soil. The hazard of erosion is very severe where this soil is used for cultivated crops. The sticky surface layer, moderately slow permeability, and slope are limitations for many nonfarm uses. Capability unit IVe-1; woodland suitability group 2o1.

MlD3—Miamian clay loam, 12 to 18 percent slopes, severely eroded. This moderately steep soil is on narrow breaks at the heads of drainageways. Erosion has removed much of the original surface layer. The existing surface layer is mostly moderately fine textured material from the subsoil. This soil has a profile similar to the one described as representative of the series, but it is thinner to calcareous till. Calcareous till is generally at a depth of 20 to 25 inches, in some spots it is exposed at the surface. Short shallow gullies, 1 foot to 2 feet deep, are common.

Included with this soil in mapping are a few areas of more silty Russell soils and spots of thinner Hennepin soils.

The surface layer is very low in organic matter content, which has reduced its capacity to absorb and retain water. Runoff is rapid. The hazard of erosion is very severe.

This soil is not suited to cultivated crops. Slope is the main limitation for nonfarm uses. Capability unit VIe-1; woodland suitability group 2r1.

MmD2—Miamian-Casco complex, 12 to 18 percent slopes, moderately eroded. This complex is on long, narrow ridges and knolls in areas of moraines where kames are common. The composition of this complex is variable from one area to the next. In most areas, however, it is about 50 percent Miamian soils, 40 percent Casco soils, and 10 percent included soils.

These soils have a plow layer that consists of a mixture of material from the original surface layer and from the subsoil. The surface layer is silt loam or loam. A few areas are gravelly loam. The underlying material is variable, and changes occur within short horizontal distances.

Included with these soils in mapping are small areas of Hennepin soils that are shallow to glacial till. A few spots are severely eroded.

These soils are mostly used for crops and pasture. A few areas are in woodland. The hazard of erosion is severe. Casco soils are droughty during summer. Slope is the main limitation for most nonfarm uses. Capability unit IVe-1; woodland suitability group 2r1.

MmE2—Miamian-Casco complex, 18 to 35 percent slopes, moderately eroded. This complex is mainly on kames or moraines, and most areas are circular or irregular in shape. In most areas this complex is about 50 percent Miamian soils, 35 percent Casco soils, and 15 percent included soils. The underlying material of these soils is quite variable in composition, alternating between glacial till and sand and gravel within short horizontal distances.

Included with these soils in mapping are a few areas of severely eroded soils. Also included are small areas of Rodman soils that have a surface layer of silt loam or loam.

The main limitation to the use of these soils for farming is a very severe hazard of erosion if cultivated crops are grown. In addition, the Casco soils and the included Rodman soils are droughty during summer. Slope is a severe limitation for most nonfarm uses of these soils. Capability unit VIe-1; woodland suitability group 2r1.

MoB2—Miamian-Eldean silt loams, 2 to 6 percent slopes, moderately eroded. These soils are on low knolls and ridges on moraines. Miamian soils formed in glacial till, and Eldean soils formed in sand and gravel. This unit is about 40 percent Miamian soils, 30 percent Eldean soils, and 30 percent included soils. These soils have profiles similar to the ones described as representative of their respective series, but the plow layer is a mixture of material from the original surface layer and from the subsoil because of moderate erosion.

Included with these soils in mapping are small areas of Hennepin soils that are shallow to glacial till and Casco soils that are shallow to sand and gravel.

These soils have a moderate limitation for farming. Runoff is moderate. The hazard of erosion is moderate. Eldean soils are moderately droughty during summer. These soils have few limitations for most nonfarm uses. The rapid permeability in the underlying material of the Eldean soils is a severe limitation for uses such as sewage lagoons or trench-type sanitary landfills. Capability unit IIe-2; woodland suitability group 2o1.

MoC2—Miamian-Eldean silt loams, 6 to 12 percent slopes, moderately eroded. These soils are on long, narrow ridges and knolls in areas of moraines. Miamian soils formed in glacial till, and Eldean soils formed in sand and gravel. These soils are not in predictable pattern on the landscape.

This mapping unit is commonly about 40 percent Miamian soils, 30 percent Eldean soils, and 30 percent included soils. The plow layer consists of a mixture of material from the original surface layer and from the subsoil. The surface layer is mostly silt loam, but in some areas it is loam.

Included with these soils in mapping are small areas of Hennepin soils that are shallow to glacial till and Casco soils that are shallow to sand and gravel.

Runoff is rapid. The hazard of erosion is severe. The Eldean soils are moderately droughty during summer. Slope is the main limitation of these soils for nonfarm uses. The rapid permeability of the Eldean substratum is a severe limitation for uses such as trench-type sanitary landfill and sewage lagoons. Capability unit IIIe-1; woodland suitability group 2o1.

MpE—Miamian and Hennepin soils, 18 to 25 percent slopes. Individual areas of this undifferentiated group contain Miamian soils, Hennepin soils, or both soils in various proportions. Miamian soils have a profile similar to the one described as representative of the series, but they are shallower to calcareous material.

Included with these soils in mapping are a few areas of severely eroded soils. Erosion spot symbols indicate these areas on the soil map.

These soils are too steep to be used for crops. They are most commonly used for pasture or woodland. The steep slopes are a severe limitation for most nonfarm uses. Capability unit VIe-1; woodland suitability group 2r1.

MpF—Miamian and Hennepin soils, 25 to 50 percent slopes. This complex is on steep side slopes on uplands near rivers and large tributaries. Slopes are smooth and uniform, and most are slightly convex in the upper part and slightly concave at the base. Individual areas of this mapping unit consist of either Miamian soils or Hennepin soils or contain both soils in various proportions. The Hennepin soil has the profile described as representative of the series. The Miamian soil has a profile similar to the one described as representative of the series, but it is shallower to calcareous material.

Included with these soils in mapping are a few areas of soils that have as much as 70 percent slopes.

These soils are mainly used for pasture or woodland. They are too steep to be used for crops. Runoff is rapid. The hazard of erosion is very severe. The very steep slopes are a severe limitation for most nonfarm uses. Capability unit VIIe-1; woodland suitability group 2r2.

MrB—Miamian-Urban land complex, undulating. This gently sloping complex is on uplands underlain by glacial till. Most areas are used for urban or industrial development. About 15 to 30 percent of this complex is covered by buildings, driveways, and streets; 25 to 50 percent is borrow and fill areas; and 20 to 60 percent is undisturbed areas of Miamian soils in undeveloped lots and parts of developed areas.

Included with this complex in mapping are spots of Russell, Celina, Xenia, and Birkbeck soils in undisturbed areas.

Runoff is generally rapid, and there is a serious hazard of erosion on disturbed areas. Practices are needed to control erosion and siltation from construction sites. Not assigned to a capability unit and woodland suitability group.

MrC—Miamian-Urban land complex, rolling. This complex is on uplands. It is underlain by glacial till. Slopes are dominantly 6 to 12 percent. Most areas are used for urban development. Much of the original soil material has been disturbed or buried by earthmoving and filling operations. About 15 to 30 percent of this complex is covered by buildings, driveways, and streets; 25 to 50 percent is borrow or fill areas; and 25 to 60 percent is undisturbed Miamian soils in undeveloped lots, parts of developed lots, and small patches of woodland.

Included with this complex in mapping are spots of Russell soils in undisturbed areas.

Runoff is rapid. The hazard of erosion is severe in areas bare of vegetation during construction. Practices are needed to control erosion and siltation from construction sites. Slope and moderately slow permeability are limitations for some nonfarm uses. Not assigned to a capability unit and woodland suitability group.

Millsdale Series

The Millsdale series consists of nearly level, moderately deep, very poorly drained soils that formed in glacial till. These soils are 20 to 40 inches thick over limestone bedrock. They are on uplands in the northeastern part of the county.

In a representative profile the surface layer is black silty clay loam 14 inches thick. The subsoil is mottled gray clay loam 12 inches thick. Light gray limestone bedrock is at a depth of 26 inches.

Available water capacity is high, and permeability is moderately slow. The surface layer is high in organic matter content. These soils have a seasonal high water table in winter and in spring. They often receive seepage water from adjacent higher soils. The rooting zone is moderately deep over bedrock.

Millsdale soils are used mostly for pasture and cultivated crops. Most cultivated areas are artificially drained. In some areas, drainage is difficult because the depth to limestone bedrock varies.

Representative profile of Millsdale silty clay loam, in Miami Township, NW¼NE¼ sec. 24; 2 miles south of Village of Yellow Springs, 0.5 mile east of U.S. Route 68, and 600 feet south of Hyde Road:

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam; strong medium granular structure; firm; many roots; neutral; clear smooth boundary.

B21t—8 to 14 inches; black (10YR 2/1) heavy silty clay loam; strong fine columnar structure parting to strong fine angular blocky; firm; many roots; thin patchy clay films on ped faces; neutral; clear irregular boundary.

B22tg—14 to 26 inches; gray (10YR 5/1) heavy clay loam; few fine distinct dark brown (7.5YR 4/4) mottles; moderate medium and coarse subangular blocky structure; firm; few roots; thin patchy clay films on ped faces; mildly alkaline; abrupt smooth boundary.

IIR—26 inches; light gray (10YR 7/1) hard dolomitic limestone; exterior coated with dark brown (7.5YR 4/4) and gray (10YR 5/1) stains; roots penetrate into widely spaced joints in the bedrock.

The thickness of the solum and depth to bedrock range from 20 to 40 inches. The lower part of the solum in some profiles formed in limestone residuum. Reaction ranges from slightly acid to neutral in the upper part of the B horizon and from neutral to mildly alkaline in the lower part.

The A horizon and upper part of the B horizon to a depth of 10 to 16 inches are black (10YR 2/1) or very dark gray (10YR 3/1) silty clay loam or clay loam. The lower part of the B horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 0 through 2. It is heavy silty clay loam, silty clay, clay, or heavy clay loam. A thin C horizon is in some profiles. It is loam or clay loam, and is calcareous.

Millsdale soils are the very poorly drained members of a drainage sequence that includes the somewhat poorly drained Randolph soils and the well drained Milton soils. In a few areas Millsdale soils are near Brookston, Ragsdale, and Westland soils. Millsdale soils have limestone bedrock at a depth of less than 40 inches, whereas Brookston, Ragsdale, and Westland soils are underlain by glacial till or by sand and gravel and have no bedrock within a depth of 40 inches.

Ms—Millsdale silty clay loam. This nearly level soil is in the northern part of the county. Most areas are 5 to 50 acres in size and are irregular in shape.

Included with this soil in mapping are small areas of Brookston and Ragsdale soils. Also included are a few areas of soils that have a surface layer of silt loam and a few areas of soils that are gently sloping.

If drained this soil is suited to crops. Undrained areas are generally too wet for cultivated crops. Runoff is slow. Water tends to pond on this soil in the depressions. The surface layer becomes cloddy if worked when wet. In some areas, the shallowness to bedrock is a limitation to the installation of tile drains. The seasonal high water table and the underlying limestone bedrock are limitations for many nonfarm uses. Capability unit IIIw-3; woodland suitability group 2w1.

Milton Series

The Milton series consists of nearly level to sloping, well drained, moderately deep soils that formed in glacial till. Limestone bedrock is at a depth of 20 to 40 inches.

In a representative profile the surface layer is dark grayish brown and brown silt loam 6 inches thick. The upper part of the subsoil is 13 inches of brown silty clay loam, and the lower part is 11 inches of brown clay loam. Light gray limestone bedrock is at a depth of 30 inches.

Available water capacity is moderate. Permeability is moderate in the subsoil, but the underlying limestone bedrock is fractured and water moves rapidly through it. The rooting zone is moderately deep over bedrock.

Milton soils are used mostly for crops. Some areas, especially those in which soils are sloping, are used for pasture or woodland.

Representative profile of Milton silt loam, 2 to 6 percent slopes, in Miami Township; ½ mile east of village of Yellow Springs, 100 yards northwest of Outdoor Education Center Office (Sample GN-22 in Laboratory Data Section):

Ap1—0 to 3 inches; dark grayish brown (10YR 4/2) silt loam, strong fine granular structure; friable; many roots; medium acid; clear smooth boundary.

Ap2—3 to 6 inches; brown (10YR 4/3) silt loam; weak fine subangular blocky structure; friable; many roots; medium acid; abrupt irregular boundary.

B1t—6 to 10 inches; brown (7.5YR 4/4) light silty clay loam; moderate medium subangular blocky structure; friable; many roots; thin patchy dark yellowish brown (10YR 4/4) clay films; strongly acid; gradual smooth boundary.

B21t—10 to 19 inches; brown (7.5YR 5/4) silty clay loam; moderate medium subangular blocky structure parting to moderate fine subangular and angular blocky; firm; many roots; thin and medium continuous brown (7.5YR 4/4) clay films; about 5 percent coarse material consisting of glacial erratics; strongly acid; gradual wavy boundary.

B22t—19 to 30 inches; brown (7.5YR 4/4) clay loam; strong medium subangular blocky structure parting to moderate fine subangular and angular blocky; very firm; common roots; medium continuous dark yellowish brown (10YR 4/4) clay films; 5 to 10 percent coarse fragments consisting of glacial erratics to a depth of 28 inches and sandstone fragments between depths of 28 and 30 inches; strongly acid; abrupt wavy boundary.

IIR—30 inches; light gray (10YR 7/1) hard dolomitic limestone; yellowish brown (10YR 5/4 or 5/6) stains on rock surface.

The thickness of the solum and depth to bedrock range from 20 to 40 inches. Reaction of the solum ranges from strongly acid to neutral in the upper part and ranges to mildly alkaline in the lower part.

The Ap horizon is dark grayish brown (10YR 4/2) or brown (10YR 4/3). The B horizon is brown (7.5YR 5/4 or 4/4) or reddish brown (5YR 4/4). It is silty clay loam, heavy clay loam, or clay. Some profiles have a thin C horizon several inches thick in till or in residuum weathered from limestone.

Milton soils are the well drained members of a drainage sequence that includes the somewhat poorly drained Randolph soils and the very poorly drained Millsdale soils. Milton soils are near these soils and are also near Ritchey, Miamian, and Milton variant soils. Milton soils are deeper to limestone bedrock than Ritchey soils. They are shallower to limestone than Miamian soils. They have a lighter colored surface layer and contain fewer coarse fragments than Milton variant soils.

MtA—Milton silt loam, 0 to 2 percent slopes. This nearly level soil is on broad upland ridgetops. Areas are irregular in shape, and even though the topography is rather uniform, some areas are slightly depressed and concave.

Included with this soil in mapping are spots of deeper Miamian soils.

This soil is suited to all crops commonly grown in the county. It dries out and warms up earlier in the spring than the nearby Miamian soils. Runoff is slow. Moderately slow permeability and the underlying limestone bedrock are limitations for some nonfarm uses. Capability unit IIs-1; woodland suitability group 2o1.

MtB—Milton silt loam, 2 to 6 percent slopes. This gently sloping soil is on low knolls and ridges at the heads of drainageways. It has the profile described as representative of the series.

Included with this soil in mapping are a few spots of soils that are moderately eroded. A few scattered limestone fragments commonly are on the surface in some areas. Also included are spots of Miamian soils.

This soil is suited to most crops commonly grown in the county. It is moderately susceptible to erosion. Slope, moderately slow permeability, and moderate depth to bedrock are limitations for some nonfarm uses. Capability unit IIe-4; woodland suitability group 2o1.

MtC2—Milton silt loam, 6 to 12 percent slopes, moderately eroded. This sloping soil is on long, narrow side slopes at the heads of drainageways and knolls on the uplands. The surface layer is moderately eroded. It is a mixture of the original surface layer and material from the subsoil.

Included with this soil in mapping are a few small areas of soils that are slightly eroded and a few small areas of soils that are severely eroded. The severely eroded areas are indicated on the soil map by erosion spot symbols. In some areas, there are limestone flagstones scattered on the surface.

This soil is suited to limited use for crops. Runoff is rapid, and the soil is highly susceptible to erosion. The surface layer has poor tilth. Slope and moderate depth to bedrock are the main limitations for nonfarm uses. Capability unit IIIe-3; woodland suitability group 2o1.

Milton Variant

The Milton variant consists of very steep, well drained soils that formed mostly in residuum and colluvium of limestone bedrock. These soils are moderately deep over limestone bedrock. They are on side slopes of the valley of the Little Miami River.

In a representative profile the surface layer is very dark brown very channery silt loam 12 inches thick. The upper 7 inches of the subsoil is dark brown channery silty clay loam, the middle 5 inches is yellowish brown very channery silty clay loam, and the lower 6 inches is yellowish brown very channery loam. Limestone bedrock is at a depth of 30 inches.

Available water capacity is low, and permeability is moderate. The rooting zone is moderately deep.

Most areas of Milton variant soils are in woodland.

Representative profile of Milton soils, channery variant, 25 to 50 percent slopes, in Miami Township; about 0.8 mile southwest of Clifton, 500 feet north-northwest of 4-H Camp recreation building, and 150 feet east of the Little Miami River:

A1—0 to 12 inches; very dark brown (10YR 2/2) very channery silt loam; strong medium granular structure; friable; many fine roots; dark gray (N 4/0) coatings on ped faces; 50 to 60 percent coarse fragments; neutral; gradual wavy boundary.

B21—12 to 19 inches; dark brown (10YR 4/3) channery silty clay loam; moderate fine and medium subangular blocky structure; firm; common fine roots; thin very patchy brown (10YR 5/3) coatings on ped faces; about 25 percent coarse fragments; neutral; gradual wavy boundary.

B22—19 to 24 inches; yellowish brown (10YR 5/4) very channery light silty clay loam; weak medium subangular blocky structure; friable; few fine roots; thin patchy pale brown (10YR 6/3) coatings on ped faces; about 50 percent coarse fragments; neutral; gradual wavy boundary.

B3—24 to 30 inches; yellowish brown (10YR 5/4) very channery loam; weak medium subangular blocky structure; friable; few fine roots; thin very patchy dark yellowish brown (10YR 4/4) coatings on ped faces; about 50 percent coarse fragments; mildly alkaline; gradual wavy boundary.

R—30 inches; light yellowish brown (2.5Y 6/4) limestone.

The thickness of the solum and depth to bedrock range from 20 to 40 inches. Reaction of the B horizon is neutral to mildly alkaline.

The A horizon is very dark grayish brown (10YR 3/2), very dark brown (10YR 2/2), or black (10YR 2/1). It is very channery silt loam and channery silt loam. The B horizon is dark brown (10YR 4/3), yellowish brown (10YR 5/4), and dark yellowish brown (10YR 4/4). The B2 horizon is channery or very channery and is mainly silty clay loam, but individual horizons are clay, silty clay, or clay loam. The B3 horizon, where present, is very channery loam or very channery clay loam.

Milton variant soils are commonly adjacent to Ritchey and Milton soils. They have a darker colored surface layer and contain more coarse fragments than these soils.

MUF—Milton soils, channery variant, 25 to 50 percent slopes. This undifferentiated group of very steep soils is on side slopes of deeply entrenched valleys along the Little Miami River. Areas normally are less than a quarter of a mile wide, but they may be a mile or more long. Slopes are irregular, and erosion varies within short distances. Most slopes are greater than 35 percent.

The surface of these soils is covered by numerous limestone channers. The lower slopes commonly have an accumulation of talus. Tree roots penetrate this soil to bedrock and into fractures of the bedrock.

Included with these soils in mapping are a few areas of soils that have short slopes of more than 50 percent. These areas also have narrow benches which are useful for logging trails. Also included are a few areas that have limestone ledges exposed on the surface.

The very steep slopes limit the farm and nonfarm uses of these soils. These soils are suited to woodland or wildlife. Capability unit VIIe-2; woodland suitability group 3f1.

Ockley Series

The Ockley series consists of nearly level to gently sloping, well drained soils that formed in a thin loess mantle and loamy glacial outwash underlain by sand and gravel at a depth of 40 to 60 inches. These soils are on valley train terraces along the major streams and on broad outwash terraces on the uplands.

In a representative profile the surface layer is brown silt loam 10 inches thick. The subsoil extends to a depth of 45 inches. The upper 12 inches is dark brown silty clay loam, the middle 12 inches is dark brown clay loam, and the lower 11 inches is dark yellowish brown and dark brown gravelly sandy clay loam. The substratum is stratified gravelly sand to a depth of 60 inches.

Available water capacity is high, and permeability is moderate in the subsoil and rapid in the underlying sand and gravel. Runoff is moderate to slow. Water seldom ponds on the surface for prolonged periods. The rooting zone is deep.

Most areas of Ockley soils are used for crops. Corn, soybeans, and meadow crops are the main crops. These soils generally dry out quickly in spring, and they are suited to specialty and truck crops. They make desirable building sites.

Representative profile of Ockley silt loam, 2 to 6 percent slopes, in Beaver Creek Township, NE¼SE¼ sec. 22; 6 miles northwest of Xenia, 1,500 feet east of Beaver Valley Road, and 100 yards south of ½ section line:

Ap—0 to 10 inches; brown (10YR 4/3) silt loam; moderate medium granular structure; friable; many roots; slightly acid; clear smooth boundary.

B1t—10 to 19 inches; dark brown (7.5YR 4/4) light silty clay loam; moderate medium subangular blocky structure; friable; many roots; thin patchy dark brown (7.5YR 4/2) clay films; medium acid; clear wavy boundary.

B21t—19 to 22 inches; dark brown (7.5YR 4/4) light silty clay loam; moderate medium subangular blocky structure; firm; common roots; thin and medium continuous dark brown (7.5YR 4/2) clay films; medium acid; clear wavy boundary.

IIB22t—22 to 34 inches; dark brown (7.5YR 4/4) clay loam, moderate coarse and medium subangular blocky structure; firm; common roots; medium continuous dark brown (7.5YR 4/2) clay films; about 5 percent gravel; medium acid; gradual irregular boundary.

IIB23t—34 to 39 inches; dark yellowish brown (10YR 4/4) gravelly sandy clay loam; moderate medium subangular blocky structure; firm; few roots; medium continuous dark brown (7.5YR 4.2) clay films; about 25 percent gravel; slightly acid; gradual irregular boundary.

IIB3—39 to 45 inches; dark brown (10YR 4/3) gravelly sandy clay loam; weak coarse and medium subangular blocky structure; firm; few roots; medium continuous dark brown (7.5YR 4/2) clay film coating sand grains; about 25 percent gravel; neutral; clear irregular boundary.

IIC—45 to 60 inches; dark grayish brown (10YR 4/2) stratified gravelly sand; single grained; loose; moderately alkaline, calcareous.

The solum ranges from 42 to 60 inches in thickness. The loess mantle is as much as 24 inches thick. Unless limed, the upper part of the solum ranges from medium acid to strongly acid; reaction gradually becomes less acid as depth increases. Calcareous material commonly is at a depth of 40 to 50 inches.

The Ap horizon is brown (10YR 4/3) or dark yellowish brown (10YR 4/4). The upper part of the B horizon is silty clay loam or clay loam. The B horizon has hue of 7.5YR and 10YR, value of 3 through 5, and chroma of 3 or 4. The lower part of the solum is clay loam, gravelly clay loam, or gravelly sandy clay loam. The C horizon is dark grayish brown (10YR 4/2), yellowish brown (10YR 5/4), or brown (10YR 5/3).

