SOIL SURVEY OF

Richland County, Ohio

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

Major fieldwork for this soil survey was done in the period 1966–70. Soil names and descriptions were approved in 1971. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1970. 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 Richland County Soil and Water Conservation District. The survey was materially aided by funds and facilities provided by the Richland County Commissioners.

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

HOW TO USE THIS SOIL SURVEY

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

Locating Soils

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

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

Finding and Using Information

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

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

Farmers and those who work with farmers can learn about the soils from the sections "Use and Management of the Soils" and "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 "Soils and Land-Use Planning."

Engineers and builders can find, under "Engineering Uses of the Soils," tables that contain 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 Richland County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the information about the county given in the section "General Nature of the County."

Cover picture: **Farm buildings on well-drained Chili loam, 2 to 6 percent slopes. Lobdell silt loam is in the foreground.**

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SOIL SURVEY OF RICHLAND COUNTY, OHIO

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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

RICHLAND COUNTY is in the north-central part of Ohio (fig. 1). It has a total area of 318,080 acres, or 497 square miles.

Richland County is near the southern boundary of the Wisconsin Glaciation. Most of its soils formed in glacial deposits. These deposits are thickest in the northern part of the county and thin out toward the south, where, in the southeastern part, they are lacking on some of the higher hills.

In 1970 the population of Richland County was 129,997. Of this, about 70 percent was classed as urban and 30 percent as rural. Mansfield, the county seat and largest city, accounts for nearly half of the county's population.

About 63 percent of the county acreage is used for farming. The rest is used for residential, industrial, and other purposes. The principal farm crops are corn and soybeans, grown mostly in the north. Dairy products are produced in the south.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soils are in Richland 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 (*12*).[1] 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 other geographic feature near the place where a soil of that series was first observed and mapped. Cardington and Pewamo, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface layer and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Cardington silt loam, 2 to

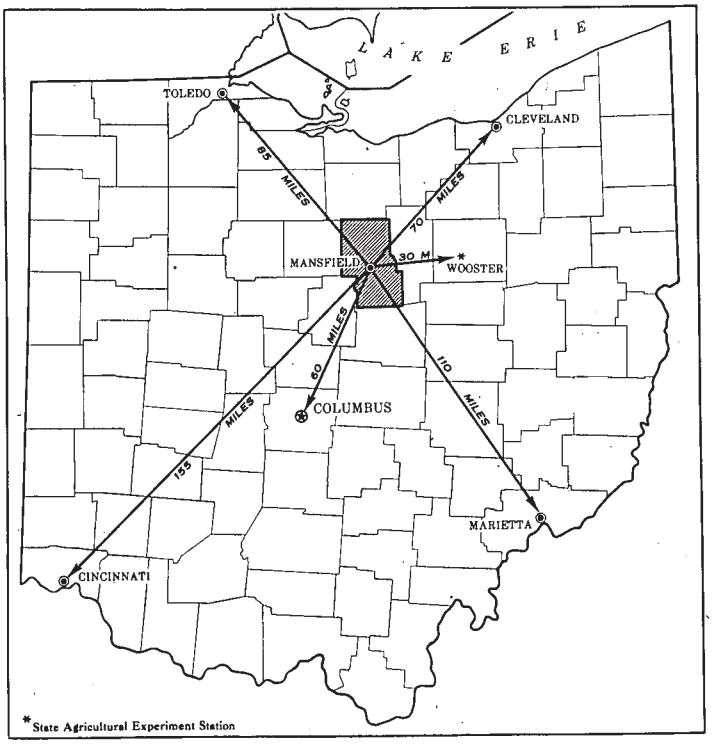

Figure 1.—Location of Richland County in Ohio.

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

6 percent slopes, is one of several phases within the Cardington series.

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

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of 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 Richland County. They are soil complexes and undifferentiated groups.

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

An undifferentiated group is made up of two or more soils that could be delineated individually but are shown as one unit because, for the purpose of the soil survey, there is little value in separating them. The pattern and proportion of soils are not uniform. An area shown on the map may be made up of only one of the dominant soils, or of two or more. Chili and Conotton soils is an undifferentiated soil group in this county.

In most areas surveyed there are places where the soil material is so rocky, so shallow, so severely eroded, or so variable that it has not been classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Cut and fill land, Gravel pits, and Urban land are land types in Richland 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 kinds of soil. Yields under defined management are estimated for all the soils.