Ockley soils are the well drained member of a drainage sequence that includes the moderately well drained Thackery soils, the somewhat poorly drained Sleeth soils, and the very poorly drained Westland soils. Ockley soils are commonly near Rush, Eldean, and Wea soils. They are deeper to sand and gravel than Eldean soils, and they have a lighter colored surface layer than Wea soils. They have more sand in the subsoil than Rush soils.

OcA—Ockley silt loam, 0 to 2 percent slopes. This nearly level soil is throughout the county on terraces along the larger streams. The largest areas are on terraces along Little Miami River.

Included with this soil in mapping are small areas of Rush and Eldean soils.

This soil has few, if any, limitations that restrict its use for farming. It is well suited to all crops commonly grown in the county. Runoff is slow, and the hazard of erosion is slight. The soil is well suited to irrigation. This soil has few limitations for most nonfarm uses. Capability unit I-1; woodland suitability group 1o1.

OcB—Ockley silt loam, 2 to 6 percent slopes. This gently sloping soil is on broad, undulating terraces. Areas commonly are round in shape and 3 to 10 acres in size. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Rush soils. Also included are a few areas of Eldean soils.

Runoff is medium. The hazard of erosion is moderate if this soil is cultivated. The soil is suited to most crops commonly grown in the county. It is well suited to irrigation. It has few limitations for most nonfarm uses. Capability unit IIe-1; woodland suitability group 1o1.

OcB2—Ockley silt loam, 2 to 6 percent slopes, moderately eroded. This gently sloping soil is along the margins of terraces and along drainageways. Areas commonly are round in shape and 3 to 10 acres in size. The plow layer is a mixture of the original surface layer and material from the subsoil. Erosion has lowered the organic matter content of the surface layer, which has resulted in a slightly lower available water capacity and poorer tilth.

Included with this soil in mapping are spots of Eldean soils.

This soil is used mostly for crops. It is highly susceptible to erosion. It is slightly more droughty than uneroded Ockley soils and is subject to crusting if irrigated.

Erosion and droughtiness are the main limitations to use of this soil for farming. It has few limitations for most nonfarm uses. Capability unit IIe-2; woodland suitability group 1o1.

OdB—Ockley-Urban land complex, undulating. This complex consists of nearly level and gently sloping Ockley soils that are on stream terraces and that have been developed for residential and industrial use. Most areas have been disturbed or buried by earthmoving and fill operations. About 15 to 30 percent of the area of this complex is covered by buildings, driveways, and streets; 25 to 50 percent is borrow or fill areas; and 25 to 60 percent is undisturbed Ockley soils in undeveloped lots and parts of developed lots.

Included with this complex in mapping are spots of Rush and Eldean soils in the undisturbed areas.

This complex is not used for farming. It provides stable sites for buildings. Erosion is a hazard on construction sites, particularly in the gently sloping areas. The rapid permeability in the underlying sand and gravel is a hazard for sewage lagoons and trench-type sanitary landfills. There are few limitations for most other nonfarm uses. Not assigned to a capability unit and woodland suitability group.

Odell Series

The Odell series consists of gently sloping, somewhat poorly drained soils that formed in loam glacial till. These soils are in small areas on the uplands in the eastern and northwestern parts of the county.

In a representative profile the upper part of the surface layer is 7 inches of black silt loam and the lower part is 4 inches of silty clay loam. The subsoil is 13 inches of mottled dark yellowish brown and brown clay loam. The substratum is mottled grayish brown loam to a depth of 60 inches.

Available water capacity is high, and permeability is moderate in the subsoil and moderately slow in the underlying glacial till. These soils have a seasonal high water table in winter and in spring if not artificially drained. The rooting zone is moderately deep.

Odell soils are used mostly for crops.

Representative profile of Odell silt loam, 2 to 6 percent slopes, in Bath Township; 75 feet north of drainage ditch along north side of Herr Road, directly north of farm lane that enters Herr Road from the south:

Ap—0 to 7 inches; black (10YR 2/1) silt loam; moderate medium and fine granular structure; friable; many roots; mildly alkaline; clear smooth boundary.

A12—7 to 11 inches; black (10YR 2/1) light silty clay loam; few fine distinct brown (10YR 4/3) and grayish brown (10YR 5/2) mottles; moderate medium and coarse subangular blocky structure; friable; many roots; neutral; clear smooth boundary.

B2t—11 to 15 inches; dark yellowish brown (10YR 4/4) clay loam; many medium faint brown (10YR 4/3) mottles and common medium faint dark grayish brown (10YR 4/2) mottles; moderate medium subangular blocky structure; friable; many roots; thin patchy very dark grayish brown (10YR 3/2) organic coatings and clay films on ped faces; neutral; clear wavy boundary.

B3—15 to 24 inches; brown (10YR 5/3) light clay loam; many fine distinct yellowish brown (10YR 5/6) mottles and common fine faint grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; friable; few thin roots; thin patchy brown (10YR 4/3) clay films; few gray to light gray (10YR 5/1 to 7/1) weathered limestone pebbles; mildly alkaline; gradual wavy boundary.

C—24 to 60 inches; grayish brown (10YR 5/2) loam; many fine distinct yellowish brown (10YR 5/4) and brownish yellow (10YR 6/6) mottles and stains; massive; very firm; moderately alkaline, calcareous.

The solum ranges from 20 to 30 inches in thickness. The A horizon is 10 to 14 inches thick. Reaction of the solum is slightly acid or neutral in the upper part and neutral or mildly alkaline and, in places, slightly calcareous in the lower part.

The A horizon is black (10YR 2/1), very dark gray (10YR 3/1), and very dark grayish brown (10YR 3/2). The B horizon has hue of 10YR, value of 4 through 6, and chroma of 3 or 4. Chroma of 2 is in individual horizons. This horizon is heavy loam or clay loam and includes thin horizons of silty clay loam in places. The C horizon is grayish brown (10YR 5/2), brown (10YR 5/3), and yellowish brown (10YR 5/4).

Odell soils are near Brookston and Crosby soils. They have a more brownish and less grayish subsoil than Brookston soils. They have a darker colored surface layer than Crosby soils.

OeB—Odell silt loam, 2 to 6 percent slopes. This gently sloping soil commonly is near the base of the more sloping upland soils. It is at slightly higher elevations around Brookston soils in depressions. Most areas are small.

Included with this soil in mapping are spots of Brookston soils.

This soil is used mostly for crops. Runoff is slow to medium. The moderate hazard of erosion as well as a seasonal high water table is also a limitation for many nonfarm uses. Capability unit IIw-2; woodland suitability group 2w2.

Patton Series

The Patton series consists of nearly level to depressional, very poorly drained soils that formed in silty lacustrine material. These soils are in areas that formerly were glacial lakes.

In a representative profile the surface layer is very dark grayish brown silty clay loam 8 inches thick. The upper part of the subsoil is 10 inches of very dark gray silty clay loam. The lower part is 14 inches of mottled, dark gray and light brownish gray silty clay loam. The substratum is light brownish gray stratified silt loam to a depth of 60 inches.

Available water capacity is high, and permeability is moderately slow. The water table is high for long periods in winter and in spring unless these soils are drained. The organic matter content is high. The rooting zone is moderately deep.

Drained areas of Patton soils are used for most field crops commonly grown in the county. Undrained areas are used mostly for pasture.

Representative profile of Patton silty clay loam, in Xenia Township, NW¼ sec. 5; ¼ mile west of State Route 235, along Ludlow Creek:

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) light silty clay loam; strong medium and fine granular structure; friable; many roots; neutral; clear smooth boundary.

B1g—8 to 18 inches; very dark gray (10YR 3/1) silty clay loam; strong medium and coarse angular blocky structure; firm; many roots; neutral; gradual smooth boundary.

B2g—18 to 26 inches; dark gray (10YR 4/1) heavy silty clay loam; common medium faint dark grayish brown (10YR 4/2) mottles and few fine distinct brown (10YR 5/3) and yellowish brown (10YR 5/4) mottles; strong medium and coarse angular blocky structure; firm, sticky when wet; thin patchy very dark grayish brown (10YR 3/2) coatings; neutral; gradual smooth boundary.

B3g—26 to 32 inches; light brownish gray (10YR 6/2) silty clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; weak coarse angular blocky structure; firm, sticky when wet; few roots; thin patchy clay films on ped faces; neutral; clear smooth boundary.

C1g—32 to 36 inches; light brownish gray (2.5Y 6/2) silt loam; few medium distinct brown (10YR 5/3) mottles; weak thick platy structure; friable; neutral to mildly alkaline; gradual wavy boundary.

C2g—36 to 60 inches; light brownish gray (2.5Y 6/2) silt loam; thin laminations of silty clay loam; friable; moderately alkaline, calcareous.

The solum ranges from 30 to 40 inches in thickness. Reaction of the solum is generally neutral, but it ranges from slightly acid to mildly alkaline.

The A horizon is black (10YR 2/1), very dark gray (10YR 3/1), and very dark grayish brown (10YR 3/2). The B2g and B3g horizons have hue of 2.5Y or 10YR, value of 4 through 6, and chroma of 1 or 2. They are mainly silty clay loam but thin layers of silty clay or clay are in some profiles. Mottles range from few to many. The C horizon has hue of 10YR or 2.5Y, value of 4 through 6, and chroma of 2 through 4. It is silty clay loam or silt loam and is laminated.

Patton soils are commonly adjacent to Brookston, Ragsdale, and Westland soils. They are underlain by silty lacustrine material instead of loam glacial till that underlies Brookston soils. Patton soils are similar to Ragsdale soils. They have stratification in the underlying material, and Ragsdale soils have no stratification. They contain more silt and less sand than Westland soils, and are underlain by silt loam, whereas Westland soils are underlain by sand and gravel.

Pa—Patton silty clay loam. This nearly level, very poorly drained soil is in depressional positions in the northwestern and western parts of the county. Most areas are 3 to 10 acres in size.

Included with this soil in mapping are spots of Westland soils. Also included are spots of soils which have a subsoil of silt loam.

Runoff is slow to ponded. This soil is seasonally wet and slow to dry out in spring. Wetness is the major limitation to the use of this soil. If this soil is drained, it is suited to most row crops commonly grown in the county. The high water table is a severe limitation for most nonfarm uses. Capability unit IIw-3; woodland suitability group 2w1.

Ragsdale Series

The Ragsdale series consists of nearly level, very poorly drained soils that formed in loess 40 to more than 60 inches thick over glacial till. These soils are mostly in broad upland areas in the east-central part of the county. In the more rolling western part of the county, they are less extensive and are in slightly depressional upland areas and in areas along small drainageways.

In a representative profile the surface layer is black silty clay loam 16 inches thick. The upper part of the subsoil is 9 inches of dark grayish brown silty clay loam, the lower part is 25 inches of yellowish brown silty clay loam and silt loam. The upper part of the substratum is 15 inches of yellowish brown silt loam and the lower part is yellowish brown loam to a depth of 96 inches.

Available water capacity is high, and permeability is slow. Runoff is slow or ponded. These soils are saturated with water for a significant period in winter and in spring, and they are slow to dry out unless they are artificially drained. Some areas adjacent to drainageways are subject to flooding. The rooting zone is deep during the growing season when the water table is low.

Ragsdale soils are used mostly for cultivated crops. Most areas have been artificially drained.

Representative profile of Ragsdale silty clay loam, in Xenia Township; 2.9 miles south of Xenia, 250 feet west of State Route 380, and ½ mile south of intersection of Washington Road and State Route 380 (Sample GN-11 in Laboratory Data Section):

Ap—0 to 8 inches; black (10YR 2/1) light silty clay loam; weak fine granular structure; friable; many roots; slightly acid; abrupt smooth boundary.

A1—8 to 16 inches; black (10YR 2/1) silty clay loam; common medium faint very dark grayish brown (10YR 3/2) mottles and common medium distinct dark grayish brown (10YR 4/2) mottles; strong fine subangular blocky structure; firm; many roots; slightly acid; clear wavy boundary.

B21tg—16 to 25 inches; dark grayish brown (10YR 4/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to strong medium and fine angular blocky; firm; many roots; nearly continuous very dark grayish brown (10YR 3/2) organic stains on ped faces; thin patchy clay films on ped faces; neutral; clear wavy boundary.

B22t—25 to 39 inches; yellowish brown (10YR 5/4) light silty clay loam; common fine and medium distinct grayish brown (2.5Y 5/2) mottles and common medium faint yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium and coarse subangular blocky; firm; many roots; continuous dark grayish brown (10YR 4/2) coatings on ped faces; thin patchy clay films; on ped faces; mildly alkaline; diffuse wavy boundary.

B3—39 to 50 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct grayish brown (2.5Y 5/2) mottles and common fine and medium faint yellowish brown (10YR 5/6) mottles; moderate very coarse subangular blocky structure (some peds are 6 to 10 inches across); firm; few roots on surfaces of large peds; continuous dark grayish brown (10YR 4/2) silty coatings on ped faces; mildly alkaline; diffuse irregular boundary.

C1—50 to 66 inches; yellowish brown (10YR 5/4) silt loam; common fine and medium faint yellowish brown (10YR 5/6) mottles and common fine distinct grayish brown (2.5Y 5/2) mottles; massive; firm; common dark concretions; common krotovinas that contain dark gray (10YR 4/1), dark grayish brown (10YR 4/2), and very dark grayish brown (10YR 3/2) silty clay loam material extending into the C horizon. These are 1 inch to 2 inches in diameter and range from 1 foot to 10 feet apart; mildly alkaline; abrupt irregular boundary.

IIC2—66 to 96 inches; yellowish brown (10YR 5/4) loam; massive; firm; about 10 percent coarse fragments; moderately alkaline, calcareous.

The solum ranges from 40 to 60 inches in thickness. Unless limed, the solum is slightly acid to neutral in the upper part and neutral to mildly alkaline in the lower part.

The A horizon is black (10YR 2/1), very dark grayish brown (10YR 3/2), and very dark gray (10YR 3/1). It ranges from 10 to 18 inches in thickness. The B horizon to a depth of 25 to 40 inches has hue of 10YR through 5Y, value of 4 through 6, and chroma of 1 or 2. Mottles are common to many. This horizon is typically silty clay loam. The lower part of the B horizon commonly has higher chroma than the upper part; it is brown (10YR 5/3) or yellowish brown (10YR 5/6 or 5/4) silty clay loam or silt loam. The C horizon is yellowish brown (10YR 5/4) and brown (10YR 5/3) silt loam or loam. The thickness of the silt mantle in which these soils formed, which is the depth to the IIC horizon, ranges from 40 inches to more than 60 inches.

Ragsdale soils are the very poorly drained members of a drainage sequence that includes the somewhat poorly drained Reesville soils and the moderately well drained Birkbeck soils. Ragsdale soils are commonly adjacent to Westland, Raub, and Millsdale soils. They differ from Westland soils in that they formed in silty material, whereas Westland soils formed in loamy material over sand and gravel. They have more gray in the subsoil than Raub soils. They differ from Millsdale soils in not having bedrock within a depth of 20 to 40 inches. Ragsdale soils are similar to Brookston and Patton soils. They formed in loess, whereas Brookston soils formed in loam glacial till. They differ from Patton soils in having no stratification in the underlying material.

Ra—Ragsdale silty clay loam. This nearly level, very poorly drained soil is mainly in depressions on the uplands. In the eastern part of the county it is in large, irregularly shaped areas several hundred acres in size, and in the western part of the county it is in irregular-shaped areas 5 to 100 acres in size.

Included with this soil in mapping are small areas of Reesville soils on slight rises. Also included are small areas of Westland soils near large drainageways, and a few areas of soils that have a surface layer of silt loam.

This soil is suited to crops if drained. Runoff is slow and there is little hazard of erosion. The main limitation to use of this soil is seasonal wetness. The high water table is also a severe limitation for most nonfarm uses. Excavations or trenches in this soil are subject to caving. Capability unit IIw-3; woodland suitability group 2w1.

Randolph Series

The Randolph series consists of nearly level, somewhat poorly drained, moderately deep soils that formed in glacial till. These soils are in small areas in the northern and northeastern parts of the county.

In a representative profile the surface layer is dark grayish brown silt loam 9 inches thick. A subsurface layer is mottled brown silt loam 4 inches thick. The subsoil is mottled yellowish brown and brown. The upper part is 9 inches of silty clay loam, and the lower part is 13 inches of silty clay. Limestone bedrock is at a depth of 37 inches.

Available water capacity is moderate, and permeability is moderately slow. These soils have a high water table in winter and in spring. The rooting zone is moderately deep over limestone bedrock.

Areas of Randolph soils that can be drained are used for farming. Corn, soybeans, and grass-legume meadows are the main crops. Undrained areas are used for meadow, pasture, or woodland.

Representative profile of Randolph silt loam, 0 to 2 percent slopes, in Miami Township; about ½ mile southwest of the village of Clifton, ¼ mile west of Wilberforce-Clifton Road, and 160 feet north of Clifton Road:

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; many roots; medium acid; clear smooth boundary.

A2—9 to 13 inches; brown (10YR 5/3) silt loam; many medium faint grayish brown (10YR 5/2) mottles and few fine faint yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; friable; many roots; medium acid; clear smooth boundary.

B1—13 to 18 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct grayish brown (10YR 5/2) and brown (10YR 5/3) mottles; moderate medium subangular blocky structure; firm; common roots; continuous light brownish gray (10YR 6/2) silty coatings on ped faces; strongly acid; clear smooth boundary.

B21t—18 to 24 inches; brown (10YR 5/3) heavy silty clay loam; many medium faint grayish brown (10YR 5/2) mottles and many fine and medium distinct yellowish brown (10YR 5/6) mottles; strong medium subangular blocky structure; firm; common roots; common dark concretions; thin continuous grayish brown (10YR 5/2) clay films on vertical and horizontal ped faces; about 2 percent coarse fragments; strongly acid; gradual smooth boundary.

B22t—24 to 37 inches; yellowish brown (10YR 5/4) silty clay; many medium distinct grayish brown (10YR 5/2) and many medium faint yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm, sticky when wet; medium continuous grayish brown (10YR 5/2) clay films on ped faces; common roots; about 2 percent coarse fragments; neutral; abrupt irregular boundary.

IIR—37 inches; light gray (10YR 7/1) limestone bedrock.

The solum thickness and depth to bedrock range from 20 to 40 inches. Unless limed, the upper part of the solum ranges from slightly acid to strongly acid, and reaction in the lower part increases to neutral as depth increases.

The Ap horizon is dark grayish brown (10YR 4/2) and brown (10YR 5/3). The A2 horizon has hue of 10YR, value of 4 through 6, and chroma of 1 through 3. The B horizon has hue of 10YR and 2.5Y, value of 4 or 5, and chroma dominantly of 3 or 4, but chroma of 1 or 2 in subhorizons. Coatings on peds dominantly have chroma of 2 or less. The B2 horizon is heavy clay loam, heavy silty clay loam, silty clay, or clay. Some profiles have a thin layer of calcareous loam or sandy loam material above the bedrock. A thin dark grayish brown (10YR 4/2) very plastic clay layer several inches thick is in some profiles immediately at the contact with the limestone bedrock.

Randolph soils are the somewhat poorly drained members of a drainage sequence that includes the very poorly drained Millsdale soils and the well drained Milton soils. Randolph soils are near these soils and also near Crosby and Fincastle soils. They have limestone bedrock at a depth of 20 to 40 inches, and Crosby and Fincastle soils have no limestone bedrock at these depths.

RbA—Randolph silt loam, 0 to 2 percent slopes. This nearly level soil is on the uplands in the northern and northeastern parts of the county. Most areas are small and irregular in shape.

Included with this soil in mapping are spots of Fincastle and Crosby soils. Also included are a few areas of gently sloping soils.

This soil is used mostly for crops if it is artificially drained. Runoff is slow. The underlying bedrock is a hindrance to the installation of tile drainage systems in some areas. The seasonal high water table and moderate depth to bedrock are limitations for many nonfarm uses. Capability unit IIIw-1; woodland suitability group 3w1.

Raub Series

The Raub series consists of nearly level to gently sloping, somewhat poorly drained soils that formed in 22 to 40 inches of loess and in the underlying glacial till. These soils are on uplands, commonly below wet-weather seep zones. These seeps dry up early in summer.

In a representative profile the surface layer is very dark gray silt loam 8 inches thick. A subsurface layer is very dark grayish brown silty clay loam 6 inches thick. The subsoil is mottled yellowish brown. The upper 13 inches is silty clay loam, and the lower 17 inches is clay loam. The substratum is mottled yellowish brown clay loam to a depth of 60 inches.

Available water capacity is high. Permeability is moderate in the subsoil and slow in the underlying glacial till. Runoff is slow, but water does not generally pond on the surface. These soils have a seasonal high water table that is fed by seeps and springs. The rooting zone is deep. The water table and seep condition can be a hazard to houses with basements or to septic tanks built on these soils.

Most Raub soils are used for farming. Corn, soybeans, wheat, and grass-legume meadow are the main crops.

Representative profile of Raub silt loam, 2 to 6 percent slopes, in Sugar Creek Township, NW¼SW¼ sec. 4; ½ mile east-northeast of the village of Ferry, 0.2 mile south of Middle Run Road, and 100 feet east of Haines Road (Sample GN-23 in Laboratory Data Section):

Ap—0 to 8 inches; very dark gray (10YR 3/1) silt loam; moderate medium and fine granular structure; friable; many roots; slightly acid; clear smooth boundary.

A12—8 to 14 inches; very dark grayish brown (10YR 3/2) light silty clay loam; common fine distinct brown (10YR 4/3) mottles; strong medium and fine subangular blocky structure; firm; many roots; continuous very dark gray (10YR 3/1) organic stains on ped faces; slightly acid; gradual smooth boundary.

B21t—14 to 27 inches; yellowish brown (10YR 5/4) silty clay loam; few fine distinct light brownish gray (2.5Y 6/2) mottles; strong fine and medium subangular blocky structure; firm; common roots; thin continuous dark yellowish brown (10YR 4/4) clay films; very dark grayish brown (10YR 3/2) and very dark gray (10YR 3/1) organic stains on ped faces in the upper 3 inches of this horizon; slightly acid; abrupt wavy boundary.

IIB22t—27 to 36 inches; yellowish brown (10YR 5/6) clay loam; few medium distinct grayish brown (2.5Y 5/2) mottles; strong coarse subangular blocky structure; very firm; common roots; thin continuous brown (10YR 5/3) and dark yellowish brown (10YR 4/4) clay films on vertical and horizontal ped faces; 2 to 5 percent coarse fragments; slightly acid; gradual irregular boundary.

IIB3t—36 to 44 inches; yellowish brown (10YR 5/4) light clay loam; few fine faint yellowish brown (10YR 5/6) mottles; weak very coarse subangular blocky structure; firm; few roots; thin continuous dark yellowish brown (10YR 4/4) clay films on surface of large peds; common dark grayish brown (10YR 4/2) organic stains on ped faces; 5 to 19 percent coarse fragments; neutral on ped faces, mildly alkaline in ped interiors; gradual wavy to irregular boundary.

IIC—44 to 60 inches; yellowish brown (10YR 5/4) light clay loam; few fine faint yellowish brown (10YR 5/6) and common medium distinct light olive brown (2.5Y 5/4) mottles; massive; very firm; 10 to 15 percent coarse fragments; mildly alkaline, calcareous.

The solum ranges from 36 to 60 inches in thickness. Unless limed, the solum is medium acid to slightly acid in the upper part and neutral to mildly alkaline in the lower part.

The A horizon is very dark gray (10YR 3/1), very dark grayish brown (10YR 3/2), very dark brown (10YR 2/2), and black (10YR 2/1). It is 11 to 17 inches thick. The B horizon has hue of 10YR and value of 4 or 5. Dominant chroma is 3 or more and the range is 2 through 6. Mottles are few to many. The upper part of the B horizon is silty clay loam and the lower part is clay loam. The C horizon is yellowish brown (10YR 5/4) or light olive brown (2.5Y 5/4) loam or light clay loam.

Raub soils are near Xenia, Edenton, and Ragsdale soils. They have a darker colored surface layer than Xenia soils and less gray in the subsoil than Ragsdale soils. They have a darker colored surface layer than Edenton soils and have no bedrock at a depth of 20 to 40 inches.

RdA—Raub silt loam, 0 to 2 percent slopes. This nearly level soil is commonly at the base of gently sloping areas. It has uniform slopes and is only slightly eroded. Areas of this soil are mostly less than 15 acres in size.

Included with this soil in mapping are spots of very poorly drained Ragsdale soils in slight depressions.

Runoff is slow. The dominant limitation to use of this soil for farming is long periods of wetness in winter and in spring. Drainage is needed for optimum crop production. The seasonal high water table is also a limitation for many nonfarm uses. Capability unit IIw-2; woodland suitability group 2w2.

RdB—Raub silt loam, 2 to 6 percent slopes. This gently sloping soil is near the base of more sloping upland soils. Slopes are mostly convex and are 80 to 150 feet or more in length. Most areas are 4 to 20 acres in size. Bedrock is within a depth of 8 to 10 feet in many areas. This soil is in a slightly higher position than the nearby Ragsdale soils in depressions. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of lighter colored Xenia soils and a few spots of the wetter Ragsdale soils. Also included are a few areas of soils that are similar to this soil but are moderately well drained.

This soil is used mostly for crops. Runoff is moderate. This soil has a moderate hazard of erosion as well as a seasonal high water table. The seasonal high water table is the main limitation for many nonfarm uses. Capability unit IIw-2; woodland suitability group 2w2.

Reesville Series

The Reesville series consists of nearly level, somewhat poorly drained soils that formed in loess 34 to 60 inches thick over glacial till. These soils are mostly on upland areas in the east-central part of the county. They are less extensive in the southern and southwestern parts of the county.

In a representative profile the surface layer is dark grayish brown silt loam 8 inches thick. A subsurface layer is mottled grayish brown silt loam 4 inches thick. The upper 18 inches of the subsoil is mottled brown silty clay loam, and the lower 7 inches is mottled light olive brown silt loam. The upper part of the substratum is 5 inches of mottled light olive brown silt loam and the lower part is mottled brown loam to a depth of 72 inches.

Available water capacity is high, and permeability is moderate to moderately slow. Runoff is medium to slow. Ponding may occur but is generally of short duration. These soils are saturated with water for significant periods in winter and in spring unless they are artificially drained. The rooting zone during the growing season is deep.

Reesville soils are used mostly for cultivated crops.

Representative profile of Reesville silt loam, 0 to 2 percent slopes, in Jefferson Township; 3 miles west-northwest of Bowersville, 1¼ miles north of Hussey Road on Hite Road, 75 yards east of Hite Road, and 40 yards northeast of farm buildings:

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

A2—8 to 12 inches; grayish brown (10YR 5/2) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak thick platy structure parting to weak fine subangular blocky; friable; medium acid; clear smooth boundary.

B21tg—12 to 18 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct dark grayish brown (10YR 4/2) mottles and few fine faint yellowish brown (10YR 5/6) mottles; moderate medium and fine subangular blocky structure; firm; many fine black concretions; thiny patchy dark grayish brown (10YR 4/2) clay films; thin grayish brown (2.5Y 5/2) silty coatings in upper part; medium acid; gradual smooth boundary.

B22tg—18 to 30 inches; yellowish brown (10YR 5/4) silty clay loam; many medium faint light olive brown (2.5Y 5/4) mottles and common fine distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; few fine and medium black concretions; thin continuous dark grayish brown (10YR 4/2) clay films; slightly acid; clear wavy boundary.

B3tg—30 to 37 inches; light olive brown (2.5Y 5/4) silt loam; common medium distinct yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; friable; thin patchy grayish brown (10YR 5/2) clay films on vertical ped faces; mildly alkaline, calcareous; clear wavy boundary.

C1—37 to 42 inches; light olive brown (2.5Y 5/4) silt loam; many medium distinct yellowish brown (10YR 5/6) mottles and common medium distinct grayish brown (10YR 5/2) mottles; massive; friable; moderately alkaline, calcareous; clear wavy boundary.

IIC2—42 to 72 inches; brown (10YR 4/3) loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium platy structure; firm; moderately alkaline, calcareous.

The solum ranges from 30 to 60 inches in thickness. Depth to carbonates commonly is the same as solum thickness, although some profiles have a calcareous B3 horizon a few inches thick. Thickness of the loess is 34 to 60 inches, and is highly variable in many areas. Unless limed, the solum ranges from slightly acid to strongly acid in the upper part and from slightly acid to mildly alkaline in the lower part.

The Ap horizon ranges from dark grayish brown (10YR 4/2) to grayish brown (10YR 5/2). The B horizon is dominantly yellowish brown (10YR 5/4), but in places it is also brown (10YR 5/3 and 4/3), grayish brown (10YR 5/2), dark yellowish brown (10YR 4/4), and light olive brown (2.5Y 5/4). Mottles are few to many. This horizon is silty clay loam or silt loam. A calcareous C horizon of silt loam that is as much as 30 inches thick is in most profiles. A IIC horizon of loam or coarse silt loam is below this.

Reesville soils are the somewhat poorly drained member of a drainage sequence that includes the moderately well drained Birkbeck soils and the very poorly drained Ragsdale soils. Reesville soils are similar to Fincastle soils, but they formed entirely in loess, whereas Fincastle soils formed partly in the underlying glacial till.

ReA—Reesville silt loam, 0 to 2 percent slopes. This nearly level soil is on uplands in the east-central part of the county. Areas are mostly large; some are more than 100 acres in size. They are irregular in shape. This soil is associated with the wetter Ragsdale soils. Thickness of the silt is very irregular. More than half the acreage of this soil has a loess mantle that is more than 40 inches thick.

Included with this soil in mapping are small areas of Ragsdale soils and areas of Fincastle soils where the silt mantle is less than 40 inches thick. Also included are a few areas of soils that have slopes of 3 to 4 percent.

The variable silt thickness makes slight differences in the use of this soil for farming. Tile drains will function more efficiently where tile is placed in soil formed from silt than where placed in soil formed from till. The underlying glacial till has greater strength for buildings and highways than the overlying silty material. The high water table for prolonged periods in winter and in spring is a hazard for such nonfarm uses as homesites or individual sewage disposal systems. Capability unit IIw-2; woodland suitability group 2w2.

Ritchey Series

The Ritchey series consists of gently sloping to steep, shallow, well drained soils that formed in glacial till. These soils are on the uplands along valley side slopes in the northern part of the county.

In a representative profile the surface layer is very dark grayish brown silt loam 4 inches thick. A subsurface layer is yellowish brown silt loam 3 inches thick. The upper part of the subsoil is 4 inches of yellowish brown silty clay loam, and the lower part is 7 inches of dark yellowish brown clay. Limestone bedrock is at a depth of 18 inches.

Available water capacity is low, and permeability is moderate. These soils are droughty. The rooting zone is shallow over bedrock. Tree roots often penetrate joints and cracks in the upper layers of bedrock.

Ritchey soils are used mostly for woodland or permanent pasture.

Representative profile of Ritchey silt loam, 2 to 6 percent slopes, in Miami Township; ½ mile southwest of the village of Clifton and 500 feet north of Clifton Road:

Ap—0 to 4 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; neutral; clear smooth boundary.

A2—4 to 7 inches; yellowish brown (10YR 5/4) silt loam; moderate fine granular structure; friable; neutral; clear smooth boundary.

B1—7 to 11 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine subangular blocky structure; firm; thin patchy brown coatings on ped surfaces; 2 to 5 percent limestone and granitic fragments; neutral; gradual smooth boundary.

B2t—11 to 18 inches; dark yellowish brown (10YR 4/4) clay; moderate medium subangular blocky structure; firm; thin patchy clay films on ped surfaces; 5 to 10 percent limestone and granitic fragments; mildly alkaline; clear wavy boundary.

IIR—18 inches; hard limestone bedrock.

The solum thickness and depth to limestone bedrock range from 10 to 20 inches. Reaction of the solum ranges from medium acid to neutral in the upper part and from neutral to mildly alkaline in the lower part.

The Ap horizon is dark grayish brown (10YR 4/2) or dark brown (10YR 4/3). A thin A2 horizon is commonly in uncultivated areas and below the Ap horizon in some cultivated areas. The Bt horizon is brown (7.5YR 4/4) or dark yellowish brown (10YR 4/4) silty clay loam, silty clay, or clay. Tongues of material from the B2 horizon commonly extend into fractures of the limestone bedrock. The B horizon is 2 to 10 percent limestone and granitic coarse fragments.

Ritchey soils in Greene County contain slightly more clay in the subsoil than other Ritchey soils. This difference does not affect the use and management of these soils.

Ritchey soils are near Hennepin, Milton, and Milton variant soils. They are underlain by bedrock at a depth of 10 to 20 inches, and Hennepin soils have no bedrock at these depths. They are shallower to limestone bedrock than Milton soils. They contain fewer coarse fragments and have a lighter colored surface layer than Milton variant soils.

RhB—Ritchey silt loam, 2 to 6 percent slopes. This gently sloping soil is on the upper parts of slopes in areas of bedrock-controlled uplands. Most areas are about 5 to 15 acres in size. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of the Milton soils. Also included are a few areas of soils that have slopes of less than 2 percent.

Some areas of this soil are used for crops, but most areas are used for pasture or are in brush. This soil has moderate hazards of drought and erosion if it is farmed. It has severe limitations for most nonfarm uses because it is shallow to limestone bedrock. Capability unit IIIe-4; woodland suitability group 4d1.

RhC—Ritchey silt loam, 6 to 12 percent slopes. This sloping soil is in narrow bands on the shoulders of the uplands. Most areas are about 2 to 10 acres in size. In most areas the surface layer is moderately eroded. Most areas have scattered limestone flagstones on the surface. A few areas of this soil are severely eroded and the surface layer consists mainly of material from the subsoil.

Included with this soil in mapping are small areas of Milton soils and a few spots of soils that have bedrock at a depth of less than 10 inches. Also included are a few spots of darker colored soils in the narrow drainageways.

This soil has a moderate hazard of drought and a severe hazard of erosion if it is farmed. Slope and shallow depth to bedrock are limitations for nonfarm uses. Capability unit IVe-2; woodland suitability group 4d1.

RhD—Ritchey silt loam, 12 to 18 percent slopes. This moderately steep soil is on uplands along Little Miami River. It commonly is in narrow bands parallel to stream valleys and escarpments. In some areas, this soil makes up most of the valley side slope.

Included with this soil in mapping are small areas of Milton soils, which are deeper to limestone bedrock than this soil. Also included are areas where the limestone bedrock is at a depth of less than 10 inches. Limestone outcrop is common in some areas.

The hazard of erosion is very severe. Drought is a moderate hazard because the rooting zone is shallow. This soil is generally unsuited to cultivated crops because of steep slope and shallow depth to limestone bedrock. Slope and shallow depth to bedrock are also severe limitations for most nonfarm uses. Capability unit VIe-3; woodland suitability group 4d2.

RhE2—Ritchey silt loam, 18 to 25 percent slopes, moderately eroded. This steep soil is on hillsides of the bedrock-controlled uplands overlooking the river valleys. Most areas are 5 to 30 acres or more in size. This soil has a profile similar to the one described as representative of the series, but the surface layer is thinner, and 5 to 15 percent of the surface is commonly covered by limestone flagstones.

Included with this soil in mapping are small areas of soils that are less than 10 inches to limestone bedrock. Also included are small spots of darker colored soils in the narrow drainageways.

Runoff is very rapid. This soil has a very severe hazard of erosion and a severe hazard of drought which makes it unsuitable for crops. It is suited to woodland or pasture. Slope and shallow depth to bedrock are severe limitations for most nonfarm uses. Capability unit VIe-3; woodland suitability group 4d2.

Rodman Series

The Rodman series consists of steep to very steep, excessively drained soils that formed in loamy material over sand and gravel outwash. These soils are on terrace escarpments along streams and on kames on the uplands.

In a representative profile the surface layer is very dark gray gravelly loam 6 inches thick. The subsoil is dark brown gravelly sandy loam 4 inches thick. The substratum is yellowish brown stratified sand and gravel to a depth of 60 inches.

Available water capacity is low, and permeability is rapid. The rooting zone is shallow. These soils are droughty.

Most Rodman soils are in woodland or pasture; a small acreage is cropped.

Representative profile of Rodman gravelly loam, from an area of Casco-Rodman loams, 18 to 50 percent slopes, moderately eroded, in Bath Township, NE¼ SW¼ sec. 9; 2 miles northeast of Fairborn and 150 yards south of Yellow Springs-Fairfield Road (Sample GN-24 in Laboratory Data Section):

A1—0 to 6 inches; very dark gray (10YR 3/1) gravelly loam; moderate fine granular structure; friable; many roots; 20 percent coarse fragments; mildly alkaline; clear smooth boundary.

B2—6 to 10 inches; dark brown (7.5YR 4/4) gravelly sandy loam; moderate fine granular structure; friable; many roots; 30 to 40 percent coarse fragments; mildly alkaline, weakly calcareous; gradual wavy boundary.

C—10 to 60 inches; yellowish brown (10YR 5/4) very gravelly loamy coarse sand; single grained; stratified; loose; few fine roots in upper part; 50 percent coarse fragments, variable from one stratum to the next; moderately alkaline, calcareous.

The solum ranges from 8 to 15 inches in thickness. Reaction of the solum is neutral or mildly alkaline.

The A horizon is very dark gray (10YR 3/1), very dark grayish brown (10YR 3/2), very dark brown (10YR 2/2), and dark brown (7.5YR 3/2). The B horizon generally has hue of 7.5YR, but has 10YR in places; it has value of 4 or 5 and chroma of 3 or 4. The C horizon consists of stratified sand and gravel. The outwash strata are variable over short distances, ranging from sand to gravel or a mixture of sand and gravel. In kames the bedding is generally tilted and more irregular than in valley trains or outwash terraces.

Rodman soils in Greene County have a higher calcium carbonate content immediately below the surface layer than other Rodman soils. This difference does not affect the use and management of these soils.

Rodman soils are most commonly near Casco soils. They have a darker colored surface layer and are shallower to sand and gravel than these soils.

Rodman soils in Greene County are mapped only in complex with Casco soils. For description of Casco-Rodman loams, see Casco series.

Ross Series

The Ross series consists of nearly level, well drained soils that formed in recent alluvium on flood plains. These soils are mainly along Little Miami River and its larger tributaries.

In a representative profile the surface layer is dark brown loam in the upper 12 inches and very dark grayish brown loam in the lower 16 inches. The subsoil is yellowish brown loam 12 inches thick. The substratum is brown loam in the upper 16 inches and brown gravelly sand to a depth of 78 inches.

Available water capacity is high, and permeability is moderate. These soils are subject to occasional flooding, generally in winter and in spring. A high water table persists in these soils for an extended period after the floodwater subsides. The rooting zone is deep in summer.

Most Ross soils are used for crops. Corn is the main crop. Some areas are also used for soybeans, grass-legume meadow, or pasture.

Representative profile of Ross loam, in Spring Valley Township; 4½ miles southeast of the village of Spring Valley, 100 feet south of Andersons Fork, and 200 feet east of Cemetery Road:

A11—0 to 8 inches; dark brown (10YR 3/3) loam; weak fine and medium granular structure; friable; many roots; neutral; clear smooth boundary.

A12—8 to 12 inches; dark brown (10YR 3/3) loam; weak medium granular structure; friable; many roots; neutral; clear irregular boundary.

A13—12 to 28 inches; very dark grayish brown (10YR 3/2) loam; moderate medium and fine subangular blocky structure; friable; common roots; neutral; gradual wavy boundary.

B—28 to 40 inches; yellowish brown (10YR 5/4) loam; weak medium and coarse subangular blocky structure; friable; few roots; very dark grayish brown (10YR 3/2) organic stains on ped faces in upper part of horizon and as filling in old root channels or worm casts; neutral; gradual smooth boundary.

C1—40 to 56 inches; brown (10YR 5/3) loam; massive; friable; neutral; clear wavy boundary.

C2—56 to 78 inches; brown (10YR 5/3) gravelly sand; single grained; loose; moderately alkaline; abrupt smooth boundary.

The solum ranges from 24 to 40 inches in thickness. Reaction of the solum ranges from neutral to mildly alkaline.

The A horizon ranges from very dark brown (10YR 2/2) to dark brown (10YR 3/3). The B horizon has hue of 10YR, value of 4, and chroma of 3 or 4. It is generally loam, but strata of silt loam are common. The C horizon is brown (10YR 4/3 or 5/3), yellowish brown (10YR 5/4) and dark yellowish brown (10YR 4/4) loam, gravelly sand, or gravelly sandy loam.

Ross soils are near Eel, Genesee, and Sloan soils. They have a darker surface layer than Genesee and Eel soils. They differ from Sloan soils in having no gray mottles in the subsoil. They have less clay in the subsoil than Wea soils.

Rs—Ross loam. This nearly level soil is on flood plains along Little Miami River and its larger tributaries. It is mainly on slightly higher positions than the nearby Sloan soils. In a few places it is dissected by old river channels. The surface layer in most areas is loam, but in some it is silt loam.

Included with this soil in mapping are small areas of Genesee soils. Also included are small areas of soils that have thin layers of light colored alluvium deposited on the surface.

This soil is well suited to cultivated crops. It has good tilth and is easy to work. Flooding is the main hazard, especially to crops in winter. Row crops can be planted and often harvested during the nonflood period. Occasional flooding is also the main limitation of this soil for many nonfarm uses. Capability unit IIw-5; woodland suitability group 1o1.

Rush Series

The Rush series consists of nearly level to gently sloping, well drained soils that formed in loess 24 to 45 inches thick and in the underlying loamy glacial outwash. These soils are on outwash plains and terraces in the central part of the county.

In a representative profile the surface layer is brown silt loam 13 inches thick. The upper part of the subsoil is 25 inches of brown silty clay loam. The lower part is 9 inches of dark brown sandy clay loam, 7 inches of dark reddish brown sandy clay, and 6 inches of brown gravelly coarse sandy loam. The substratum is stratified sand and gravel to a depth of 120 inches.

Available water capacity is high, and permeability is moderate. Runoff is slow to medium, but water seldom ponds on this soil for extended periods. The rooting zone is deep.

Most areas of Rush soils are used for cultivated crops. Corn and soybeans are the main crops.

Representative profile of Rush silt loam, 0 to 2 percent slopes, in Xenia Township; 2¼ miles west of center of Xenia, 200 yards west of U.S. Route 35 bypass, and 250 yards south of Upper Bellbrook Road (Sample GN-16 in Laboratory Data Section):

Ap—0 to 10 inches; brown (10YR 4/3) silt loam; moderate medium and fine granular structure; friable; many roots; medium acid; abrupt smooth boundary.

A2—10 to 13 inches; brown (10YR 5/3) silt loam; weak medium and thin platy structure; friable; common roots; medium acid; gradual wavy boundary.

B1t—13 to 21 inches; brown (7.5YR 5/4) silty clay loam; moderate medium and fine subangular blocky structure; firm; common roots; thin very patchy brown (7.5YR 4/4) clay films on ped faces and thin patchy clay films in pores and root channels; patchy brown (7.5YR 5/4) silt coatings on ped faces; very strongly acid; gradual wavy boundary.

B21t—21 to 28 inches; brown (7.5YR 4/4) silty clay loam; strong medium subangular blocky structure parting to fine subangular blocky; firm; common roots; thin continuous dark yellowish brown (10YR 4/4) clay films on primary ped faces and most secondary ped faces; few very dark grayish brown (10YR 3/2) stains on faces of larger peds; very strongly acid; gradual wavy boundary.

B22t—28 to 38 inches; brown (7.5YR 4/4) silty clay loam; moderate coarse subangular blocky structure parting to moderate medium subangular blocky; firm; common roots; medium to thick continuous dark yellowish brown (10YR 4/4) clay films on primary ped faces and most secondary ped faces; common very dark grayish brown (10YR 3/2) and black (10YR 2/1) stains on faces of larger peds; very strongly acid; abrupt smooth boundary.

IIB23t—38 to 47 inches; dark brown (7.5YR 4/4) sandy clay loam; weak coarse subangular blocky structure parting to medium and fine subangular blocky; firm; few roots; medium and thick continuous dark yellowish brown (10YR 4/4) clay films on ped faces, and coatings on sand grains and gravel; 2 to 5 percent coarse fragments; very strongly acid; abrupt wavy boundary.

IIB24t—47 to 54 inches; dark reddish brown (5YR 3/3) sandy clay; weak coarse and medium subangular blocky structure; firm, sticky when wet; few roots; dark brown (7.5YR 3/2) clay films coating sand and gravel; 10 to 14 percent coarse fragments; slightly acid; clear irregular boundary.

IIB3—54 to 60 inches; brown (10YR 4/3) gravelly coarse sandy loam; single grained; loose; thin very patchy dark reddish brown (5YR 3/3) and dark brown (7.5YR 3/2) clay films coating some sand and gravel; remnants of weathered limestone and weathering rind on limestone gravel; 40 percent coarse fragments; mildly alkaline, calcareous; clear irregular boundary.

IIC—60 to 120 inches; brown (10YR 4/3) gravelly coarse sand; single grained; stratified; loose; strata range from 25 to 75 percent coarse fragments a few sandy lenses that have little or no coarse fragments; moderately alkaline, calcareous.

The solum ranges from 45 to 70 inches in thickness. These soils formed in 24 to 45 inches of silty material over loamy outwash. Unless limed, the solum is medium acid to very strongly acid in the upper part and slightly acid to mildly alkaline in the lower part.