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

After data have been collected and tested for the key, or benchmark, soils in a survey area, the soil scientists set up trial groups of soils. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others. Then they adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

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

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

The soil associations in this survey have been grouped into four general kinds of landscapes for broad interpretative purposes. Each of the broad groups and the soil associations in each group are described in the following pages.

The map also shows the location of the larger organic (muck) soil areas in the county. These areas are indicated on the general soil map by a special symbol.

Somewhat Poorly Drained to Well-Drained Soils on Flood Plains, Terraces, and Outwash Deposits

These soils are in and along the valleys of the major streams throughout the county and in hummocky areas on uplands. Slopes generally are short and irregular. The soils have a medium-textured to moderately coarse textured subsoil. The soils on terraces and outwash deposits are underlain by stratified sand and gravel. About half the acreage of soils in these associations is used for cash grain crops or for general farming. These associations make up about 11 percent of the county.

1. Shoals-Chili-Wheeling association

Deep, nearly level to moderately steep, somewhat poorly drained and well-drained soils that have a medium-textured to moderately coarse textured subsoil; on flood plains, terraces, and outwash deposits

This association is in and along the valleys of major streams throughout the county. The nearly level soils are on flood plains, and the gently sloping to moderately steep soils are on stream terraces. The terraces are broken where tributaries enter the main stream valley or where rock hills are close to the stream channel.

This association makes up about 10 percent of the county. It is about 30 percent Shoals soils, 16 percent Chili soils, 14 percent Wheeling soils, and 40 percent minor soils.

Shoals soils are nearly level and somewhat poorly drained. They formed in silty or loamy stream-deposited sediment. They are on flood plains. In the wetter stream valleys, these soils generally occupy high positions on the landscape, but in the drier stream valleys, they are in low spots.

Chili soils are sloping to moderately steep and are well drained. They formed in outwash deposits and are underlain by sand and gravel. They are mainly on terraces, kames, and eskers.

Wheeling soils are dominantly nearly level or gently sloping and well drained. They formed in medium-textured silty deposits underlain by sand and gravel. These soils are on terraces. They have less gravel and more silt in the surface layer and in the subsoil than Chili soils.

Minor soils in this association include the Lobdell and Sloan soils on flood plains and the Glenford, Fitchville, Luray, and Bogart soils on terraces. Included also in this association are some small areas of organic (muck) soils, shown by swamp symbols on the general soil map. Each symbol represents about 80 acres. The Carlisle and Linwood soils occupy most of these areas.

About half of the association is farmed. Corn, soybeans, wheat, and hay are the main crops. About 15 percent of the acreage is used for nonfarm purposes. The remaining 35 percent is used mainly for wildlife habitat.

Susceptibility to flooding and somewhat poor natural drainage are the major limitations to use of Shoals soils. The Wheeling and Chili soils are not generally subject to flooding. If protected from flooding and adequately drained, Shoals soils are well suited to crops. The Chili and Wheeling soils that are nearly level or gently sloping are also well suited to crops, but in dry years droughtiness is a limitation.

Susceptibility to flooding is a severe limitation to use of Shoals soils for most nonfarm purposes. Where slope is not a limitation, the Chili and Wheeling soils have only slight limitations to use for most nonfarm purposes. The sand and gravel underlying these soils are commonly suitable for commercial use.

2. Belmore-Haney association

Deep, gently sloping to moderately steep, well drained and moderately well drained soils that have a medium-textured to moderately coarse textured subsoil; formed in outwash deposits mainly on kames and eskers

This association of gravelly soils occupies three areas in the northwestern part of the county. These areas are characterized by conical hills, or kames; narrow, winding ridges, or eskers; and stream terraces that commonly surround closed depressional pockets. Slopes are short and irregular.

This association makes up about 1 percent of the county. About 50 percent of it is Belmore soils, 15 percent is Haney soils, and 35 percent is minor soils.

Belmore and Haney soils formed in deposits of poorly sorted sand and gravel that contain a varying amount of silt and clay. Belmore soils are well drained. They are gently sloping to moderately steep and are generally on the highest and steepest parts of the landscape. Haney soils are moderately well drained and are nearly level to gently sloping.

Carlisle, Linwood, Luray, Digby, Fitchville, Glenford, Alexandria, Cardington, Bennington, and Pewamo are minor soils in this association. Carlisle and Linwood are organic (muck) soils. They are in the closed depressional pockets that are designated on the general soil map by special swamp symbols.