The Ap horizon is brown (10YR 4/3) or dark grayish brown (10YR 4/2). The A2 horizon has hue of 10YR, value of 4 or 5, and chroma of 2 through 4. The B1 and B2 horizons have hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 through 6. They are silt loam or silty clay loam. The IIB2 horizon has hue of 7.5YR or 5YR, and value and chroma of 3 through 5. The IIB2 horizon is clay loam, sandy clay loam, or sandy clay, and is gravelly in places. The C horizon is brown (10YR 4/3 or 5/3) calcareous sand and gravel.

Rush soils are commonly near Ockley, Thackery, and Wea soils. They have less sand in the subsoil than Ockley and Wea soils. They are not so dark colored in the surface layer as Wea soils. They are better drained than Thackery soils.

RtA—Rush silt loam, 0 to 2 percent slopes. This nearly level soil is on outwash plains and on terraces along the larger streams in the county. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of Wea soils. Also included are small areas of Ockley soils, which have more sand in the subsoil than this Rush soil. A few areas are underlain by loam glacial till at a depth of 40 to 72 inches.

This soil has few, if any, limitations that restrict its use for farming. It is well suited to all crops commonly grown in the county. There is little or no evidence of erosion. Runoff is slow and susceptibility to erosion is slight. This soil has good tilth over a wide range of soil moisture conditions. It has few limitations for most nonfarm uses. Capability unit I-1; woodland suitability group 1o1.

RtB—Rush silt loam, 2 to 6 percent slopes. This gently sloping soil is on terraces along the larger streams in the county. Most areas of this soil are 5 to 20 acres in size.

Included with this soil in mapping are small areas of Ockley soils, which have more sand in the subsoil than this Rush soil. Also included are a few areas of soils that are moderately eroded.

This soil is suited to most crops commonly grown in the county. Runoff is medium, and there is a moderate hazard of erosion if this soil is cultivated. This soil has good tilth over a wide range of moisture conditions and is well suited to irrigation. It has few limitations for most nonfarm uses. Capability unit IIe-1; woodland suitability group 1o1.

Russell Series

The Russell series consists of nearly level to gently sloping, well drained soils that formed partly in loess and partly in the underlying loam glacial till. These soils are on uplands in the central, southern, and southwestern parts of the county.

In a representative profile the surface layer is dark grayish brown silt loam 8 inches thick. A subsurface layer is brown silt loam 5 inches thick. The subsoil is yellowish brown. It is silty clay loam in the upper 16 inches and clay loam in the lower 8 inches. The substratum is yellowish brown and dark yellowish brown loam to a depth of 60 inches.

Available water capacity is high. Permeability is moderate in the upper part of the subsoil and moderately slow in the lower part and in the underlying glacial till. Runoff is slow to rapid, depending on the slope. Water seldom ponds on the surface for extended periods. The rooting zone is deep.

Most Russell soils are cultivated. Corn, soybeans, wheat, and grass-legume meadow are the main crops.

Representative profile of Russell silt loam, from an area of Russell-Miamian silt loams, 2 to 6 percent slopes, in Silvercreek Township; 100 feet east of Quarry Road, and 0.2 mile south of Cottonville Road:

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

A2—8 to 13 inches; brown (10YR 5/3) silt loam; weak fine granular structure; friable; many roots; slightly acid; clear smooth boundary.

B1t—13 to 17 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine and medium subangular blocky structure; firm; many roots; thin patchy dark yellowish brown (10YR 4/4) clay films; medium acid; clear wavy boundary.

B21t—17 to 22 inches; yellowish brown (10YR 5/4) silty clay loam; strong medium subangular blocky structure; firm; many roots; medium patchy brown (10YR 4/3) clay films; medium acid; clear smooth boundary.

IIB22t—22 to 29 inches; yellowish brown (10YR 5/4) heavy silty clay loam; moderate medium subangular blocky structure; firm; common roots; medium continuous brown (10YR 4/3) clay films on vertical and horizontal ped faces; 5 percent coarse fragments; slightly acid; gradual wavy boundary.

IIB3t—29 to 37 inches; yellowish brown (10YR 5/4) light clay loam; weak coarse subangular blocky structure; firm; few roots; thick continuous brown (10YR 4/3) clay films on ped faces; 5 percent coarse fragments; neutral, weakly calcareous in ped interiors; gradual irregular boundary.

C—37 to 60 inches; yellowish brown (10YR 5/4) and dark yellowish brown (10YR 4/4) loam; massive; firm; few roots; common gray (10YR 5/1) lime segregations; 10 percent coarse fragments; moderately alkaline, calcareous.

The solum is commonly 36 to 48 inches in thickness. The upper part of the solum formed in loess about 22 to 40 inches thick. Unless limed, the solum is medium acid to strongly acid in the upper part and slightly acid or neutral in the lower part.

The A horizon is dark grayish brown (10YR 4/2) or brown (10YR 5/3). The B and IIB horizons have hue of 10YR, value of 4 or 5, and chroma of 4 through 6. The B horizon is silty clay loam or heavy silt loam, and the IIB horizon is silty clay loam and clay loam. The C horizon is yellowish brown (10YR 5/4) and dark yellowish brown (10YR 4/4).

Russell soils are the well drained member of a drainage sequence that includes the moderately well drained Xenia soils and the somewhat poorly drained Fincastle soils. Russell soils are commonly adjacent to Miamian and Edenton soils. They formed in a thicker loess mantle than Miamian soils. They differ from Edenton soils in not having limestone bedrock at a depth of 20 to 40 inches.

RuA—Russell silt loam, 0 to 2 percent slopes. This nearly level soil is on broad ridgetops. Many areas are nearly circular.

Included with this soil in mapping are small areas of Miamian soils, which formed in a thinner loess mantle over glacial till than this Russell soil.

This soil is well suited to cultivated crops. It has few limitations for farming. Runoff is slow, and the hazard of erosion is slight. Moderately slow permeability in the lower part of the subsoil and in the underlying till is a limitation for some nonfarm uses. Capability unit I-1; woodland suitability group 1o1.

RvB—Russell-Miamian silt loams, 2 to 6 percent slopes. This complex consists of gently sloping soils in high positions on the glacial till uplands. Most areas are roughly circular, and they generally range from 5 to 25 acres in size. A few areas are as large as 100 acres. Most slopes are long. The Russell soil in this complex has the profile described as representative of the Russell series. This complex is 50 to 75 percent Russell soils and 25 to 50 percent Miamian soils. Russell soils are on the lower, slightly concave slopes, and Miamian soils are mostly on the upper, convex slopes.

Included with these soils in mapping are areas of moderately well drained Xenia soils. Also included are a few spots of soils that are moderately eroded. Some soils in areas of this complex between Little Miami River and Clark Run in Miami and Cedarville Townships have limestone bedrock at a depth of 40 to 60 inches.

Runoff is medium. There is a moderate hazard of erosion if cultivated crops are grown. Slope and moderately slow permeability in the lower part of the subsoil and in the underlying till are limitations for some nonfarm uses. Capability unit IIe-1; woodland suitability group 1o1.

RvB2—Russell-Miamian silt loams, 2 to 6 percent slopes, moderately eroded. This complex consists of gently sloping soils high on till plains. Most areas are circular and range from 5 to 25 acres in size. Slopes are mostly long.

The Russell soil and the Miamian soil both have profiles similar to the ones described as representative of their respective series, but they are moderately eroded. The plow layer of these soils is a mixture of the surface layer and some material from the upper part of the subsoil. Soils of this complex have a lower available water capacity and poorer tilth than the uneroded Russell-Miamian soils.

Russell and Miamian soils each make up about 40 to 60 percent of this complex. Miamian soils are mostly on convex upper slopes and the Russell soils are on concave lower slopes.

Included with these soils in mapping are small areas of moderately well drained Xenia soils.

Because surface runoff is mostly rapid, the hazard of erosion is moderate to severe in cultivated areas. Slope and moderately slow permeability in the lower part of the subsoil and in the underlying till are limitations for some nonfarm uses. Capability unit IIe-2; woodland suitability group 1o1.

Sleeth Series

The Sleeth series consists of nearly level, somewhat poorly drained soils that formed in medium textured material over sand and gravel glacial outwash. These soils are on outwash deposits on terraces and uplands.

In a representative profile the surface layer is dark grayish brown silt loam 6 inches thick. The subsurface layer is 4 inches of mottled grayish brown silt loam. The subsoil extends to a depth of 52 inches, and is mottled. The upper part is 5 inches of brown silt loam. Next is 9 inches of yellowish brown and light brownish gray silty clay loam and 8 inches of grayish brown gravelly clay loam. The lower part is 8 inches of pale brown gravelly loam. The substratum is brown gravelly coarse sandy loam to a depth of 60 inches.

Available water capacity is high. Permeability is moderate in the subsoil and rapid in the underlying sand and gravel. These soils have a seasonal high water table. The rooting zone is deep. Artificial drainage is often difficult because of inadequate drainage outlets.

Some areas of Sleeth soils are used for crops. Corn, soybeans, and meadow crops most commonly are grown. Some areas that are difficult to drain are woodland.

Representative profile of Sleeth silt loam, 0 to 2 percent slopes, in Spring Valley Township; 100 yards south of Spring Valley-Paintersville Road, and 3/4 mile east of U.S. Route 42 and village of Spring Valley (Sample GN-29 in Laboratory Data Section):

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium granular structure; friable; many roots; medium acid; abrupt smooth boundary.

A2—6 to 10 inches; grayish brown (10YR 5/2) silt loam; common medium faint light brownish gray (10YR 6/2) mottles and few fine faint dark yellowish brown (10YR 4/4) mottles; weak medium platy structure; friable; many roots; many dark grayish brown (10YR 4/2) stains and fillings in worm holes or root channels; medium acid; clear smooth boundary.

B1—10 to 15 inches; brown (10YR 5/3) silt loam; many medium faint light brownish gray (10YR 6/2) and light gray (10YR 7/2) mottles and common medium faint yellowish brown (10YR 5/4) mottles; weak coarse subangular blocky structure; friable; common roots; about 2 percent coarse fragments; medium acid; clear wavy boundary.

B21t—15 to 24 inches; yellowish brown (10YR 5/4) and light brownish gray (10YR 6/2) light silty clay loam; common faint brownish yellow (10YR 6/6) mottles and common medium distinct gray (10YR 6/1) mottles; moderate coarse subangular blocky structure parting to moderate fine subangular blocky; firm; common roots; few dark concretions; light brownish gray (10YR 6/2) ped coatings; thin very patchy clay films on ped faces; about 2 percent chert fragments as much as 1/2 inch in diameter; strongly acid; clear wavy boundary.

IIB22t—24 to 36 inches; light brownish gray (10YR 6/2) clay loam; many medium distinct yellowish brown (10YR 5/4) mottles and common fine faint grayish brown (10YR 5/2) and dark grayish brown (10YR 4/2) mottles; weak coarse subangular blocky structure; firm; few roots; thin continuous clay films that are light brownish gray (10YR 6/2) on vertical and horizontal ped faces and that are grayish brown (10YR 5/2) on linings of root channels and worm holes; medium acid; about 5 percent coarse fragments; clear smooth boundary.

IIB23t—36 to 44 inches; grayish brown (10YR 5/2) gravelly clay loam; many medium and large distinct yellowish brown (10YR 5/4 and 5/6) mottles; weak coarse subangular blocky structure; firm, sticky when wet; few roots; medium continuous grayish brown (10YR 5/2) clay films on vertical and horizontal ped faces; about 17 percent coarse fragments; neutral; clear irregular boundary.

IIB3t—44 to 52 inches; pale brown (10YR 6/3) gravelly loam; many fine and medium distinct yellowish brown (10YR 5/4 and 5/6), grayish brown (10YR 5/2), light gray (10YR 7/2), and very pale brown (10YR 8/3) mottles; weak coarse subangular blocky structure; firm; few roots; medium continuous grayish brown (10YR 5/2) clay films coating sand grains and gravel; about 32 percent coarse fragments; mildly alkaline; gradual irregular boundary.

IIC—52 to 60 inches; brown (10YR 5/3, 4/3) gravelly coarse sandy loam; single grained; loose; about 40 percent coarse fragments; moderately alkaline; calcareous.

The solum ranges from 40 to 55 inches in thickness. A silt mantle as much as 24 inches thick is on some areas. Unless limed, the solum is medium acid to strongly acid in the upper part and ranges to mildly alkaline in the lower part.

The Ap horizon is dark grayish brown (10YR 4/2 or 2.5Y 4/2). The A2 horizon is light brownish gray (10YR 6/2) or grayish brown (10YR 5/2). The B2 horizon has hue of 10YR or 2.5Y, value of 4 through 6, and chroma of 1 through 4. Mottles are common to many. The B2t horizon is silty clay loam or clay loam in the upper part and gravelly clay loam in the lower part. In places, individual horizons are loam, sandy clay loam, or sandy loam, and they are gravelly in places.

Sleeth soils are the somewhat poorly drained members of a drainage sequence that includes the well drained Ockley soils, the moderately well drained Thackery soils, and the very poorly drained Westland soils. They are most commonly associated with these soils.

SlA—Sleeth silt loam, 0 to 2 percent slopes. This nearly level soil is on outwash terraces at a slightly higher elevation than darker colored Westland soils. It is also in slightly depressed drainageways that are surrounded by Ockley soils.

Included with this soil in mapping are small areas of very poorly drained Westland soils and small areas of moderately well drained Thackery soils. Also included are areas of soils on the heads of drainageways of Massie Creek which are underlain by glacial till at a depth of 5 to 8 feet.

Seasonal wetness is the main limitation for farming. This soil is suited to crops if adequately drained. Runoff is slow and there is little, if any, hazard of erosion. Seasonal wetness is a moderate limitation for many nonfarm uses. Capability unit IIw-2; woodland suitability group 2w2.

Sloan Series

The Sloan series consists of level, very poorly drained soils that formed in alluvium. These soils are on flood plains along Little Miami River, Mad River, and their tributaries.

In a representative profile the surface layer is very dark gray silty clay loam 24 inches thick. The subsoil is mottled gray silty clay loam 21 inches thick. The substratum is mottled gray stratified loam, silt loam, sandy loam, and clay loam to a depth of 60 inches.

Available water capacity is high, and permeability is moderate. Runoff is slow. Sloan soils have a high water table for prolonged periods and are generally saturated in winter and in spring. They are commonly adjacent to streams and are subject to frequent flooding. The rooting zone is deep in summer after the water table drops. Artificial drainage is helpful in lowering the water table but it is often difficult to establish drainage outlets.

Where drained, Sloan soils are used for crops. Corn and soybeans are the main crops. Undrained areas are in swamp grasses, reeds, and water tolerant deciduous trees.

Representative profile of Sloan silty clay loam, in Beavercreek Township, SE¼ sec. 23; 4½ miles northwest of Xenia, and 0.75 mile east of Beaver Valley Road, on the west side of Beaver Creek:

Ap—0 to 8 inches; very dark gray (10YR 3/1) silty clay loam; moderate fine and medium granular structure; firm; many roots; neutral; gradual smooth boundary.

A12—8 to 24 inches; very dark gray (10YR 3/1) silty clay loam; moderate fine and medium subangular blocky structure; firm; many roots; neutral; gradual wavy boundary.

B2g—24 to 45 inches; gray (10YR 5/1) silty clay loam; many fine and medium faint gray (10YR 6/1) and dark gray (10YR 4/1) mottles and few fine distinct brown (10YR 5/3) and yellowish brown (10YR 5/4) mottles; weak coarse subangular blocky structure; firm; common roots; mildly alkaline; clear wavy boundary.

C—45 to 60 inches; gray (10YR 5/1) stratified loam, silt loam, sandy loam, and clay loam; common medium distinct grayish brown (10YR 5/2) and brown (10YR 5/3) mottles; massive; friable; mildly alkaline, calcareous.

The solum ranges from 36 to 48 inches in thickness. Reaction of the solum ranges from slightly acid to mildly alkaline in the upper part and from neutral to mildly alkaline in the lower part. Depth to calcareous material ranges from 30 to 50 inches.

The Ap and A1 horizons are very dark gray (10YR 3/1), black (10YR 2/1), and very dark grayish brown (10YR 3/2). The A horizon ranges from 15 to 24 inches in thickness. The B horizon has hue of 10YR, value of 4 or 5, and chroma of 1 or 2, and has few to many bright mottles. It is silty clay loam, clay loam, silt loam, or loam. The C horizon is stratified and has variable texture.

Sloan soils are the very poorly drained member of a drainage sequence that includes the well drained Genesee soils and the moderately well drained Eel soils. Sloan soils have a darker colored surface layer and are not so well drained as nearby Algiers soils. They are similar to Ross soils but have grayer colors in the subsoil.

So—Sloan silty clay loam. This level soil is on flood plains along many of the streams in the county. The largest areas are along Beaver Creek, Little Beaver Creek, Ludlow Creek, and Little Miami River. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Algiers and Eel soils that have a lighter colored surface layer than this Sloan soil and areas of better drained Ross soils. Also included are a few areas of soils that have a surface layer of silt loam and areas of soils along Beaver Creek that have a high water table throughout the year and are indicated on the soil map by wet spot symbols.

This soil has a seasonal high water table in winter and in spring, and it dries out slowly in spring. It is suited to most crops if drained. Fall planted crops such as wheat are subject to damage from flooding which commonly occurs in winter and in spring. Runoff is slow to ponded. A seasonal high water table and flooding are also major limitations for nonfarm uses. Capability unit IIIw-2; woodland suitability group 2w1.

Sp—Sloan-Fill land complex. This complex is made up of nearly level soil on flood plains where as much as 50 percent of the original soil has been covered by fill. The main area of this complex is on the Wright-Patterson Air Force Base. It is specifically in runways, taxiways, and land adjacent to these uses. The fill areas have 3 to 5 feet of fill material, mostly Sloan soil and some Westland and Linwood soils. The fill material is generally mineral soil, organic material, and other organic or inorganic debris from various sources. The parts of this mapping unit that are not covered by fill are mostly Sloan silty clay loam.

This complex is not used for farming. Suitability of the fill material for plant growth is quite variable. This complex is used mostly for nonfarm purposes. In most areas there is a hazard of flooding. The hazard is particularly acute in low areas or areas not yet filled. The high water table is also a limitation in these low areas. Not assigned to a capability unit and woodland suitability group.

Sr—Sloan-Urban land complex. This complex is made up of nearly level soil on flood plains where 50 to 72 percent of the original soil has been disturbed or covered by urban development. The major areas of this mapping unit are in the cities of Xenia and Fairborn. About 30 to 60 percent of this complex is covered by streets, driveways, parking lots, and buildings; 20 to 40 percent is undisturbed Sloan soil. Most areas are Sloan soil that has been covered by 2 to 5 feet of fill material. The fill material is mineral soil, organic waste, and other organic or inorganic debris from various sources.

This complex is not used for farming. Determining suitability for plant growth requires detailed study. Most areas are subject to flooding, especially those that have not been filled. The high water table in low lying areas is also a limitation for most uses. Not assigned to a capability unit and woodland suitability group.

Thackery Series

The Thackery series consists of nearly level to gently sloping, moderately well drained soils that formed in silty material and in the underlying loamy glacial outwash. These soils are on valley trains, terraces, and upland outwash deposits.

In a representative profile the surface layer is dark grayish brown silt loam 8 inches thick. The subsurface layer is about 4 inches of brown silt loam. The upper part of the subsoil is 6 inches of brown silt loam. Below this, the subsoil is mottled. It is dark yellowish brown, brown, and grayish brown clay loam to a depth of about 40 inches and is yellowish brown very gravelly loam between the depths of 40 and 50 inches. The substratum is brown gravelly loamy sand to a depth of 72 inches.

Available water capacity is high. Permeability is moderate in the subsoil and rapid in the substratum. Runoff is slow to medium. A perched water table is in these soils for short periods in winter and in spring. The rooting zone is deep.

Most areas of Thackery soils are used for cultivated crops. Corn, soybeans, wheat, and grass-legume meadow are the main crops.

Representative profile of Thackery silt loam, 0 to 2 percent slopes, in Xenia Township; 1.6 miles north of Xenia on U.S. Route 68, and 1/3 mile east of the intersection of U.S. Route 68 and Township Road T88 (Kinsey Road):

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

A2—8 to 12 inches; brown (10YR 5/3) silt loam; few fine faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/4) mottles; weak medium platy structure; friable; dark grayish brown (10YR 4/2) worm casts; medium acid; abrupt smooth boundary.

B1—12 to 18 inches; brown (10YR 5/3) heavy silt loam; moderate fine subangular blocky structure; friable; thin patchy grayish brown (10YR 5/2) silt coatings and thin very patchy brown (10YR 4/3) clay films on ped faces; medium acid; clear smooth boundary.

IIB21t—18 to 26 inches; dark yellowish brown (10YR 4/4) clay loam; few fine distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; thin patchy brown (10YR 4/3) clay films; 5 percent coarse fragments; strongly acid; clear wavy boundary.

IIB22t—26 to 33 inches; brown (10YR 4/3) clay loam; common fine and medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; moderate medium and coarse subangular blocky structure; firm; thin continuous dark grayish brown (10YR 4/2) clay films on ped faces; few dark concretions and stains; 5 percent coarse fragments; slightly acid; clear wavy boundary.

IIB23t—33 to 40 inches; grayish brown (10YR 5/2) clay loam; few fine faint gray (10YR 5/1) mottles and many medium distinct brown (10YR 4/3) and yellowish brown (10YR 5/4) mottles; weak coarse subangular blocky structure; firm; thin patchy dark grayish brown (10YR 4/2) clay films; few dark concretions; 10 percent coarse fragments; neutral; abrupt wavy boundary.

IIB3—40 to 50 inches; yellowish brown (10YR 5/4) very gravelly loam; many medium distinct dark grayish brown (10YR 4/2) mottles; massive; friable; many large distinct light brownish gray (10YR 6/2) lime segregations; 55 percent coarse fragments; mildly alkaline, calcareous; gradual wavy boundary.

IIC—50 to 72 inches; brown (10YR 5/3) gravelly loamy sand; single grained; loose; moderately alkaline, calcareous.

The solum ranges from 40 to 60 inches in thickness. Unless limed, the solum is strongly acid to slightly acid in the upper part and slightly acid to mildly alkaline in the lower part.

The Ap horizon is dark grayish brown (10YR 4/2) or brown (10YR 5/3), and the A2 horizon is brown (10YR 5/3) or grayish brown (10YR 5/2). The B1 or B&A horizon is brown (10YR 4/3, 5/3) or yellowish brown (10YR 5/4) heavy silt loam or silty clay loam. The B2t horizon has hue of 10YR and 7.5YR, value of 4 or 5, and chroma of 3 or 4, and subhorizons have chroma of 2 or 6. This horizon is silty clay loam, clay loam, sandy clay loam, and gravelly clay loam. Low chroma mottles are in the upper 10 inches of the B2 horizon. The IIB3 horizon is brown (10YR 4/3), yellowish brown (10YR 5/4), or dark yellowish brown (10YR 4/4) and gravelly or very gravelly loam, sandy clay loam, or sandy loam. The IIC horizon is gravelly or very gravelly loamy sand or sandy loam.