About 70 percent of this association is farmed, and the rest is idle. Because Belmore and Haney soils are gravelly, they are droughty in dry seasons. Sloping areas are subject to erosion. These soils are moderately well suited to crops.

Except where slope is a limitation, Belmore and Haney soils are suitable for many nonfarm purposes. Where absorption fields are concentrated on these soils, however, there is a hazard of ground-water pollution by seepage of septic effluent through the sandy and gravelly underlying material.

Very Poorly Drained to Somewhat Poorly Drained Soils on Till Plains and Lake Plains

These soils are in the northern part of the county. They are nearly level to gently sloping and occupy broad flats intermingled with some low knolls and ridges. They have a medium-textured to moderately fine textured subsoil. If adequately drained, these soils are well suited to farming. Most of the acreage is farmed and used mainly for cash grain crops or general farming. The soils in these associations make up about 12 percent of the county.

3. Fitchville-Luray-Bennington association

Deep, nearly level to gently sloping, somewhat poorly drained and very poorly drained soils that have a medium-textured to moderately fine textured subsoil; formed in lacustrine deposits and glacial till

This association consists of three areas in the northwestern part of the county. These areas are characterized by broad flats interspersed with closed depressions and isolated, gently sloping knolls and ridges.

This association occupies about 3 percent of the county. It is about 35 percent Fitchville soils, 30 percent Luray soils, 20 percent Bennington soils, and 15 percent minor soils.

Fitchville soils are on knolls, ridges, and higher flats. These soils formed in silty material deposited in shallow postglacial lakes. They are acid and somewhat poorly drained.

Luray soils are in the lower positions and closed depressions. These soils formed in silty material from shallow postglacial lakes. They are acid to nonacid and are very poorly drained. Some areas that are adjacent to Marsh Run are subject to flooding and ponding.

Bennington soils are on knolls, ridges, and higher flats. These soils formed in silty clay loam or clay loam glacial till that was originally limy. They are somewhat poorly drained and relatively high in content of clay.

Minor soils in this association are of the Glenford, Sebring, Cardington, Tiro, and Pewamo series.

Most of this association is used for cash grain crops and general farming. A few areas are idle. A few areas that are wet or that are subject to flooding are used for timber production.

Wetness is the dominant limitation to use of the soils in this association. Surface crusting on Bennington soils and a slight hazard of erosion on the knolls occupied by gently sloping Fitchville and Bennington soils are additional limitations, particularly if these soils are used for farming. The major soils generally can be drained, but adequate tile outlets for depressions are difficult to establish and maintain. If artificial drainage is established, soil fertility is improved, and soil-conserving management is practiced, the soils of this association are well suited to farming.

Wetness and moderately slow or slow permeability are limitations to nonfarm uses.

4. Pewamo-Bennington association

Deep, nearly level to gently sloping, very poorly drained and somewhat poorly drained soils that have a moderately fine textured subsoil; formed in glacial till

This association is in three areas in the northern part of the county. These areas are characterized by low knolls and ridges separated by depressions and broad flats. If plowed, the soils of this association present a striking pattern of light and dark colors.

This association makes up about 9 percent of the county. It is about 45 percent Pewamo soils, 30 percent Bennington soils, and 25 percent minor soils.

Pewamo and Bennington soils formed in silty clay loam or clay loam glacial till that was originally limy. These soils have a moderately fine textured subsoil. The dark-colored, very poorly drained Pewamo soils are in depressions and on broad flats. Bennington soils are on low knolls and ridges. They are light colored and somewhat poorly drained.

Among the minor soils in this association are the Condit, Luray, Fitchville, Glenford, Shoals, and Lobell soils. A few areas of sloping Cardington soils are also in this association.

Most of this association is used for cash grain crops or for general farming. Undrained areas of Pewamo soils are commonly used for permanent pasture or trees. A small part of the association is being held for nonfarm purposes and is idle.

Wetness is the major limitation to use of these soils. Surface crusting is also a limitation in eroded areas of Bennington soils. The water table is near the surface of Pewamo soils during the wettest part of the year, and ponding is common. Surface and subsurface drains are commonly used to remove excess water from Pewamo and Bennington soils, but adequate tile outlets are difficult to establish in some areas. If these soils are artificially drained, fertility is improved, and conservation management is practiced, this association is moderately well suited to crops.