Thackery soils are the moderately well drained members of a drainage sequence that includes the well drained Ockley soils, the somewhat poorly drained Sleeth soils, and the very poorly drained Westland soils. Thackery soils are also associated with Eldean and Rush soils. They have mottles in the subsoil and are wetter than Eldean and Rush soils. They are deeper to sand and gravel than Eldean soils.

ThA—Thackery silt loam, 0 to 2 percent slopes. This nearly level soil is on stream terraces and outwash plains. Most areas are round and are about 5 to 10 acres in size. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Ockley soils on slight rises and spots of Sleeth soils on slightly lower positions. In Ross Township, this soil is commonly underlain by glacial till at a depth of 40 to 60 inches. This underlying till slows the internal movement of water.

This soil has few limitations that restrict its use for farming. It is well suited to all crops commonly grown in the county. Runoff is slow, and susceptibility to erosion is slight. This soil has good tilth over a wide range of soil moisture conditions. Seasonal wetness is a limitation for some nonfarm uses. Capability unit I-1; woodland suitability group 1o1.

ThB—Thackery silt loam, 2 to 6 percent slopes. This gently sloping soil is on short slope breaks along stream terraces. Areas are long and narrow and range from 5 to 10 acres in size.

Included with this soil in mapping are small areas of Ockley soils in slightly higher positions.

This soil has a moderate hazard of erosion if it is cultivated. It is suited to most crops grown in the county. Runoff is medium. The soil has good tilth over a wide range of moisture conditions. Seasonal wetness and slope are limitations for some nonfarm uses. Capability unit IIe-1; woodland suitability group 1o1.

Urban Land

Ur—Urban land. This mapping unit consists of areas 10 acres or more in size that are covered by buildings, pavement, or other man-made surfaces. Included with these areas in mapping are commercial and industrial areas, factories, and shopping centers. Slopes range from 0 to 6 percent. Most areas have a very low infiltration rate and a large amount of runoff.

This mapping unit is not used for farming. Not assigned to a capability unit and woodland suitability group.

Warsaw Series

The Warsaw series consists of nearly level, well drained soils that formed in loamy glacial outwash over sand and gravel at a depth of 24 to 40 inches. These soils are on terraces along the major streams and their larger tributaries.

In a representative profile the surface layer is very dark grayish brown loam 11 inches thick. The subsoil extends to a depth of 33 inches. The upper 4 inches is dark brown clay loam, the middle 9 inches is brown and very dark gray clay, and the lower 10 inches is dark grayish brown gravelly clay loam. The substratum is yellowish brown very gravelly loamy sand to a depth of 60 inches.

Available water capacity is moderate. Permeability is moderate in the upper part and rapid in the underlying sand and gravel. The surface layer is high in organic matter content. The rooting zone is moderately deep above the sand and gravel. These soils dry out and warm up early in the spring. Warsaw soils have a moderate hazard of drought. Crops may be affected by lack of moisture during the growing season.

Warsaw soils are used mostly for crops or for urban development. They are well suited to field crops and specialty crops.

Representative profile of a Warsaw loam, 0 to 2 percent slopes, in Bath Township, SE¼NW¼ sec. 28:

Ap—0 to 11 inches; very dark grayish brown (10YR 3/2) loam; moderate medium and fine granular structure; friable; about 5 percent gravel; neutral; clear smooth boundary.

B1—11 to 14 inches; dark brown (7.5YR 3/2) clay loam; moderate medium subangular blocky structure; friable thin patchy very dark grayish brown (10YR 3/2) coatings on ped surfaces; about 10 percent gravel; slightly acid; clear smooth boundary.

B21t—14 to 21 inches; brown (7.5YR 4/4) clay; moderate medium and fine subangular blocky structure; firm; thin patchy dark brown (7.5YR 3/2) clay films and thin patchy very dark gray (10YR 3/1) organic coatings on ped surfaces; about 10 percent gravel; slightly acid; gradual wavy boundary.

B22t—21 to 23 inches; very dark gray (10YR 3/1) clay; moderate fine subangular blocky structure; firm, sticky; medium patchy clay films on ped surfaces; about 10 percent gravel; neutral; clear wavy boundary.

B3—23 to 33 inches; dark grayish brown (10YR 4/2) gravelly clay loam; weak medium subangular blocky structure; firm; about 35 percent gravel; mildly alkaline; clear irregular boundary.

C—33 to 60 inches; yellowish brown (10YR 5/4) very gravelly loamy sand; about 50 percent gravel; single grained; loose; moderately alkaline, calcareous.

The solum ranges from 24 to 40 inches in thickness but it is dominantly 30 to 40 inches thick. Some profiles have a silty mantle as much as 24 inches thick. The dark colored material (combined A & B horizons) ranges from 11 to 20 inches in thickness. The A horizon and the upper part of the B horizon are commonly 10 percent gravel or less, and the horizon overlying the C horizon generally is more than 20 percent gravel. Unless limed, the solum ranges from medium acid to slightly acid in the upper part and from neutral to mildly alkaline in the lower part.

The Ap or A1 horizons are black (10YR 2/1), very dark grayish brown (10YR 3/2), or very dark brown (10YR 2/2). The B2t horizon has hue of 10YR through 5YR, value of 3 through 5, and chroma of 1 through 4. It is typically sandy clay loam, clay, clay loam, or gravelly phases of these textures. In some profiles, tongues of material from the B2t horizon extend several feet into the C horizon.

Warsaw soils in Greene County have slightly more clay in the subsoil and have a higher reaction in the upper part of the subsoil than other Warsaw soils. This difference does not affect the use and management of these soils.

Warsaw soils are adjacent to Eldean and Wea soils. They have a darker colored surface layer than Eldean soils, and they are shallower to sand and gravel than Wea soils.

WaA—Warsaw loam, 0 to 2 percent slopes. This nearly level soil is on terraces along the major streams and their larger tributaries. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of Wea soils. Also included are a few areas of gently sloping soils at the heads of drainageways.

This soil is suited to all crops commonly grown in the county. The major limitation to use of this soil for farming is moderate droughtiness. Runoff is slow, and erosion is not a hazard. This soil has few limitations for most nonfarm uses. Capability unit IIs-1; woodland suitability group 2o1.

WbA—Warsaw-Fill land complex, nearly level. This complex consists of nearly level areas where as much as 50 percent of the original Warsaw soils has been covered by 2 to 5 feet of fill. Most areas are in Wright-Patterson Air Force Base. About 10 to 15 percent of the area is covered by aircraft runways, and 20 to 60 percent is undisturbed areas of Warsaw soil. Included with this complex in mapping are a few borrow pits and scalped areas.

This complex is not used for farming. The suitability of the fill material for plant growth is quite variable. This complex has few limitations to most nonfarm uses. Not assigned to a capability unit and woodland suitability group.

WcA—Warsaw-Urban land complex, nearly level. This complex consists of nearly level areas where the Warsaw soil has been largely altered or covered by grading and digging operations. Most areas of this complex are used for urban or industrial development. About 15 to 30 percent of the area is covered by buildings, driveways, and streets; 25 to 50 percent is borrow or fill areas; and 20 to 60 percent is undisturbed Warsaw soil in undeveloped lots and parts of developed areas.

Fill areas have about 1 foot to 3 feet of fill material overlying the Warsaw soil or included areas of Wea soils. The fill material is loamy and clayey subsoil material and in some places it is gravelly material. Borrow areas are areas where material typical of the Warsaw subsoil is exposed.

This complex is not used for farming. The surface layer of the disturbed soil commonly has poor tilth and is droughty. Limitations are severe for lawns and landscaping; otherwise, this complex has few limitations for most nonfarm uses. Not assigned to a capability unit and woodland suitability group.

Wea Series

The Wea series consists of nearly level to gently sloping, well drained soils that formed in a thin layer of silty material and in the underlying loamy glacial outwash. These soils are on terraces along Little Miami River, Mad River, and some of their larger tributaries.

In a representative profile the surface layer is very dark grayish brown silt loam 12 inches thick. The subsoil is brown silty clay loam in the upper 12 inches, and brown clay loam in the lower 21 inches. The substratum is brown gravelly sand to a depth of 60 inches.

Available water capacity is high, and permeability is moderate in the subsoil and rapid in the underlying sand and gravel. The rooting zone is deep. The surface layer of these soils has a high organic matter content.

Wea soils are used mostly for crops. Corn, soybeans, wheat, and grass-legume meadow are the main crops. Some areas are used for pasture.

Representative profile of Wea silt loam, 1 to 3 percent slopes, in Beavercreek Township, NE¼SE¼ sec. 22; 6½ miles northwest of Xenia, ¾ mile north of Fairground Road, and 1,500 feet east of Beaver Valley Road:

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam; moderate fine and medium granular structure; friable; many roots; neutral; clear smooth boundary.

A12—8 to 12 inches; very dark grayish brown (10YR 3/2) silt loam; moderate medium subangular blocky structure; friable; many roots; slightly acid; clear wavy boundary.

B1t—12 to 18 inches; brown (7.5YR 4/4) light silty clay loam; moderate medium subangular blocky structure; firm; common roots; very dark grayish brown (10YR 3/2) organic stains; thin patchy brown (10YR 4/3) clay films on ped faces; slightly acid; gradual wavy boundary.

IIB21t—18 to 24 inches; brown (7.5YR 4/4) silty clay loam; strong medium subangular blocky structure; firm; common roots; medium continuous brown (7.5YR 4/2) clay films on ped faces and in soil pores; common very dark grayish brown (10YR 3/2) organic stains on ped faces; few coarse fragments; medium acid; gradual wavy boundary.

IIB22t—24 to 34 inches; brown (7.5YR 4/4) clay loam; strong medium subangular blocky structure; firm; few roots; medium continuous brown (7.5YR 4/2) clay films; few coarse fragments in upper part increasing to common in lower part of horizon; slightly acid; gradual wavy boundary.

IIB3t—34 to 45 inches; brown (7.5YR 4/4) clay loam; weak medium and coarse subangular blocky structure; firm; few roots; medium continuous brown (7.5YR 4/2) clay films; about 10 percent coarse fragments; neutral; clear irregular boundary.

IIC—45 to 60 inches; brown (10YR 4/3) gravelly sand; single grained; loose; mildly alkaline, calcareous.

The thickness of the solum and depth to sand and gravel range from 40 to 60 inches. Unless limed, the solum is medium acid to slightly acid in the upper part and slightly acid to neutral in the lower part.

The A horizon is black (10YR 2/1), very dark gray (10YR 3/1), very dark brown (10YR 2/2), and very dark grayish brown (10YR 3/2). The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. The B2 horizon commonly is clay loam but individual horizons in the upper part include silty clay loam. The IIB3 horizon is clay loam or gravelly clay loam.

Wea soils are near Ross, Ockley, Rush, Warsaw, and Eldean soils. They have a darker colored surface layer than Ockley, Rush, and Eldean soils. They are deeper to the underlying sand and gravel than Warsaw and Eldean soils. They are better developed and have a heavier textured subsoil than Ross soils.

WeB—Wea silt loam, 1 to 3 percent slopes. This nearly level to gently sloping soil is on low stream terraces. It is in a slightly higher position than Ross soils, but is slightly lower than Eldean and Ockley soils. The surface layer is dominantly silt loam.

Included with this soil in mapping are a few small areas of soils that have a surface layer of loam. Also included are small areas of Warsaw and Ross soils and several areas of soils that have a thicker silty subsoil.

This soil is well suited to all crops commonly grown in the county. Runoff is slow, and susceptibility to erosion is slight. This soil has good tilth over a wide range of soil moisture conditions. It has few limitations for farming and for most nonfarm uses. Capability unit I-1; woodland suitability group 1o1.

Westland Series

The Westland series consists of nearly level, very poorly drained soils that formed in loamy material in slight depressions on outwash terraces.

In a representative profile the surface layer is very dark gray silty clay loam 14 inches thick. The subsoil is mottled dark gray and gray clay loam in the upper 24 inches and mottled gray gravelly silt loam in the lower 14 inches. The substratum is stratified gravelly loam, clay loam, and very gravelly loamy sand to a depth of 108 inches.

Available water capacity is high, and permeability is moderately slow in the upper part and rapid in the underlying coarser material. If these soils are drained, the rooting zone is deep. If they are not artificially drained, they have a seasonal high water table for long periods in winter and in spring.

Westland soils are used mostly for crops. Corn and soybeans are the most common crops grown. Most areas are artificially drained.

Representative profile of Westland silty clay loam in Ross Township; about 3 miles east of Cedarville, 100 yards north of the South Fork of Massie Creek, and 25 feet west of Cummings Road (Sample GN-28 in Laboratory Data Section):

Ap—0 to 10 inches; very dark gray (10YR 3/1) silty clay loam; weak fine granular structure; friable; about 3 percent pebbles; neutral; clear smooth boundary.

A12—10 to 14 inches; very dark gray (10YR 3/1) silty clay loam; moderate fine subangular blocky structure; firm; about 1 percent pebbles; neutral; clear smooth boundary.

B21tg—14 to 24 inches; dark gray (10YR 4/1) clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; strong medium angular blocky structure; firm; thin very patchy dark gray (10YR 4/1) clay films in pores and channels; about 2 percent pebbles; neutral; gradual wavy boundary.

B22tg—24 to 30 inches; gray (5Y 5/1) clay loam; many fine prominent yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to moderate medium angular blocky; firm; thin very patchy gray (10YR 5/1) clay films in pores and root channels; very dark gray (10YR 3/1) organic coatings on some ped faces; about 2 percent pebbles; mildly alkaline; clear smooth boundary.

B23g—30 to 38 inches; gray (10YR 5/1, 6/1) clay loam; many medium distinct yellowish brown (10YR 5/4) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; firm; patchy very dark gray (10YR 3/1) and dark gray (10YR 4/1) stains on ped faces; some channels filled with very dark gray (10YR 3/1) silty clay loam material; about 5 percent pebbles; mildly alkaline; gradual wavy boundary.

B3g—38 to 52 inches; gray (10YR 6/1) gravelly silt loam; common coarse distinct yellowish brown (10YR 5/6) and brownish yellow (10YR 6/6) mottles; weak coarse prismatic structure; firm; about 30 percent gravel; common channels filled with very dark grayish brown (10YR 3/2) silty clay loam; moderately alkaline, weakly calcareous; clear wavy boundary.

C—52 to 108 inches; brown (10YR 5/3), pale brown (10YR 6/3), and gray (10YR 5/1) stratified gravelly loam, clay loam, and very gravelly loamy sand; moderately alkaline, calcareous.

The solum ranges from 40 to 60 inches in thickness. Reaction of the solum ranges from medium acid to neutral in the upper part and increases to moderately alkaline in the lower part.

The A horizon is black (10YR 2/1), very dark gray (10YR 3/1), or very dark grayish brown (10YR 3/2). The thickness of the A horizon ranges from 11 to 17 inches. The B horizon has hue of 10YR through 5Y, value of 4 through 6, and chroma of 1 or 2. Mottles range from common to many. The B2 horizon is commonly clay loam, but thin layers of silty clay loam or clay are included. The B3 horizon is clay loam, gravelly loam, gravelly silt loam, and sandy loam.

Westland soils are the very poorly drained member of a drainage sequence that includes the well drained Ockley soils, the moderately well drained Thackery soils, and the somewhat poorly drained Sleeth soils. Westland soils are in positions similar to those of Millsdale, Ragsdale, Patton, and Brookston soils. They differ from Millsdale soils in having no limestone bedrock at a depth of 20 to 40 inches. They have a higher sand content than Ragsdale and Patton soils, and are underlain by sand and gravel. They have more gravel in the lower part of the subsoil than Brookston soils. They are commonly adjacent to Linwood soils, but they lack the organic layers of these soils.

Ws—Westland silty clay loam. This nearly level soil is on broad, slightly depressed flats on outwash terraces. Most areas are 5 to 50 acres in size. This soil has the profile described as representative of the series.

Included with this soil in mapping, in the northeast part of the county along the heads of drainageways of Massie Creek, are small areas of more silty Ragsdale soils, small areas of Sloan soils formed in alluvium, and some areas of this Westland soil that has glacial till at a depth of 4 to 6 feet. Mainly included in the northwest part of the county are Sloan soils in drainageways. Also included are a few areas of soils that have a surface layer of silt loam.

This soil is well suited to crops if drained. Seasonal wetness is the main limitation. The surface layer becomes cloddy if the soil is tilled when too wet. The seasonal high water table is a severe limitation for most nonfarm uses. Capability unit IIw-3; woodland suitability group 2w1.

Wt—Westland-Urban land complex. This complex consists of nearly level Westland soil that has been partly altered or covered by grading and digging operations. Most areas are used for urban and industrial development. Approximately 15 to 30 percent of the area is covered by roads, driveways, buildings, and streets; 25 to 50 percent is fill areas; and 20 to 60 percent is undisturbed Westland soil in undeveloped lots and parts of developed lots.

Fill areas have about 1 foot to 3 feet of fill material over undisturbed Westland silty clay loam. The fill material is loamy material from the Westland subsoil, and in a few places it is limy gravelly material from the substratum.

This complex is not used for farming. The seasonal high water table is a severe limitation to the use of this complex. Ponding is also a hazard in areas that lack good surface drainage. Not assigned to a capability unit and woodland suitability group.

Xenia Series

The Xenia series consists of nearly level to gently sloping, moderately well drained soils that formed partly in loess and partly in the underlying glacial till. These soils are on uplands in the central, southern, and southwestern parts of the county.

In a representative profile the surface layer is dark grayish brown silt loam 8 inches thick. The subsoil is yellowish brown. It is silty clay loam in the upper 26 inches and loam in the lower 8 inches. It is mottled below a depth of 13 inches. The substratum is mottled yellowish brown loam to a depth of 60 inches.

Available water capacity is high. Permeability is moderate in the upper part of the soil and moderately slow in the lower part of the subsoil and in the underlying till. These soils have a seasonal high water table for short periods in winter and in spring. The rooting zone is deep.

Most areas of Xenia soils are cultivated, and these soils are well suited to farming. Corn, soybeans, and grass-legume meadow are the main crops.

Representative profile of Xenia silt loam, 2 to 6 percent slopes, in Sugar Creek Township, SW¼NW¼ sec. 4; 4 miles south-southwest of Bellbrook, 0.1 mile south of Middle Run Road, and 75 feet east of Haines Road (Sample GN-17 in Laboratory Data Section):

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

B1—8 to 13 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine and medium subangular blocky structure; friable; many roots; brown (10YR 4/3) ped coatings; thin very patchy clay films in pores and root channels; few very dark grayish brown (10YR 3/2) soft concretions; medium acid; gradual smooth boundary.

B21t—13 to 20 inches; yellowish brown (10YR 5/4) silty clay loam; common fine faint yellowish brown (10YR 5/6) mottles and few fine distinct grayish brown (10YR 5/2) mottles; moderate medium and fine subangular blocky structure; friable; common roots; brown (10YR 4/3) ped coatings; thin patchy dark grayish brown (10YR 4/2) clay films; few very dark grayish brown soft concretions; slightly acid; clear smooth boundary.

B22t—20 to 28 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct light brownish gray (2.5Y 6/2) and grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; common roots; medium continuous dark yellowish brown (10YR 4/4) clay films; few very dark grayish brown (10YR 3/2) concretions; slightly acid; abrupt wavy boundary.

IIB23t—28 to 34 inches; yellowish brown (10YR 5/4) silty clay loam; many medium faint yellowish brown (10YR 5/6) mottles and few fine distinct light brownish gray (2.5Y 6/2) mottles; moderate medium subangular blocky structure; firm; common roots; medium continuous dark grayish brown (10YR 4/2) clay films; common very dark grayish brown (10YR 3/2) concretions; 3 percent coarse fragments; neutral; clear irregular boundary.

IIB3t—34 to 42 inches; yellowish brown (10YR 5/4) loam; many medium faint yellowish brown (10YR 5/6), mottles many medium distinct grayish brown (10YR 5/2) mottles, and common large distinct gray (10YR 6/1) mottles; weak coarse subangular blocky structure; firm; few roots; medium continuous dark brown (10YR 3/3) clay films, becoming thin and very patchy below a depth of 40 inches; 5 percent coarse fragments; mildly alkaline, calcareous; gradual wavy boundary.

IIC1—42 to 52 inches; yellowish brown (10YR 5/4) loam; many coarse distinct gray (10YR 5/1) mottles and common medium faint yellowish brown (10YR 5/6) mottles; massive; firm; few dark brown (10YR 3/3) stains; 5 to 10 percent coarse fragments; mildly alkaline, calcareous; gradual smooth boundary.

IIC2—52 to 60 inches; yellowish brown (10YR 5/4) loam; common fine faint yellowish brown (10YR 5/6) mottles and common coarse distinct light gray (10YR 7/1) mottles; massive; firm; 10 to 15 percent coarse fragments as much as 3 inches across; moderately alkaline, calcareous.

The solum ranges from 36 to 60 inches in thickness. Unless limed, the solum is medium acid to slightly acid in the upper part and neutral to mildly alkaline in the lower part.

The Ap horizon is dark grayish brown (10YR 4/2) or brown (10YR 4/3). The B2 and IIB2 horizons are dark yellowish brown (10YR 4/4) or yellowish brown (10YR 5/4) and few to many mottles. The B2 horizon is silty clay loam, and the IIB2 horizon is silty clay loam or clay loam. The IIB3 horizon has color similar to that of the B2 and IIB2 horizons. It is typically clay loam or loam.

Xenia soils are the moderately well drained members of a drainage sequence that includes the well drained Russell soils and the somewhat poorly drained Fincastle soils. Xenia soils are adjacent to Birkbeck and Raub soils in some areas. They formed in loess and the underlying glacial till, whereas Birkbeck soils formed entirely in loess. They have a lighter colored surface layer than Raub soils. They are similar to Celina soils but have a thicker loess mantle.

XeA—Xenia silt loam, 0 to 2 percent slopes. This nearly level soil is on the broad, slightly elevated till plain between drainageways.

Included with this soil in mapping are small areas of Birkbeck and Celina soils, which are similar to this Xenia soil. Also included are spots of Fincastle soils in lower lying positions.

Runoff is slow. There is some wetness in spring but drainage is not needed for most crops. This soil is well suited to most crops commonly grown in the county. Seasonal wetness and moderately slow permeability in the underlying glacial till are limitations for some nonfarm uses. Capability unit I-1; woodland suitability group 1o1.

XeB—Xenia silt loam, 2 to 6 percent slopes. This gently sloping soil is commonly on slightly convex, long slopes. Most areas are broad and circular. They are commonly 3 to 50 acres in size. Drainageways typically originate in areas of this soil. This soil has the profile described as representative of the series.

Included with this soil in mapping are a few spots of Fincastle and Russell soils. Also included are small areas of Birkbeck soils that formed in 40 or more inches of silty material, and a few areas of soils that are moderately eroded.

Runoff is medium to rapid, particularly where this soil is bare of plant cover. The hazard of erosion is moderate in cultivated areas. Seasonal wetness, slope, and moderately slow permeability in the underlying till are limitations for some nonfarm uses. Capability unit IIe-1; woodland suitability group 1o1.

Formation and Classification of the Soils

This section discusses the major factors of soil formation in Greene County and provides the classification of the soils of the county according to the system used by the National Cooperative Soil Survey.