Somewhat Poorly Drained to Moderately Well Drained Soils on Till Plains

Most areas of these soils are in the central and northern parts of the county. This association is characterized by gently sloping soils on broad hilltops, knolls, and ridges; a few nearly level soils in depressions; and a few sloping to moderately steep soils on hillsides. These soils have a medium-textured to moderately fine textured subsoil. They are generally well suited or moderately well suited to farming and are used mainly for cash grain crops, dairying, and general farming. These associations make up about 31 percent of the county.

5. Rittman-Wadsworth association

Deep, nearly level to moderately steep, moderately well drained and somewhat poorly drained soils that have a moderately fine textured subsoil with a fragipan; formed in glacial till

This association is mainly in the central part of the county. It consists mainly of gently sloping soils on broad hilltops. A few, however, are in depressions, and a few are in deeply entrenched valleys.

This association makes up about 10 percent of the county. It is about 65 percent Rittman soils, 17 percent Wadsworth soils, and 18 percent minor soils.

Rittman and Wadsworth soils formed in moderately fine textured, acid glacial till. These soils have a very dense, compact, brittle layer, or a fragipan, in the lower part of the subsoil that restricts root penetration and permeability. Rittman soils are gently sloping and moderately well drained. They are on broad hilltops and on hillsides along streams. Wadsworth soils are nearly level to gently sloping and are somewhat poorly drained. They are in depressions and flat areas surrounded by larger areas of Rittman soils.

Soils of minor extent in this association are in the Wooster, Wheeling, Chili, Bogart, Fitchville, Shoals, and Lobdell series.

This association closely parallels the area that has been used for major urban expansion and transportation routes in Richland County. Consequently, a large part of it has been converted from farm to nonfarm use in recent years. About one-fourth of this association is used for residential and related purposes, and about one-third is idle and probably will be used for urban development. About one-fourth is made land, or land on which the original soil has been disturbed by cutting, filling, and paving. Only about 10 to 15 percent of this association is used for farming.

A hazard of erosion on sloping areas of Rittman soils and wetness on Wadsworth soils are the major limitations. Rittman soils generally have adequate natural drainage. The soils of this association are moderately well suited to crops if fertility is improved and conservation practices are followed, including erosion

control on Rittman soils and artificial drainage of Wadsworth soils.

Slow or very slow permeability limit the use of these soils for many nonfarm purposes.

6. Bennington-Cardington association

Deep, nearly level to gently sloping, somewhat poorly drained and moderately well drained soils that have a moderately fine textured subsoil; formed in glacial till

This association occurs extensively in the northern part of the county. It has an undulating upland landscape of low knolls and ridges that are broken in places by a few higher hills. Slopes are short and irregular.

This association makes up about 21 percent of the county. It is about 60 percent Bennington soils, 30 percent Cardington soils, and 10 percent minor soils.

Bennington and Cardington soils formed in limy, silty clay loam or clay loam glacial till and have a moderately fine textured subsoil. Bennington soils are nearly level and gently sloping and are somewhat poorly drained. They are on the low knolls and ridges and generally are in areas away from the major stream valleys. Cardington soils are gently sloping to sloping and are moderately well drained. They are on the higher hills and side slopes of major stream valleys.

Minor soils in this association are in the Alexandria, Condit, Pewamo, Shoals, and Holly series. Also among the minor soils are some small areas of organic (muck) soils that are shown by a special swamp symbol on the general soil map. Each symbol represents an area of about 80 acres. The organic soils are in depressions that lack natural drainage outlets. Carlisle and Linwood soils occupy most of these areas.

Most of this association is used mainly for cash-grain, dairy, and general farming. A small acreage is idle or is being held for nonfarm purposes.

Somewhat poor natural drainage is the major limitation to use of Bennington soils, but they generally can be artificially drained. Additional limitations are the hazard of erosion on sloping areas and surface crusting on eroded areas of Bennington soils, especially if they are used for farming. Bennington and Cardington soils are well suited to crops, however, if soil fertility is improved and management practices include artificial drainage of Bennington soils and control of erosion on Cardington soils.

The wetness of Bennington soils and the moderately slow or slow permeability in Bennington and Cardington soils are limitations to nonfarm uses.

Moderately Well Drained to Well Drained Soils on Till Plains

These soils are mainly in the southern part of the county. A few small areas are in the northern part. The soils are gently sloping to sloping on ridgetops or on hilltops and moderately steep to very steep on hillsides. They have a medium-textured to moderately fine textured subsoil. About 20 percent of the area of these soils is underlain by sandstone bedrock at a depth of 2 to 3 feet. The gently sloping and sloping soils are moderately well suited to farming and are used mainly for dairying and general farming. These associations make up about 46 percent of the county.