Factors of Soil Formation

The characteristics of a soil in any given place are determined by (1) the physical and mineralogical composition of the parent material; (2) the climate under which the soil material has accumulated and existed since accumulation; (3) the plant and animal life on and in the soil; (4) the relief, or lay of the land; and (5) the length of time the forces of soil development have acted on the soil material.

Climate and vegetation are the active factors of soil formation. They act on the parent material that has accumulated through the weathering of rock and they bring about the development of genetically related horizons. The effects of climate and vegetation are conditioned by relief. The parent material also affects the kind of profile that can be formed and, in extreme instances, determines it almost entirely. Finally, time is needed for the changing of the parent material into a soil profile. Generally, a long time is required for the development of distinct horizons.

Parent material

The soils of Greene County formed in several kinds of parent material, which is a result of their complex geologic history. The materials include glacial drift, weathered products of sedimentary bedrock, loess, lacustrine deposits, alluvium, and organic material. Some of the soils have formed in combinations of these materials.

Glacial drift, a general term applied to till and to outwash sand and gravel, is the most extensive of the parent materials in Greene County. This drift was deposited during the Wisconsin age of the Pleistocene Epoch. The general northeast to southwest orientation of the major soil areas is closely related to the advances and retreats of the Wisconsin age glaciation. Parts of two lobes of the glacier entered the county during its southernmost advance, and they came together in the central part of the county. As the glacier melted and retreated it left deposits of till and of outwash sand and gravel. After the retreat, and before much soil formation had taken place, a layer of silt (loess) of varying thickness was deposited over much of the county. This is especially noticeable between the Camden and Reesville moraines.

Many soils in Greene County formed partly in loess and partly in the underlying glacial drift. Russell and Xenia soils, for example, formed in loess 18 to 40 inches thick over glacial till, and the loess cap on Miamian and Celina soils is less than 18 inches thick. The till underlying these soils is relatively homogenous, and the subsoil layers that formed in it have rather uniform, moderately fine texture to fine texture. Some soils, such as Reesville and Birkbeck soils, formed in a loess mantle 40 inches or more in thickness. In these soils, the subsoil horizons are silty and have medium texture to moderately fine texture.

Stratified deposits of sand and gravel were laid down by water that flowed at varying velocities from the glacier. Commonly each layer of this material consists of fragments that are fairly uniform in size. Subsequently, finer textured material was deposited over the coarse material by relatively slower moving water. The overlying material consisted mostly of loamy outwash, in which Casco soils formed. Where the loamy outwash was covered by a layer of loess, such soils as Ockley, Wea, Westland, and Sleeth soils formed. Where the loess mantle is thick, Rush soils commonly formed. Ockley and Wea soils have subsoil colors that have relatively high chroma, or brownish appearance, but in Westland and Sleeth soils, which formed in similar materials, the color is dominantly gray as a result of poor internal drainage and aeration. Rodman soils formed in coarse sand and gravel containing very little fine-textured, loamy outwash. Rodman soils have a sandy and gravelly solum, are not deeply developed, and are droughty.

In some areas limestone and shale bedrock is relatively shallow. Residuum formed from this kind of parent material has affected the lower horizons of Milton and Edenton soils. All of the solum of Fairmount variant soils formed in residuum of interbedded limestone and shale. Olive brown and olive gray predominate in the soil layers that weathered from Ordovician shale, and brownish to reddish hues are prevalent where the parent rock was Silurian limestone.

Areas of lacustrine material are of minor extent in the county. These sediments were deposited mainly in lakes of the glacial era. Patton soils are an example of soils that formed in this silt and clay lacustrine material.

Alluvium deposited by floodwaters is the youngest parent material in the county. This kind of material was washed from soils on the uplands and terraces and is still accumulating whenever additional sediment is added to bottom lands by stream overflow. This is a continuing process, and these soils show little, or no, horizon development. Eel, Genesee, and Ross soils formed in deep deposits of silty and loam alluvium.

Organic material is another kind of parent material that is in small areas scattered throughout the county. It is mainly the decomposed remains of trees, sedges, and grasses that have accumulated in depressions or potholes in drainageways where the water table is high. These areas are saturated with water throughout the year. Linwood soils formed in this kind of material.

Climate

The present climate of Greene County is a humid, temperate, continental type. During the formation of the soils the climate has been favorable for physical and chemical weathering and for biological activity.

Rainfall has been enough to supply adequate percolating water to leach carbonates to moderate depths, as they are in Miamian, Celina, and Crosby soils. Frequent rains produce wetting and drying cycles that favor translocation of clay minerals and formation of soil structure, such as in Miamian and Ockley soils.

Temperature variations have been in a range that has favored physical and chemical weathering. Freezing and thawing has aided in the development of soil structure. The warm summers have favored chemical weathering of primary minerals.

Both rainfall and temperature have been conducive to plant growth and subsequent accumulation of organic matter in all the soils.

Additional information about the climate of Greene County is given in the section "General Nature of the County."

Plant and animal life

The vegetation at the time Greene County was settled was hardwood forest. Beech, maple, oak, hickory, and ash were the most abundant trees. Grassy clearings on the well drained sites and marshy openings in the poorly drained swales were also present.

Soils that formed in the forested areas are acid and moderately fertile. These include such soils as Miamian, Crosby, Birkbeck, and Xenia soils. The grassy clearings have dark, well drained, less acid, more fertile soils. Examples are Odell, Raub, and Warsaw soils. The marshy swales contain dark, fertile, very poorly drained soils, such as Brookston, Millsdale, and Westland soils.

Small animals, insects, worms, and roots form channels that make the soil permeable. Animals mix the soil materials and contribute organic matter. Worm channels or casts are plentiful in the highly organic surface layer of Odell and Raub soils. Crawfish channels are common in more poorly drained soils such as Brookston, Patton, and Westland soils.

The activities of man also affect soil development. Man plows and plants and introduces changes in vegetation. Some areas he drains, some he irrigates, and in some he removes the soils for construction. Also, he adds lime and fertilizer, which changes the chemistry of the soils. Each of these activities, in its own way, affects the future development of the soil.

Relief

Many of the differences in soils in this county are caused by differences in topography. For example, Russell, Xenia, and Fincastle soils formed under similar conditions except for natural drainage, and natural drainage depends mostly on topography. The well drained Russell soils are on slopes where surface and internal drainage are good. Xenia soils are in areas where the water table is seasonally high for brief but significant periods. Nearly level, somewhat poorly drained Fincastle soils are mainly in areas where runoff is slow and the water table is seasonally high for longer periods.

The poorly drained or very poorly drained soils in this county are nearly level or depressional. They are in areas where runoff is slow to ponded and where silty and clayey materials tend to accumulate. Very poorly drained Brookston, Patton, Ragsdale, and Westland soils have a thick, dark colored surface layer because organic matter decomposes slowly in wet soils. Muck has accumulated in swampy, depressional areas where the soil material is saturated most of the time. Linwood soils developed in these areas.

In the same series, the steeper soils are generally thinner than the more gently sloping soils. This is the result of more rapid runoff and greater erosion on the steeper slopes.

Time

Time is needed for the other soil forming factors to produce their effects. The age of a soil is indicated, to some extent, by the degree of development of its profile. In this county, glacial till parent material has been affected by soil forming processes since the retreat of the last glaciers about 10,000 to 20,000 years ago (*6*). Except for the soils formed in alluvium and those that have steep slopes, all of the soils in the county have had about the same time for development.

In many places, however, factors other than time have been responsible for most of the differences in kind and distinctness of horizons in the different soils. If the parent material weathers slowly, the profile develops slowly. If slopes are steep, so that soil is removed almost as fast as it is formed, distinct horizons are not developed. The Rodman soils for example, have a very weakly expressed subsoil. On the flood plains, frequent deposits of fresh sediment periodically interrupt the soil forming process. Ross and Genesee soils are examples of soils on flood plains in which horizons other than the surface layer are not well developed.

Most soils in the county, however, have well formed profiles. Examples are the Miamian, Ockley, Rush, and Russell soils.

Processes of Soil Formation

The factors of soil formation discussed previously largely control or influence four soil forming processes: additions, losses, transfers, and alterations (*13*). Some of the processes promote differences within a soil; others retard or preclude differences.

Additions to soils include additions of organic matter to the surface, additions of bases in the organic matter and in ground water, erosional deposition, and the addition of bases contained in lime and fertilizer. The dark colored surface layer of the Brookston, Westland, and other soils is evidence of the addition of organic matter. All of the soils in the county have had at least a thin accumulation of organic matter, but in most places cultivation has largely destroyed this identity. Plant nutrients, to some degree, move in a cycle from soil to plants and then back to soils again in the form of litter or other organic materials. This occurs in all of the soils in the county. Such soils as Brookston, Millsdale, and Westland soils are seasonally waterlogged and continually accumulate bases through additions from the solvents in the ground water. In these soils, additions of bases are generally greater than losses. Genesee, Ross, and Sloan soils periodically receive additions of soil material from floodwater. Additions of lime and fertilizer to these soils when cultivated counteracts or even exceeds normal losses of plant nutrients.

Soil losses occur as removal of bases by leaching, removal of plant nutrients by crops, and actual losses of soil material through erosion. One of the most significant losses in Greene County involves the leaching of carbonates. Carbonates have been removed to a depth of 25 to 30 inches in Celina and Crosby soils and to as much as 36 to 60 inches in Xenia and Fincastle soils. This represents a significant quantity because the original material was about 15 to 50 percent calcium carbonate. Other minerals present in the soil break down and are lost by leaching, but at a slower rate than the carbonates. The alteration of other minerals produces free iron oxides. These cause the relatively bright (high chroma) reddish or brownish colors in Ockley, Eldean, and similar soils. The recurrent water table in Brookston, Westland, and other similar soils causes a reduction of iron oxides and subsequent loss by leaching. This is responsible for the gray colors of these soils. The mottling observed in all except the well drained soils is caused by reduction and resegregation of the iron oxides.

The most significant transfer in the soils of Greene County is the transfer of colloidal material from the surface layer to lower horizons. The fine clays are suspended in percolating water moving downward from the surface layer. Seasonal drying or precipitation causes the fine clays to be deposited on the soil surface in cracks or root channels. Clay coatings of this kind can be seen in Ockley, Milton, Russell, and similar soils. Various sesquioxides are also transferred from the surface layer to lower horizons of most of the soils.

Transformations of mineral compounds occur in most soils. The results are most apparent if the development of horizons is not affected by rapid erosion or by accumulation of material at the surface. The primary silicate materials are weathered chemically to produce secondary minerals, mainly layer-lattice silicate clays. Most of the layer-lattice clays remain in the soil profile, but are transferred from upper soil horizons in the profile to deeper horizons.

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.[5] Because this system is under continual study, readers interested in developments of the current system should search the latest literature available.

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. In table 9, the soil series of Greene County are placed in 4 categories of the current system. Classes of the current system are briefly defined in the following paragraphs.

ORDER.—Ten soil orders are recognized. 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. Each order is

[5] See the unpublished working document "Selected Chapters from the Unedited Text of the Soil Taxonomy" available in SCS State Office, Columbus, Ohio.

TABLE 9.—*Classification of the soils*

Series	Family	Subgroups	Order
Algiers	Fine-loamy, mixed, nonacid, mesic	Aquic Udifluvents	Entisols.
Birkbeck[1]	Fine-silty, mixed, mesic	Typic Hapludalfs	Alfisols.
Brookston[1]	Fine-loamy, mixed, mesic	Typic Argiaquolls	Mollisols.
Casco[1]	Fine-loamy over sandy or sandy-skeletal, mixed, mesic	Typic Hapludalfs	Alfisols.
Celina	Fine, mixed, mesic	Aquic Hapludalfs	Alfisols.
Crosby	Fine, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Edenton	Fine, mixed, mesic	Typic Hapludalfs	Alfisols.
Eel	Fine-loamy, mixed, nonacid, mesic	Aquic Udifluvents	Entisols.
Eldean	Fine, mixed, mesic	Typic Hapludalfs	Alfisols.
Fairmount variant	Fine, illitic, mesic	Typic Eutrochrepts	Inceptisols.
Fincastle	Fine-silty, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Genesee[1]	Fine-loamy, mixed, nonacid, mesic	Typic Udifluvents	Entisols.
Hennepin	Fine-loamy, mixed, mesic	Typic Eutrochrepts	Inceptisols.
Linwood	Loamy, mixed, euic, mesic	Terric Medisaprists	Histosols.
Miamian	Fine, mixed, mesic	Typic Hapludalfs	Alfisols.
Millsdale	Fine, mixed, mesic	Typic Argiaquolls	Mollisols.
Milton	Fine, mixed, mesic	Typic Hapludalfs	Alfisols.
Milton variant	Loamy-skeletal, mixed, mesic	Typic Hapludolls	Mollisols.
Ockley	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols.
Odell	Fine-loamy, mixed, mesic	Aquic Argiudolls	Mollisols.
Patton	Fine-silty, mixed, mesic	Typic Haplaquolls	Mollisols.
Ragsdale	Fine-silty, mixed, mesic	Typic Argiaquolls	Mollisols.
Randolph	Fine, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Raub	Fine-silty, mixed, mesic	Aquic Argiudolls	Mollisols.
Reesville	Fine-silty, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Ritchey[1]	Loamy, mixed, mesic	Lithic Hapludalfs	Alfisols.
Rodman[1]	Sandy-skeletal, mixed, mesic	Typic Hapludolls	Mollisols.
Ross	Fine-loamy, mixed, mesic	Cumulic Hapludolls	Mollisols.
Rush	Fine-silty, mixed, mesic	Typic Hapludalfs	Alfisols.
Russell	Fine-silty, mixed, mesic	Typic Hapludalfs	Alfisols.
Sleeth	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Sloan	Fine-loamy, mixed, mesic	Fluvaquentic Haplaquolls	Mollisols.
Thackery	Fine-loamy, mixed, mesic	Aquic Hapludalfs	Alfisols.
Warsaw[1]	Fine-loamy over sandy or sandy-skeletal, mixed, mesic	Typic Argiudolls	Mollisols.
Wea	Fine-loamy, mixed, mesic	Typic Argiudolls	Mollisols.
Westland	Fine-loamy, mixed, mesic	Typic Argiaquolls	Mollisols.
Xenia	Fine-silty, mixed, mesic	Aquic Hapludalfs	Alfisols.

[1] These soils are taxadjuncts. The reasons for excluding them from the series with which they are identified are as follows:

Birkbeck. — Thinner solum and less acid throughout.

Brookston. — Contain slightly more clay. Classify as Typic Argiaquolls: fine, mixed, mesic.

Casco. — Contain slightly more clay. Classify as Typic Hapludalfs; clayey over sandy or sandy-skeletal, mixed, mesic.

Genesee. — Carbonates throughout solum and dominantly mildly alkaline in the surface horizon.

Ritchey. — Contain slightly more clay. Classify as Lithic Hapludalfs: clayey, mixed, mesic.

Rodman. — Calcium carbonate equivalent more than 40 percent immediately below mollic epipedon. Classify as Eutrochreptic Rendolls: sandy-skeletal, mixed, mesic.

Warsaw. — Contain slightly more clay and have slightly higher reaction in the upper part of the B horizon. Classify as Typic Argiudolls: fine, mixed, mesic.

named with a word of three or four syllables ending in *sol* (Moll-i-sol).

SUBORDER.—Each order is divided into suborders that are based primarily on those soil characteristics that seem to produce classes that have 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 *Aquoll*, (*Aqu*, meaning water or wet, and *oll*, from Mollisol).

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. The features used are the self-mulching properties of clay, soil temperature, major differences in chemical composition (mainly calcium, magnesium, sodium, and potassium), dark red and dark brown colors associated with basic rock, and the like. 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 Haplaquolls (*Hapl*, meaning simple horizons, *aqu* for wetness or water, and *oll*, from Mollisols).

SUBGROUP.—Great groups are divided 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 Haplaquolls (a typical Haplaquoll).

FAMILY.—Soil families are separated within a subgroup primarily 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 in table 9. An example is the fine-silty, mixed, mesic family of Typic Haplaquolls.

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 "Description of the Soils."

Some of the soils in this county do not fit in a series that have 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 taxadjuncts to the series for which they are named.

In this survey, soils in the Birkbeck, Brookston, Casco, Genesee, Ritchey, Rodman, and Warsaw series are taxadjuncts to those series.

Laboratory Data

Laboratory data are given in table 10 for soil profiles representing 15 soil series in Greene County. These data aid in the classification and correlation of these soils, and in evaluating their behavior under various land use practices. They were prepared by the Agronomy Department, Ohio Agricultural Research and Development Center (OARDC), Columbus, Ohio. Representative profile descriptions of all series listed in table 10 except Fincastle and Reesville series are given in the section, "Descriptions of the Soils." Profile descriptions for the Fincastle soil and the Reesville soil are given in this section. These two soils represent part of the range of the series, but they are not so typical as the representative profile in the section "Descriptions of the Soils."

In addition to the data in table 10, laboratory data are available for most soil series in Greene County. These data are from elsewhere in western and southwestern Ohio, and they 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.

Additional data on mineral and elemental composition of Wisconsin age till deposits in west-central Ohio are available (*17*).

The following paragraphs outline the procedures used to obtain the data presented in table 10.

Particle size distribution was measured 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 procedure entails separation of the sand fractions by sieving, the clay (less than 0.002 millimeters) by gravity sedimentation, and the fine clay (less than 0.0002 millimeters) by sedimentation in a centrifuge. Silt was determined by the difference.

All pH measurements were made using a 1:1 soil-water ratio.

The percentage of organic matter was determined by a carbon measurement in the dry combustion method.

Calcium carbonate equivalent was determined by the quantitative gasometric method (*5*).

Extractable hydrogen, which also included titratable aluminum, was determined by the triethanolamine method (*11*).

Extractable calcium, magnesium, and potassium were extracted by a neutral, normal ammonium acetate solution and measured by atomic absorption spectrophotometer.

Cation exchange capacities were calculated by the summation of extractable cations.

Fincastle Series

Profile of Fincastle silt loam (Sample Number GN-25) in Caesars Creek Township; 6 miles southeast of Xenia, 0.6 mile south of U.S. Route 68 and Eleazer Road, 50 feet east of Eleazer Road and 25 feet south of driveway:

Ap—0 to 8 inches; grayish brown (10YR 5/2) silt loam; weak medium and fine granular structure; friable; many roots; slightly acid; clear smooth boundary.

A2—8 to 12 inches; grayish brown (10YR 5/2) silt loam; common medium distinct yellowish brown (10YR 5/4) mottles; moderate medium and fine subangular blocky structure; friable; many roots; medium acid; clear smooth boundary.

B21tg—12 to 20 inches; brown (10YR 5/3) silty clay loam; weak medium columnar structure parting to moderate medium subangular blocky; firm; many roots; medium continuous dark grayish brown (10YR 4/2) clay films on both vertical and horizontal ped faces; medium acid; gradual smooth boundary.

IIB22tg—20 to 28 inches; brown (10YR 5/3) silty clay loam; few fine distinct yellowish brown (10YR 5/6) mottles and common medium distinct dark gray (10YR 4/1) mottles; moderate medium subangular blocky structure; firm; common roots; medium continuous dark grayish brown (10YR 4/2) clay films; common dark colored concretions; 2 percent coarse fragments; neutral; gradual smooth boundary.

IIB23tg—28 to 34 inches; brown (10YR 5/3) clay loam; many medium and coarse distinct gray (10YR 5/1) mottles and streaks, and few fine faint yellowish brown (10YR 4/4) mottles; weak medium and coarse subangular blocky structure parting to weak fine subangular blocky; friable; common roots; thin patchy dark grayish brown (10YR 4/2) clay films on primary ped faces; 5 percent coarse fragments; mildly alkaline; gradual wavy boundary.

IIB3—34 to 38 inches; brown (10YR 5/3) clay loam; many large faint grayish brown (10YR 5/2) and dark grayish brown (10YR 4/2) mottles, few fine distinct yellowish brown (10YR 5/6) mottles, and common medium distinct gray (10YR 5/1) streaks; weak coarse subangular blocky structure parting to moderate fine subangular blocky; friable; few roots; common dark colored concretions; mildly alkaline; gradual irregular boundary.

IIC1—38 to 48 inches; brown (10YR 5/3) loam; common medium faint grayish brown (10YR 5/2) mottles, and common gray (10YR 5/1 and 6/1) streaks; massive; very firm; 10 to 15 percent coarse fragments; mildly alkaline, calcareous; gradual smooth boundary.

IIC2—48 to 78 inches; yellowish brown (10YR 5/4) loam; common medium faint light brownish gray (10YR 6/2) and brown (10YR 5/3) mottles and few medium distinct brownish yellow (10YR 6/6) mottles; massive; very firm; 10 to 15 percent coarse fragments; moderately alkaline, calcareous.

Reesville Series

Profile of Reesville silt loam (Sample Number GN-9) in Jefferson Township; 3 miles southwest of Bowersville, 150 feet east of Port William Road, and 200 feet south of the intersection of Beale Road:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam; weak fine and medium granular structure; friable; slightly acid; clear smooth boundary.

A2—7 to 12 inches; grayish brown (10YR 5/2) silt loam; many medium faint light brownish gray (10YR 6/2) mottles and common fine and medium distinct brown (10YR 4/3) mottles; weak thick platy structure; friable; slightly acid; gradual wavy boundary.

B21t—12 to 16 inches; brown (10YR 4/3) silty clay loam; few fine distinct yellowish brown (10YR 5/4) mottles and few fine faint dark yellowish brown (10YR 4/4) mottles; moderate fine and medium subangular blocky structure; firm; thin patchy grayish brown (10YR 5/2) clay films on ped surfaces; strongly acid; gradual wavy boundary.

B22t—16 to 26 inches; dark yellowish brown (10YR 4/4) silty clay loam; few fine distinct yellowish brown (10YR 5/4 and 5/6) mottles; strong medium subangular blocky structure; firm; medium patchy dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) clay films on ped surfaces; medium acid; gradual wavy boundary.

B23t—26 to 36 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct dark gray (10YR 4/1) and gray (10YR 5/1) mottles; weak medium subangular blocky structure; firm; thin patchy gray (10YR 5/1) clay films on ped surfaces; neutral; gradual wavy boundary.

B3—36 to 41 inches; yellowish brown (10YR 5/4) silt loam, common fine and medium distinct dark gray (10YR 4/1) and dark grayish brown (10YR 4/3) mottles; weak coarse subangular blocky structure; friable; medium patchy dark gray (10YR 4/1) clay films in pores and in old root channels; neutral; gradual irregular boundary.

C1—41 to 50 inches; yellowish brown (10YR 5/4) and light brownish gray (10YR 6/2) silt loam; common fine and medium distinct gray (10YR 6/1) mottles; massive; friable; common calcium carbonate concretions; mildly alkaline, calcareous; clear wavy boundary.

IIC2—50 to 60 inches; dark yellowish brown (10YR 4/4) silt loam; common medium distinct yellowish brown (10YR 5/4) mottles and many medium distinct gray (10YR 5/1) mottles; massive; firm; about 2 percent coarse fragments; mildly alkaline, calcareous.

General Nature of the County

This section provides general information about Greene County. It discusses climate, geology, physiography, relief and drainage, water supply, transportation facilities, farming, and trends in urbanization in the county.

Climate

The climate of Greene County is classified as continental (*16*). Such climate is characteristic of a landmass the size of North America and is marked by large annual, daily, and day to day ranges of temperature. Summers are moderately warm and humid. They have an average of 18 days with temperatures of 90°F or higher. Winters are reasonably cold and cloudy. They average 4 days of sub-zero temperatures. Weather changes occur every few days. They are caused by the

TABLE 10.—

[Analyses made by the Agronomy Department, Ohio Agricultural Research and Development

Soil and sample number	Horizon	Depth	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*
Birkbeck silt loam; GN-21.	Ap	0-8	0.4	1.3	0.9	1.5	0.5	4.6	76.8	18.6	6.1
	B1	8-11	.4	.9	.7	1.0	1.2	4.2	71.3	24.5	10.6
	B21t	11-16	.2	.8	.6	1.1	1.4	4.1	61.9	34.0	17.7
	B22t	16-30	.5	.6	.3	.7	.5	2.6	62.7	34.7	21.7
	B3t	30-42	.6	1.4	.8	1.7	3.0	7.5	76.6	15.9	8.0
	IIC	42-48	2.9	7.8	5.4	10.4	8.6	35.1	50.5	14.4	5.3
Brookston silty clay loam; GN-12.	Ap	0-8	.5	1.4	1.6	4.9	5.5	13.9	53.1	33.0	10.4
	B1g	8-11	.6	1.2	1.4	4.8	5.0	13.0	49.7	37.3	13.7
	B21tg	11-16	.7	1.1	1.2	3.8	4.5	11.3	49.4	39.3	18.4
	B22tg	16-22	.7	1.3	1.5	4.6	4.8	12.9	48.8	38.3	18.6
	B23g	22-34	1.0	1.8	1.6	4.5	4.8	13.7	51.1	35.2	17.5
	B23g	34-42	1.0	1.7	1.5	4.3	4.8	13.3	50.9	35.8	17.4
	C1	42-55	3.7	3.9	3.0	7.8	9.1	27.5	51.2	21.3	7.4
	C2	55-67	5.7	5.1	3.5	8.2	9.9	32.4	49.1	18.5	6.2
	C3	67-78	6.7	6.3	4.1	8.4	8.9	34.4	47.3	18.3	5.8
Crosby silt loam; GN-18.	Ap	0-9	.2	2.3	2.5	6.9	6.4	18.3	61.1	20.6	5.2
	B1t	9-13	.4	1.5	1.7	5.2	5.3	14.1	54.3	31.6	13.5
	B2t	13-24	.5	1.8	1.6	5.0	5.1	14.0	44.6	41.4	22.2
	B3t	24-28	1.2	2.5	2.1	6.8	6.9	19.5	42.5	38.0	19.1
	C1	28-36	4.7	6.6	2.8	6.0	6.8	26.9	47.2	25.9	11.5
	C2	36-60	3.8	8.5	3.5	6.4	7.3	29.5	43.9	26.6	12.8
Eldean silt loam; GN-19.	Ap	0-8	2.5	4.7	3.7	4.9	2.5	18.3	64.8	16.9	2.8
	A&B	8-13	2.4	5.4	3.3	3.7	2.0	16.8	58.9	24.3	10.1
	B1t	13-19	4.7	5.2	3.4	3.8	1.9	19.0	50.2	30.8	14.8
	IIB21t	19-24	9.9	8.7	5.6	6.6	3.2	34.0	29.4	36.6	20.8
	IIB22t	24-33	14.1	12.6	5.7	5.8	2.4	40.6	17.9	41.5	25.6
	IIB3t	33-38	23.0	24.6	7.9	5.6	3.9	65.0	22.4	12.6	7.0
	IIC	38-60	43.7	30.9	5.2	2.7	1.3	83.8	8.2	8.0	4.3
Fincastle silt loam; GN-25.	Ap	0-8	.7	2.0	1.3	2.4	2.4	8.8	76.8	14.4	5.6
	A2	8-12	.5	1.6	1.0	1.9	1.9	6.9	71.6	21.5	7.1
	B21tg	12-20	.2	.9	.6	1.7	3.7	7.1	57.6	35.3	20.0
	IIB22tg	20-28	1.2	2.4	1.9	4.9	4.2	14.6	55.6	29.8	13.3
	B23tg	28-34	3.1	5.3	3.4	8.1	5.4	25.3	45.8	28.9	7.7
	B3	34-38	3.8	7.1	3.7	8.3	6.1	29.0	41.1	29.9	8.1
	C1	38-48	2.6	5.4	4.5	13.4	9.5	35.4	42.7	21.9	6.0
	C2	60-78	4.4	6.4	2.2	12.3	9.9	35.2	43.5	21.3	5.0
Miamian silt loam; GN-8.	Ap	0-7	.9	2.5	2.7	5.2	3.9	15.2	68.5	16.3	2.2
	B1	7-14	1.0	1.9	1.7	4.7	3.3	12.6	51.4	36.0	15.3
	IIB21t	14-22	2.4	3.3	3.4	7.4	5.1	21.6	34.8	43.6	22.3
	IIB22t	22-30	3.3	4.1	4.6	10.1	6.3	28.4	32.9	38.7	18.1
	IIB3t	30-38	4.1	5.1	4.7	10.0	8.2	32.1	42.9	25.0	8.8
	IIC1	38-42	6.7	7.3	5.6	11.1	8.1	38.8	43.0	18.2	5.0
	IIC2	42-60	7.3	8.0	6.0	11.7	8.6	41.6	42.2	16.2	4.4
Milton silt loam; GN-22.	Ap1	0-3	1.0	1.1	.9	2.0	.8	5.8	74.1	20.1	12.4
	Ap2	3-6	.7	2.0	1.8	3.2	2.9	10.6	75.8	13.6	3.6
	B1t	6-10	.3	1.1	1.2	2.5	2.4	7.5	64.9	27.6	12.2
	B21t	10-19	1.2	2.4	2.4	4.9	3.9	14.8	48.8	36.4	21.1
	B22t	19-30	2.3	4.9	5.0	10.2	6.6	29.0	32.7	38.3	22.3
Ragsdale silty clay loam; GN-11.	Ap	0-8	.8	1.7	1.3	2.3	2.0	8.1	64.1	27.8	16.0
	A1	8-16	.5	1.4	1.1	1.7	1.8	6.5	62.6	30.9	18.8
	B21tg	16-25	.2	.6	.5	.8	1.4	3.5	65.7	30.8	16.9
	B22t	25-32	.2	.4	.3	.6	1.3	2.8	69.9	27.3	14.7
	B22t	32-39	0	.2	.2	.5	1.6	2.5	75.4	22.1	11.1
	B3	39-50	.1	.4	.4	.9	2.1	3.9	74.4	21.7	11.7
	C1	50-66	2.4	3.6	4.1	9.1	7.2	26.4	57.7	15.9	7.8
	IIC2	66-78	8.0	9.7	7.2	14.0	9.3	48.2	38.2	13.6	4.4

Laboratory data

Center (OARDC), Columbus, Ohio. Dashes indicate that no determination was made]

USDA textural class	Reaction	Organic matter content	Calcium carbonate equivalent	Extractable cations: Hydrogen	Extractable cations: Calcium	Extractable cations: Magnesium	Extractable cations: Potassium	Cation exchange capacity (sum)	Sum of bases	Base saturation (sum)
	pH	*Pct*	*Pct*	*(Meq per 100g of soil)*	*(Meq per 100g of soil)*	*(Meq per 100g of soil)*	*(Meq per 100g of soil)*	*(Meq per 100g of soil)*	*(Meq per 100g of soil)*	*Pct*
Silt loam	5.5	1.3	---	5.3	5.4	2.9	0.14	13.7	8.4	61
Silt loam	5.6	.6	---	5.9	7.5	5.3	.17	18.9	13.0	69
Silty clay loam	6.4	.9	---	4.8	11.2	8.9	.27	25.2	20.4	81
Silty clay loam	7.0	.9	1.7	3.2	13.7	9.3	.27	26.5	23.3	88
Silt loam	7.7	---	26.9	---	---	---	---	---	---	---
Silt loam	8.0	---	45.8	---	---	---	---	---	---	---
Silty clay loam	7.1	4.9	---	6.5	17.8	7.3	.49	32.1	25.6	80
Silty clay loam	7.0	4.1	---	5.7	17.9	7.8	.48	31.9	26.2	82
Silty clay loam	7.4	---	.4	---	---	---	---	---	---	---
Silty clay loam	7.4	---	.2	---	---	---	---	---	---	---
Silty clay loam	7.7	---	.2	---	---	---	---	---	---	---
Silty clay loam	7.7	---	.3	---	---	---	---	---	---	---
Silt loam	8.1	---	28.8	---	---	---	---	---	---	---
Loam	8.3	---	36.1	---	---	---	---	---	---	---
Loam	8.3	---	37.1	---	---	---	---	---	---	---
Silt loam	5.4	2.8	---	9.6	7.4	2.1	.74	19.8	10.2	52
Silty clay loam	5.1	1.2	---	9.6	9.5	4.0	.41	23.5	13.9	59
Silty clay	6.0	1.0	---	7.8	14.6	7.3	.44	30.1	22.3	74
Silty clay loam	7.3	---	5.2	---	---	---	---	---	---	---
Loam	7.9	---	28.5	---	---	---	---	---	---	---
Loam	8.0	---	31.8	---	---	---	---	---	---	---
Silt loam	6.2	2.2	---	6.2	5.8	1.9	.19	14.1	7.9	56
Silt loam	6.0	1.2	---	6.5	5.9	2.6	.14	15.5	8.6	57
Silty clay loam	5.4	.9	---	8.1	7.7	2.9	.21	18.9	10.8	57
Clay loam	5.6	.9	---	9.3	10.2	3.6	.30	23.4	14.1	60
Clay	5.6	1.0	---	11.3	11.9	4.8	.35	28.3	17.0	60
Coarse sandy loam	7.6	---	42.1	---	---	---	---	---	---	---
Loamy coarse sand	7.8	---	53.6	---	---	---	---	---	---	---
Silt loam	6.2	2.1	---	4.8	6.0	2.9	.26	14.0	9.2	66
Silt loam	5.7	1.2	---	6.0	7.2	3.5	.22	16.9	10.9	65
Silty clay loam	6.0	1.2	---	6.7	13.4	6.9	.42	27.4	20.7	76
Silty clay loam	7.1	1.2	---	6.9	12.0	7.1	.29	26.3	19.4	74
Clay loam	7.6	---	4.6	---	---	---	---	---	---	---
Clay loam	7.8	---	3.9	---	---	---	---	---	---	---
Loam	7.8	---	26.6	---	---	---	---	---	---	---
Loam	8.0	---	29.9	---	---	---	---	---	---	---
Silt loam	5.3	1.7	---	6.1	3.4	1.2	.17	10.9	4.7	44
Silty clay loam	4.9	.9	---	9.8	7.3	3.3	.43	20.8	11.0	53
Clay	5.4	.7	---	8.7	9.8	5.6	.52	24.6	15.9	65
Clay loam	6.6	.9	---	4.4	10.2	5.9	.38	20.9	16.5	79
Loam	7.6	---	27.5	---	---	---	---	---	---	---
Loam	7.7	---	43.3	---	---	---	---	---	---	---
Loam	7.8	---	42.8	---	---	---	---	---	---	---
Silt loam	5.6	3.4	---	7.7	5.3	2.2	.27	15.5	7.8	50
Silt loam	6.0	2.0	---	7.2	6.4	2.7	.17	16.5	9.3	56
Silty clay loam	5.5	1.0	---	6.2	7.5	3.0	.23	16.9	10.7	63
Silty clay loam	5.4	.7	---	7.1	9.1	4.2	.33	20.7	13.6	66
Clay loam	5.4	.7	---	7.0	8.6	5.2	.42	21.2	14.2	67
Silty clay loam	6.5	4.9	---	7.7	18.1	5.4	.37	31.6	23.9	76
Silty clay loam	6.4	2.9	---	6.2	18.0	5.9	.40	30.5	24.3	80
Silty clay loam	7.1	1.0	---	3.2	14.0	6.4	.37	24.0	20.8	87
Silty clay loam	7.4	---	.3	---	---	---	---	---	---	---
Silt loam	7.5	---	.4	---	---	---	---	---	---	---
Silt loam	7.6	---	.3	---	---	---	---	---	---	---
Silt loam	7.7	---	6.0	---	---	---	---	---	---	---
Loam	8.0	---	25.6	---	---	---	---	---	---	---

TABLE 10.—

Soil and sample number	Horizon	Depth	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*
Raub silt loam; GN-23.	Ap	0-8	1.4	1.4	0.6	1.2	0.5	5.1	67.6	27.3	8.7
	A12	8-14	.1	.8	.8	1.7	1.4	4.8	65.2	30.0	12.9
	B21t	14-27	.5	1.2	1.0	2.4	1.9	7.0	59.1	33.9	18.0
	IIB22t	27-36	1.4	3.7	4.2	10.1	5.6	25.0	38.9	36.1	10.8
	IIB3t	36-44	2.1	4.6	4.9	11.3	7.8	30.7	42.0	27.3	11.8
	IIC	44-60	1.7	5.5	5.5	12.2	7.5	32.4	38.1	29.5	4.8
Reesville silt loam; GN-9.	Ap	0-7	1.9	2.5	1.4	2.5	2.6	10.9	75.2	13.9	1.9
	A2	7-12	1.7	2.2	1.1	2.0	2.1	9.1	69.9	21.0	6.8
	B21t	12-16	.5	.9	.7	1.5	1.8	5.4	61.4	33.2	15.3
	B22t	16-26	.4	.8	.6	1.4	1.8	5.0	59.7	35.3	19.7
	B23t	26-36	.3	.8	.9	2.7	3.3	8.0	64.3	27.7	14.1
	B3	36-41	1.1	2.0	2.2	6.5	6.2	18.0	55.3	26.7	11.3
	C1	41-50	.4	.7	.7	2.0	3.0	6.8	75.2	18.0	8.8
	IIC2	50-60	2.7	3.3	2.5	6.5	6.1	21.1	54.2	24.7	8.0
Rodman loam; GN-24.	A1	0-6	3.4	7.2	9.8	20.7	8.7	49.8	33.4	16.8	4.8
	B2	6-10	9.5	15.0	12.2	19.1	7.3	63.1	25.7	11.2	5.9
	C	10-40	27.1	52.2	5.5	.9	.5	86.2	9.1	4.7	1.6
Rush silt loam; GN-16.	Ap	0-10	.6	.9	.4	.9	1.0	3.8	78.9	17.3	6.3
	A2	10-13	.1	.7	.5	.8	1.3	3.4	75.6	21.0	7.5
	B1t	13-21	0	.2	.2	.4	1.0	1.8	69.9	28.3	15.9
	B21t	21-28	0	.1	.1	.3	1.2	1.7	66.0	32.3	16.8
	B22t	28-38	.1	.2	.4	.8	2.2	3.7	68.0	28.3	15.9
	IIB23t	38-47	3.0	9.8	14.5	18.4	3.3	49.0	25.3	25.7	15.3
	IIB24t	47-54	7.5	17.8	11.3	8.5	3.0	48.1	14.3	37.6	25.2
	IIB3	54-60	16.1	27.8	15.8	6.4	3.3	69.4	23.4	7.2	4.7
	IIC	60-120	18.4	36.1	21.6	11.8	2.5	90.4	5.7	3.9	2.3
Sleeth silt loam; GN-29.	Ap	0-6	1.1	3.0	3.2	6.3	3.8	17.4	67.7	14.9	5.8
	A2	6-10	1.4	2.9	3.5	6.7	3.3	17.8	79.6	11.8	2.6
	B1	10-15	.9	3.1	3.6	7.2	3.9	18.7	67.1	14.2	3.9
	B21t	15-24	1.1	2.3	2.5	4.0	2.4	12.3	59.4	28.3	13.5
	IIB22t	24-36	2.7	4.8	4.7	8.7	4.3	25.2	44.8	30.0	16.7
	IIB23t	36-44	9.5	15.5	6.6	6.7	4.9	43.2	26.7	30.1	17.7
	IIB3t	44-52	8.3	9.9	3.7	6.1	8.9	36.9	45.1	18.0	9.8
	IIC	52-60	21.5	28.5	4.2	4.4	4.7	63.3	28.9	7.8	3.3
Westland silty clay loam; GN-28.	Ap	0-10	1.6	2.7	2.0	3.1	2.4	11.8	56.3	31.9	14.4
	A12	10-14	.8	1.6	1.4	2.5	2.1	8.4	57.1	34.5	17.6
	B21tg	14-24	1.5	4.4	4.1	6.7	3.7	20.4	46.1	33.5	17.7
	B22tg	24-30	1.6	3.9	4.1	7.1	3.7	20.4	43.6	36.0	17.9
	B23g	30-38	2.2	5.3	5.1	8.3	4.5	25.4	43.5	31.1	15.5
	B3g	38-52	5.2	8.5	5.0	6.1	7.3	32.1	52.7	15.2	6.9
	C	52-108	20.3	22.6	10.0	6.0	3.9	62.8	30.0	7.2	2.3
Xenia silt loam; GN-17.	Ap	0-8	1.3	.7	.8	1.9	1.8	6.5	75.6	17.9	7.6
	B1	8-13	.2	.9	.9	2.3	2.3	6.6	62.0	31.4	19.0
	B21t	13-20	.1	.4	.3	1.0	1.5	3.3	61.7	35.0	20.8
	B22t	20-28	.3	.7	.6	1.6	2.1	5.3	61.4	33.3	18.0
	IIB23t	28-34	.7	2.0	2.0	4.7	3.9	13.3	54.8	31.9	17.5
	IIB3t	34-42	5.7	8.2	6.7	13.9	9.4	43.9	37.0	19.1	8.8
	IIC1	42-52	5.9	7.6	5.9	11.8	8.4	39.6	38.5	21.9	7.0

Laboratory data—Continued

USDA textural class	Reaction	Organic matter content	Calcium carbonate equivalent	Extractable cations				Cation exchange capacity (sum)	Sum of bases	Base saturation (sum)
				Hydrogen	Calcium	Magnesium	Potassium			
	pH	*Pct*	*Pct*	*(Meq per 100g of soil)*	*(Meq per 100g of soil)*	*(Meq per 100g of soil)*	*(Meq per 100g of soil)*	*(Meq per 100g of soil)*	*(Meq per 100g of soil)*	*Pct*
Silty clay loam	6.2	3.8		7.7	11.5	4.0	0.33	23.5	15.8	67
Silty clay loam	6.3	2.8		7.3	13.3	3.9	.32	24.8	17.5	71
Silty clay loam	6.2	.9		5.0	12.1	3.2	.29	20.6	15.6	76
Clay loam	6.3	.7		3.9	10.8	3.4	.19	18.3	14.4	79
Clay loam	7.4		13.8							
Clay loam	7.8		24.4							
Silt loam	6.1	2.2		4.5	6.1	2.7	.27	13.6	9.1	67
Silt loam	6.1	.7		4.2	5.9	3.5	.21	13.8	9.6	70
Silty clay loam	5.1	.9		9.3	8.2	5.6	.41	23.5	14.2	60
Silty clay loam	5.7	.9		6.6	11.8	8.3	.46	27.2	20.6	76
Silty clay loam	7.1	1.3		2.5	10.0	6.7	.38	19.6	17.1	87
Silt loam	7.3		1.1							
Silt loam	7.5		15.3							
Silt loam	7.6		23.0							
Loam	7.4	3.3	5.0	3.3	17.5	4.7	.68	26.2	11.9	88
Sandy loam	7.8		6.0							
Loamy coarse sand	8.1		69.5							
Silt loam	6.0	1.9		7.0	4.9	1.3	.27	13.5	6.5	48
Silt loam	5.8	1.0		6.4	5.2	1.6	.34	13.5	7.1	53
Silty clay loam	4.8	.5		10.3	5.2	2.0	.37	17.9	7.6	42
Silty clay loam	4.6	.5		13.5	5.7	2.3	.25	21.7	8.2	38
Silty clay loam	4.8	.3		12.2	3.7	4.5	.03	20.4	8.2	43
Sandy clay loam	5.0	.5		8.8	4.3	5.5	.02	18.6	9.8	53
Sandy clay	6.4	1.0		7.1	8.9	9.3	.01	25.3	18.2	72
Coarse sandy loam	7.8		37.8							
Coarse sand	8.0		52.5							
Silt loam	6.0	5.4		7.0	10.2	2.3	.18	19.7	12.7	64
Silt loam	6.0	2.2		4.2	4.9	1.5	.10	10.7	6.5	61
Silt loam	5.9	1.1		3.7	3.8	1.8	.09	9.4	5.7	61
Silty clay loam	5.2	.8		7.2	5.5	4.9	.28	17.9	10.7	60
Clay loam	5.7	.7		5.2	9.1	7.6	.36	22.3	17.1	77
Clay loam	7.3	.5	6.0							
Loam	7.7		44.6							
Coarse sandy loam	8.0		53.3							
Silty clay loam	7.3	6.0		4.0	25.4	6.2	.43	36.0	32.0	89
Silty clay loam	7.2	5.7		5.2	27.2	5.0	.30	37.7	32.5	86
Clay loam	7.2	5.4		5.1	27.4	9.3	.30	42.1	37.0	88
Clay loam	7.4	3.0	1.0	3.5	25.0	9.1	.35	37.9	34.5	91
Clay loam	7.5		5.6							
Silt loam	7.9		48.9							
Coarse sandy loam	8.0		56.8							
Silt loam	5.6	2.0		7.3	5.3	1.7	.34	14.6	7.3	50
Silty clay loam	6.0	.6		6.3	10.7	3.6	.38	21.0	14.7	70
Silty clay loam	6.2	.6		6.7	11.0	4.8	.35	22.8	16.1	71
Silty clay loam	6.6	.5		5.1	10.9	6.0	.36	22.4	17.3	77
Silty clay loam	7.2	.8		3.0	12.1	7.2	.33	22.6	19.6	87
Loam	7.8		31.0							
Loam	7.8		33.6							

passing of cold or warm fronts and their associated centers of high and low pressure.

Average temperature and precipitation data is given in table 11. This data was recorded at Xenia, Ohio, from 1936 to 1965 and is generally representative of Greene County.

TABLE 11.—*Temperature and precipitation data*
[Data from Xenia. Period of record, 1936-1965]

Month	Temperature			Precipitation	
	Average daily maximum	Average daily minimum	Average monthly	Average[1] monthly total	Average snow and sleet total
	°F	*°F*	*°F*	*Inches*	*Inches*
January	38.3	21.1	29.7	3.08	6.7
February	41.5	22.9	32.2	2.54	5.0
March	51.1	30.3	40.7	3.61	3.4
April	63.5	40.2	51.8	3.96	.2
May	74.5	50.3	62.4	3.75	0
June	82.5	59.0	70.7	4.30	0
July	85.4	61.9	73.6	3.84	0
August	84.1	60.6	72.3	3.28	0
September	78.7	53.5	66.1	2.67	0
October	67.7	42.9	55.3	2.10	0
November	52.3	32.5	42.4	2.71	1.7
December	40.7	23.8	32.2	2.24	4.7
Year	63.3	41.5	52.4	38.08	21.7

[1]Precipitation in the form of snow and sleet have been included.