7. Wooster-Loudonville association

Deep and moderately deep, gently sloping to very steep, well-drained soils that have a medium-textured to moderately fine textured subsoil; formed in glacial till

This soil association is in three areas in the southern part of the county. It consists of gently sloping to moderately sloping soils on ridgetops and of steep to very steep soils on hillsides. Slopes are long and uniform. The soils on hillsides are underlain by sandstone bedrock that is capped by a mantle of glacial till.

This association makes up about 2 percent of the county. It is about 45 percent Wooster soils, 25 percent Loudonville soils, and 30 percent minor soils.

Wooster and Loudonville soils are well drained and are loamy in texture. Wooster soils formed in acid, loamy glacial till that is underlain by sandstone bedrock at a depth of more than 40 inches. They are mainly on ridgetops and in the lower areas of valley walls. They have a compact, brittle layer, or fragipan, in the lower part of their subsoil that somewhat restricts root penetration and permeability. Loudonville soils are underlain by sandstone bedrock at a depth of 20 to 40 inches. They occupy the middle and upper parts of valley walls and extend on to the ridgetops in many places. Wooster and Loudonville soils occur in an intricate pattern in some areas.

Minor soils in this association are in the Canfield, Ravenna, Lordstown, Berks, and Schaffenaker series.

About half of this association is farmed, and dairy farming is the main enterprise. Crops are grown on the less strongly sloping areas. Some of the steep areas are used for permanent pasture and trees. The rest of the association is idle, but some areas probably will be used for urban development. Other areas are too steep for most uses.

Shallowness to bedrock and steepness of slope are the major limitations to the use of soils in this association. Erosion is a hazard, especially on cultivated areas. The soils are moderately well suited to crops if soil fertility is improved and conservation is practiced.

The limitations for nonfarm uses of this association range from slight to severe. They are slight on the gently sloping soils that are deep over bedrock and severe on the steep soils that are moderately deep over bedrock.

8. Hanover-Titusville-Loudonville association

Deep and moderately deep, gently sloping to steep, well drained and moderately well drained soils that have a medium-textured to moderately fine textured subsoil; formed in glacial till

This association occurs in three areas in the southern part of the county. It is on uplands. The soils are gently sloping to steep and are underlain by sandstone bedrock at a depth of 2 to 6 feet. These soils formed in glacial till of Illinoian age over the bedrock.

This association makes up about 4 percent of the county. It is about 45 percent Hanover soils, 20 percent Titusville soils, 20 percent Loudonville soils, and 15 percent minor soils.

Hanover and Titusville soils are loamy and acid and are more than 40 inches deep over bedrock. These soils have a compact, brittle layer, or fragipan, in the lower

part of their subsoil that restricts root penetration and permeability. Hanover soils are gently sloping to steep and are well drained. They are on broad hilltops just above areas of moderately steep to very steep soils. Titusville soils are gently sloping and moderately well drained. They are mainly in strips between the stream flood plains and the steeper valley walls. Loudonville soils also are acid and loamy, but they are underlain by sandstone bedrock at a depth of 20 to 40 inches. These soils are gently sloping to steep and are on hillsides.

Minor soils in this association are in the Shoals, Latham, Schaffenaker, Lordstown, and Berks series.

About 55 percent of this association is idle. The rest is used for farming, mainly general farming.

Steepness of slope and shallowness to bedrock are the main limitations of this association. Temporary wetness is a limitation of Titusville soils in a few places, particularly areas in the valleys. Some of the shallow areas of Loudonville soils are droughty. The gently sloping, uneroded areas of this association are moderately well suited to crops if soil fertility is improved and the soils are otherwise well managed.

The limitations for nonfarm use depend largely on steepness of slope and depth to bedrock. Moderately slow permeability is a limitation to use of Hanover and Titusville soils for some nonfarm uses.

9. Lordstown-Loudonville association

Moderately deep, gently sloping to steep, well-drained soils that have a medium-textured to moderately fine textured subsoil; formed in glacial till and material weathered from sandstone bedrock

This association is in the southern and southeastern parts of the county. It has a landscape of narrow, moderately sloping ridgetops separated by deeply entrenched valleys that have steep to very steep side slopes. The hills are of sandstone bedrock covered by a thin deposit of glacial till. Slopes are long and uniform.

This association makes up about 9 percent of the county. It is about 40 percent Lordstown soils, 35 percent Loudonville soils, and about 25 percent minor soils.