Showers and thunderstorms account for most of the rainfall during the growing season. Thunderstorms occur on about 40 days each year, mostly in the period April through August. A high percentage of the erosion that occurs is during this period. Heavy rains of 2.4 inches in 24 hours can be expected at least once in 2 years and rains of 3.1 inches in 24 hours about once in 5 years. Surface windspeed averages about 7 miles per hour in summer and 11 miles per hour in winter. Damaging winds of 35 to 85 miles per hour occur most often in spring and summer; they are commonly associated with migrating thunderstorms. Between 1900 and 1968, eight tornadoes were reported in Greene County.

The amount of moisture in the soil is related to rainfall and commonly varies from season to season in a pattern that often repeats itself each year. It reaches its lowest point in October and is replenished late in winter and early in spring when precipitation exceeds evaporation and water used by vegetation.

To achieve high yields of most field crops, a large amount of available water is needed in the rooting zone of the soil, particularly during July and August. Available water is mainly that water retained in the soil after natural or artificial drainage. In July and August the amount of rainfall is somewht less per month than earlier in the growing season, and rainfall distribution in some years is not uniform, so the success of a crop often depends on the reserve of available water in the rooting zone during the dryer months of the growing season. The size of this reserve, both at the beginning of the season and throughout the season, depends on the available water capacity of each kind of soil and on the extent to which soil and water conservation practices are used. Information about available water capacity and conservation practices is in the sections "Use and Management of the Soils" and "Descriptions of the Soils" of this survey.

The length of the average growing season in the county is 168 days. This period is generally from about April 26 to October 11th; the average dates of the last freezing temperature in spring and the first in fall are given in table 12.

Some kinds of soil in the county warm up earlier in the spring than others, and these soils are more suited to early planting of crops. The rate in which the temperature of the soil increases in the spring is related to the amount of water in the soil. It takes more heat to increase the temperature of water in the soil than the other mineral or organic components. Therefore good drainage, either natural or artificial, is necessary for early spring planting.

TABLE 12.—*Probability of last freezing temperatures in spring and first in fall*
[Data from Xenia. Period of record, 1936-1965]

Probability	Minimum temperature		
	24° F or lower	28° F or lower	32° F or lower
Spring:			
1 year in 10 later than	Apr. 15	Apr. 28	May 11
3 years in 10 later than	Apr. 6	Apr. 21	May 2
5 years in 10 later than	Mar. 30	Apr. 16	Apr. 26
Fall:			
1 year in 10 earlier than	Oct. 20	Oct. 11	Sept. 27
3 years in 10 earlier than	Oct. 28	Oct. 18	Oct. 5
5 years in 10 earlier than	Nov. 3	Oct. 23	Oct. 11

The maximum depth to which soils freeze in winter varies. Generally, soil bare of vegetative cover can freeze to a depth of approximately 30 inches. Depth of frost penetration also depends on degrees of coldness and the duration of a period of cold weather. The amounts of water in the soil and of vegetative cover on the surface are moderating factors.

Frost heaving occurs in the soil when there is a specific combination of freezing temperature and moisture condition. Frost heaving can damage the root system of a plant as well as crumble a hard-surface road. Those soils with a relatively high silt content and a water table within a few feet of the surface are most susceptible to the ice buildup associated with frost heaving. The combination of temperature and moisture conditions favorable for frost heaving commonly occurs in winter and early in spring. Vegetative cover or snow cover, or both, moderate the effect of heaving.

In most soils in the county a crust forms on the surface as the soil dries after a period of rain. Crusting is most common on those soils that have a texture of silt loam or finer and that are unprotected from the puddling effect of raindrops. The impact of the rain and the consolidating effect of water on the soil particles causes the crust to form when the surface dries. The crust commonly is about ½ inch to 1½ inches thick. Crusting is less common on soils that have a surface layer either high in organic matter content or high in sand.

Conditions that favor crusting may occur throughout the year, but the effect of crusting is most critical while seedlings are emerging. Surface crusts also reduce infiltration and increase runoff.

Geology

Greene County has been covered by continental glaciers at least twice. Wisconsin age glacial drift presently covers the entire county. Older glacial deposits are present only in deeply buried, pre-Wisconsin age valleys. The Wisconsin age deposits include glacial till, outwash, associated loess or silty windblown deposits, and lacustrine clays and silts. Alluvium in the county was deposited relatively recently in terms of geologic time. Soils that formed in residuum from the underlying bedrock are in only a few areas along steep stream valley sides and in areas of thin deposits of glacial till. The bedrock in Greene County includes limestone and shale of Ordovician age and limestone and dolomite of Silurian age.

The glacial history of the county is very complex. The Wisconsin glacier entered the county in two separate masses called lobes. One mass, the Miami lobe, entered the county from the northwest and west. The other mass, the Scioto lobe, entered from the northeast and east. The two lobes did not reach their maximum extent at the same time. Instead, they fluctuated across the center of the county over a period of 3,000 to 5,000 years (*6*).

One lobe often overrode deposits laid down earlier by the opposing lobe. The two lobes came together in a general north to south area in the part of the county now occupied by Little Miami River.

Two prominent glacial moraines extend across Greene County. The Cuba end moraine is a belt of gently sloping to rolling land east of Xenia that is about 5 miles wide and extends in a general north-south direction across the county. The Reesville end moraine is a strip of gently sloping to sloping land just east of Jamestown that is about 3 miles wide and also extends in a north-south direction. Both these moraines and the land areas that lie to the east of each represent the area of the county covered by the last advance of the Scioto lobe. The land area west of the Cuba moraine was affected mostly by glaciation from the Miami lobe.

When the glacier began its last retreat, the melt water from the glacial ice cut channels through the glacial till and created the drainage pattern that exists today. In some places the melt water deposited large areas of outwash sand and gravel.

Both the Miami and Scioto ice lobes moved over limestone and dolomite bedrock as they entered the county. As a result, the glacial till under the soils of Greene County contains a high percentage of limestone and dolomite pebbles, including fine material in the form of ground up limestone and dolomite. Glacial drift in Greene County also includes numerous igneous rocks that were transported hundreds of miles from the north.

During the immediate post-glacial period, there was a period when conditions favored the erosion and transport of silt by wind. As a result, loess deposits are of varying thickness throughout the county. Relatively deep deposits cover most of the county except for an area in the northwestern part and a strip along the eastern boundary. The silt is relatively shallow or absent in an area north and west of a line between the towns of Zimmerman and Clifton which covers parts of Bath, Beaver Creek, and Miami Townships. The silt deposits are relatively thin or absent in a belt of land along the eastern part of the county, mostly east of a line between the towns of Bowersville and Gladstone, which covers parts of Ross, Silver Creek, and Jefferson Townships.

Physiography, Relief, and Drainage

The eastern part of the county is largely composed of nearly level to gently sloping soils that show major changes in relief only in areas along streams, in small areas of terraces, and on the Cuba and Reesville moraines. These moraines are long belts of higher land, oriented in a general north-south direction, that were formed by movement of the Wisconsin glacier in its final stages. In this part of the county Ragsdale, Reesville, Fincastle, Brookston, and Crosby soils are dominant in areas of gentle relief. Less extensive are Miamian, Celina, Russell, and Xenia soils in areas of more prominent relief. Most of this part of the county is drained southwestward by tributaries of Little Miami River; Massie and Caesar Creeks are the largest tributaries.

The western part of the county shows more prominent relief than the eastern part. The soils are generally gently sloping to steep. Little Miami River, the main river in the county, and Mad River, which cuts through the northwest corner, flow southwestward to drain this part of the county. These rivers and their tributaries are more deeply entrenched in the glacial drift than the streams in the eastern part of the county. This is particularly true of Little Miami River because its downcutting has produced limestone gorges and deeply cut tributaries. Such dissection by the streams in this part of the county has contributed to removal of water from the land. This has resulted in the formation of a relatively higher percentage of soils that are well drained or moderately well drained.

In the western part of the county, Miamian, Celina, Russell, and Xenia soils are dominant in areas of glacial till, but Eldean, Ockley, and Rush soils are dominant in areas of glacial outwash.

Elevation of the present valley floors in the western part of the county ranges from about 800 to 850 feet above sea level. Elevations on the uplands range from 950 to 1,000 feet in the western part to more than 1,100 feet in the eastern part of the county.

Water Supply

The ground water supply is adequate in most parts of the county to meet the needs of the people. Several small areas are in the southern and western parts of the county where glacial deposits are thin over Ordovician shale and the supply of water is restricted. Dug wells in these areas may provide enough water for home use, but wells drilled into the shale do not yield a large amount of water.

The larger towns and cities are served by public water and sewer services. The water supply for these systems is mostly from wells that penetrate aquifers formed in deep pre-glacial valleys that are filled with coarse textural glacial drift. When developed, some of these aquifers provide as much as 2,000 gallons or more of water per minute.

Some springs in the area provide a strong flow of water, and they provide water for livestock. Few streams currently provide water for domestic consumption. Wells drilled into the Silurian bedrock, which underlies the glacial drift in the north-central and eastern parts of the county, generally supply adequate water for home and farm needs.

Transportation Facilities

Greene County is well served by hard-surfaced, all-weather highways. Interstate 71 crosses the southeastern corner of the county and is accessible at the intersection with State Route 72 in Jefferson Township south of Bowersville. Interstate 675 is being constructed in the western part of the county and will have interchanges with several roads in Bath, Beaver Creek, and Sugar Creek Townships. Three U.S. Highways cross the county: U.S. 35 runs east and west through the county, U.S. 68 runs north and south, and U.S. 42 runs northeast and southwest. These highways intersect at Xenia. State highways intersect with these larger highways to provide access to all parts of the county. All county roads and nearly all township roads are hard-surfaced, all-weather roads. Three railroad lines serve the county with freight service.

The Greene County Airport, located west of Xenia, and a privately owned airport, east of Xenia, provide air services, but do not offer scheduled commercial passenger service. Wright-Patterson Air Force Base, near Fairborn in Bath Township, has a large airport but does not offer commercial services. A few privately owned aircraft operate from private air strips in the county.

Farm products are generally transported by truck to a rail terminal or often to a major elevator or market.

Farming

According to the 1969 Census of Agriculture, the average size of farms in Greene County decreased from 181.8 acres in 1964 to 163.9 acres in 1969. During the same period farms increased in number from 1,120 to 1,198. An increase in the number of farms in the 1- to 9-acre, 10- to 49-acre, and 50- to 69-acre sizes accounts for much of the shift in the number of farms and the average size of farms. The proportion of the total land area in farms in the county has declined from 75.4 percent in 1964 to 73.9 percent in 1969.

Following are the number of acres used for selected crops during 1964 and 1969:

	1964	1969
Corn (all purposes)	63,128	56,782
Wheat	22,683	15,291
Soybeans	12,306	16,452
Hay	19,341	11,671
Vegetables, sweet corn, and melons	130	174

Livestock trends between 1964 and 1969 show cattle and calves increasing slightly from 27,968 to 28,578 head; hogs and pigs decreasing from 122,455 to 99,771 head; and sheep and lambs decreasing from 16,423 to 14,112 head.

Urbanization

One of the main factors affecting the use of land in Greene County is the demand for homesites and commercial or industrial sites, especially in the western part of the county. The suburbs of Dayton, which is in adjacent Montgomery County, are spreading into the western part of Greene County.

The eastern part of the county, generally east of U.S. 68, is dominantly in agricultural use. New houses are being constructed along roads and near existing villages, but not to the same extent as in the western part of the county. Large areas of soils in the eastern part of the county are very poorly drained, which reduces their relative suitability for homesites.

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Glossary

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Available water capacity (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 moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	More than 9

Base saturation. The degree to which material having base exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the 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 (commonly with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid. A soil having measurable amounts of calcium carbonate or magnesium carbonate.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coat, clay skin.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds 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, little affected by moistening.

Contour stripcropping (or contour farming). Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, 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 classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climatic moors."

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by running water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes a bare surface.

Esker (geology). A narrow, winding ridge of stratified gravelly and sandy drift deposited by a stream flowing in a tunnel beneath a glacier.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the assorted and unassorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by melt water as it flows from glacial ice.

Glacial till (geology). Unassorted, nonstratified glacial drift consisting of clay silt, sand, and boulders transported and deposited by glacial ice.

Heaving of plants. The partial lifting of plants out of the soil caused by freezing and thawing of soil in winter. Frequently results in broken roots.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows:

O horizon.—An organic layer, fresh and decaying plant residue, at the surface of a mineral soil.

A horizon.—The mineral horizon, formed or forming at or near the surface, in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon most of which was originally part of a B horizon.

A2 horizon.—A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

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 a combination of these; (2) by prismatic or blocky structure; (3) by redder or browner colors than those in the A horizon; or (4) by a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that from which the solum is presumed to have formed. If the material is known to differ from that in the solum the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or B 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.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields or close-growing crops or in orchards so that it flows in only one direction.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame (geology). An irregular, short ridge or hill of stratified glacial drift.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

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

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is greater than that of organic soil.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded 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 of the diameter along the greatest dimension. Fine indicates less than 5 millimeters (about 0.2 inch); medium, from 5 to 15 millimeters (about 0.2 to

0.6 inch); and coarse, more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material mixed with mineral soil material. The content of organic matter is more than 20 percent.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Permeability. The quality that enables the soil to transmit water or air, measured as the number of inches per hour that water moves through the soil. Terms describing permeability are very slow (less than 0.06 inch), slow (0.06 to 0.02 inch), moderately slow (0.2 to 0.6 inch), moderate (0.6 to 2.0 inches), moderately rapid (2.0 to 6.0 inches), rapid (6.0 to 20 inches), and very rapid (more than 20 inches.)

pH value. (See Reaction, soil). A numerical designation of acidity and alkalinity in soil.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH		pH
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Moderately alkaline	7.9 to 8.4
Strongly acid	5.1 to 5.5	Strongly alkaline	8.5 to 9.0
Medium acid	5.6 to 6.0	Very strongly alkaline	9.1 and higher
Slightly acid	6.1 to 6.5		

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged in stream channels from a drainage area. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Soil. A natural, three-dimensional body at the earth's surface that is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in mature soil consists of 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 characteristics of the soil are largely confined to the solum.

Stratified. Arranged in strata, or layers. The term refers to geologic 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 aggregates that are separated from adjoining aggregates. 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 without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. A stream terrace is frequently called a second bottom, in contrast with a flood plain, and is seldom subject to overflow. A marine terrace, generally wide, was deposited by the sea.

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, silt loam, 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, especially the soil structure, as related to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Water table. The upper limit of the soil or underlying rock material that is wholly saturated with water.

Water table, apparent. A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

Water table, artesian. A water table under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

Water table, perched. A water table standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

GUIDE TO MAPPING UNITS

Map symbol	Mapping unit	Page	Capability unit Symbol	Capability unit Page	Woodland suitability group Symbol
Ag	Algiers silt loam	57	IIw-1	9	2w2
BbB	Birkbeck silt loam, 1 to 4 percent slopes	58	IIe-1	8	1o1
Bs	Brookston silty clay loam	59	IIw-3	9	2w1
Bt	Brookston-Urban land complex	59	------	--	---
CcD2	Casco-Eldean loams, 12 to 18 percent slopes, moderately eroded	60	VIe-2	12	3s1
CdE2	Casco-Rodman loams, 18 to 50 percent slopes, moderately eroded	60	VIIe-1	12	3s2
CeA	Celina silt loam, 0 to 2 percent slopes	61	I-1	8	2o1
CeB	Celina silt loam, 2 to 6 percent slopes	61	IIe-1	8	2o1
CrA	Crosby silt loam, 0 to 2 percent slopes	62	IIw-2	9	3w1
CrB	Crosby silt loam, 2 to 6 percent slopes	62	IIw-2	9	3w1
EdB	Edenton silt loam, 2 to 6 percent slopes	63	IIe-4	9	2o1
EdC2	Edenton silt loam, 6 to 12 percent slopes, moderately eroded	63	IIIe-3	10	2o1
EdD2	Edenton silt loam, 12 to 18 percent slopes, moderately eroded	63	IVe-1	11	2r1
Ee	Eel loam	64	IIw-5	10	1o1
EmA	Eldean silt loam, 0 to 2 percent slopes	64	IIs-1	10	2o1
EmB	Eldean silt loam, 2 to 6 percent slopes	65	IIe-3	8	2o1
EmB2	Eldean silt loam, 2 to 6 percent slopes, moderately eroded	65	IIe-3	8	2o1
EmC2	Eldean silt loam, 6 to 12 percent slopes, moderately eroded	65	IIIe-2	10	2o1
EnC3	Eldean clay loam, 6 to 12 percent slopes, severely eroded	65	IVe-1	11	2o1
EpC	Eldean-Urban land complex, rolling	65	------	--	---
FaF	Fairmount silty clay loam, moderately deep variant, 25 to 50 percent slopes	66	VIIe-2	12	4d3
FnA	Fincastle silt loam, 0 to 2 percent slopes	67	IIw-2	9	2w2
Gn	Genesee loam	67	IIw-5	10	1o1
Ln	Linwood muck	68	IIw-4	9	---
MhA	Miamian silt loam, 0 to 2 percent slopes	69	I-1	8	2o1
MhB	Miamian silt loam, 2 to 6 percent slopes	69	IIe-1	8	2o1
MhB2	Miamian silt loam, 2 to 6 percent slopes, moderately eroded	69	IIe-2	8	2o1
MhC2	Miamian silt loam, 6 to 12 percent slopes, moderately eroded	70	IIIe-1	10	2o1
MhD2	Miamian silt loam, 12 to 18 percent slopes, moderately eroded	70	IVe-1	11	2r1
MlB3	Miamian clay loam, 2 to 6 percent slopes, severely eroded	70	IIIe-1	10	2o1
MlC3	Miamian clay loam, 6 to 12 percent slopes, severely eroded	70	IVe-1	11	2o1
MlD3	Miamian clay loam, 12 to 18 percent slopes, severely eroded	70	VIe-1	12	2r1
MmD2	Miamian-Casco complex, 12 to 18 percent slopes, moderately eroded	70	IVe-1	11	2r1
MmE2	Miamian-Casco complex, 18 to 35 percent slopes, moderately eroded	70	VIe-1	12	2r1
MoB2	Miamian-Eldean silt loams, 2 to 6 percent slopes, moderately eroded	71	IIe-2	8	2o1
MoC2	Miamian-Eldean silt loams, 6 to 12 percent slopes, moderately eroded	71	IIIe-1	10	2o1
MpE	Miamian and Hennepin soils, 18 to 25 percent slopes	71	VIe-1	12	2r1
MpF	Miamian and Hennepin soils, 25 to 50 percent slopes	71	VIIe-1	12	2r2
MrB	Miamian-Urban land complex, undulating	71	------	--	---
MrC	Miamian-Urban land complex, rolling	71	------	--	---
Ms	Millsdale silty clay loam	72	IIIw-3	11	2w1
MtA	Milton silt loam, 0 to 2 percent slopes	73	IIs-1	10	2o1
MtB	Milton silt loam, 2 to 6 percent slopes	73	IIe-4	9	2o1
MtC2	Milton silt loam, 6 to 12 percent slopes, moderately eroded	73	IIIe-3	10	2o1
MUF	Milton soils, channery variant, 25 to 50 percent slopes	73	VIIe-2	12	3f1
OcA	Ockley silt loam, 0 to 2 percent slopes	74	I-1	8	1o1
OcB	Ockley silt loam, 2 to 6 percent slopes	74	IIe-1	8	1o1
OcB2	Ockley silt loam, 2 to 6 percent slopes, moderately eroded	74	IIe-2	8	1o1
OdB	Ockley-Urban land complex, undulating	75	------	--	---
OeB	Odell silt loam, 2 to 6 percent slopes	75	IIw-2	9	2w2
Pa	Patton silty clay loam	76	IIw-3	9	2w1
Ra	Ragsdale silty clay loam	77	IIw-3	9	2w1
RbA	Randolph silt loam, 0 to 2 percent slopes	78	IIIw-1	11	3w1
RdA	Raub silt loam, 0 to 2 percent slopes	78	IIw-2	9	2w2
RdB	Raub silt loam, 2 to 6 percent slopes	78	IIw-2	9	2w2
ReA	Reesville silt loam, 0 to 2 percent slopes	79	IIw-2	9	2w2
RhB	Ritchey silt loam, 2 to 6 percent slopes	80	IIIe-4	10	4d1
RhC	Ritchey silt loam, 6 to 12 percent slopes	80	IVe-2	11	4d1

Map symbol	Mapping unit	Page	Capability unit Symbol	Capability unit Page	Woodland suitability group Symbol
RhD	Ritchey silt loam, 12 to 18 percent slopes	80	VIe-3	12	4d2
RhE2	Ritchey silt loam, 18 to 25 percent slopes, moderately eroded	80	VIe-3	12	4d2
Rs	Ross loam	81	IIw-5	10	1o1
RtA	Rush silt loam, 0 to 2 percent slopes	82	I-1	8	1o1
RtB	Rush silt loam, 2 to 6 percent slopes	82	IIe-1	8	1o1
RuA	Russell silt loam, 0 to 2 percent slopes	83	I-1	8	1o1
RvB	Russell-Miamian silt loams, 2 to 6 percent slopes	83	IIe-1	8	1o1
RvB2	Russell-Miamian silt loams, 2 to 6 percent slopes, moderately eroded	83	IIe-2	8	1o1
SlA	Sleeth silt loam, 0 to 2 percent slopes	84	IIw-2	9	2w2
So	Sloan silty clay loam	85	IIIw-2	11	2w1
Sp	Sloan-Fill land complex	85	------	--	---
Sr	Sloan-Urban land complex	85	------	--	---
ThA	Thackery silt loam, 0 to 2 percent slopes	86	I-1	8	1o1
ThB	Thackery silt loam, 2 to 6 percent slopes	86	IIe-1	8	1o1
Ur	Urban land	86	------	--	---
WaA	Warsaw loam, 0 to 2 percent slopes	87	IIs-1	10	2o1
WbA	Warsaw-Fill land complex, nearly level	87	------	--	---
WcA	Warsaw-Urban land complex, nearly level	87	------	--	---
WeB	Wea silt loam, 1 to 3 percent slopes	88	I-1	8	1o1
Ws	Westland silty clay loam	89	IIw-3	9	2w1
Wt	Westland-Urban land complex	89	------	--	---
XeA	Xenia silt loam, 0 to 2 percent slopes	90	I-1	8	1o1
XeB	Xenia silt loam, 2 to 6 percent slopes	90	IIe-1	8	1o1

☆ U.S. GOVERNMENT PRINTING OFFICE: 1978— 222-072/64

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