In many areas Lordstown and Loudonville soils do not occur in a set pattern. These soils are gently sloping to steep, are well drained, and are acid. They are underlain by sandstone bedrock at a depth of 20 to 40 inches. Lordstown soils are silty to loamy in texture. These soils formed in material weathered from sandstone bedrock. Loudonville soils are loamy. They formed in thin deposits of glacial till.

Minor soils in this association are in the Wooster, Canfield, Hanover, Titusville, Latham, and Berks series.

About 60 percent of this association is farmland. Most of the less strongly sloping areas are used for crops and improved pasture. Orchards and woodlots are managed on the steeper areas. Where the areas are steep and rocky, the use of equipment is difficult. The remaining 40 percent of the association is idle, and much of it is too steep and stony for farming and for nonfarm uses. Shallowness to bedrock is also a limitation for nonfarm uses.

10. Wooster-Canfield association

Deep, nearly level to very steep, well drained and moderately well drained soils that have a medium-textured subsoil with a fragipan; formed in glacial till

This association occurs mainly in the south-central part of the county. It is on uplands and is characterized by gently sloping to moderately sloping soils on hilltops and moderately steep to very steep soils on hillsides that form the sides of narrow stream valleys. Slopes generally are long.

This association makes up about 25 percent of the county. It is about 40 percent Wooster soils, 25 percent Canfield soils, and 35 percent minor soils.

The loamy, well-drained Wooster soils are gently sloping to very steep. They are on the hillsides and on the more convex hilltops. The moderately well drained Canfield soils are nearly level to sloping and are on the more concave hilltops. Wooster and Canfield soils formed in acid, loamy glacial till and have a compact, brittle layer, or fragipan, in the lower part of the subsoil that restricts root growth and permeability. The fragipan in Canfield soils, however, is more restrictive than that in Wooster soils.

Soils that occur to a minor extent in this association are Ravenna, Loudonville, Lordstown, Shoals, and Schaffenaker soils. Also included in this association are some small areas of organic (muck) soils. These areas are shown on the general soil map by a special symbol for swamp. Each symbol represents about 80 acres. These soils are in depressions that lack natural drainage outlets. Carlisle and Linwood soils are in most of these areas.

About half of this association is farmed, and 30 percent is used for residential and commercial purposes. The rest is idle.

A moderate to severe hazard of erosion and the steep slopes of Wooster soils in some places are the major limitations of this association. In areas that have been farmed, erosion has damaged soil tilth and reduced productivity, and the depth to the fragipan. If erosion is controlled and a high level of fertility is maintained, the soils of this association are moderately well suited to farming. Although natural drainage is generally adequate for farming, a few seep spots and springs, particularly where slopes are steep, produce local wetness.

Susceptibility to erosion, especially on the steep soils, and restricted permeability are limitations to some nonfarm uses.

11. Cardington-Alexandria association

Deep, gently sloping to very steep, moderately well drained and well drained soils that have a moderately fine textured subsoil; formed in glacial till

This association occurs mainly along valley walls adjacent to the Black Fork and its major tributaries in the northern part of the county. It is on uplands and is characterized by gently sloping to moderately sloping soils on hilltops and moderately steep to very steep soils on hillsides.

This association makes up about 6 percent of the county. It is about 50 percent Cardington soils, 30 percent Alexandria soils, and 20 percent minor soils.

Cardington and Alexandria soils formed in clay loam or silty clay loam that was originally limy. This subsoil is relatively high in clay content. Cardington soils are moderately well drained and are gently sloping to moderately sloping. These soils are on hilltops. Alexandria soils are well drained and moderately steep to very steep, and they are on stream valley walls and hillsides. Layers of gravel are below a depth of 3 feet in some areas of Alexandria soils.

Among the less extensive soils in the association are the somewhat poorly drained, light-colored Bennington soils and the very poorly drained, dark-colored Pewamo soils. Also included are Carlisle and Linwood soils in a few basinlike depressions.

About 40 percent of this association is used for farming. The gently sloping areas are generally used for crops, and the steeper areas for permanent pasture and trees. Residential areas along State, county, and township roads occupy 30 percent of the association. The rest is idle.

Steep slopes in places severely limit the use of these soils for many purposes. A moderate to severe erosion hazard is an additional limitation, particularly on the steeper Alexandria soils. Although natural drainage is generally adequate, a few wet spots on Cardington soils require artificial drainage in places. If soil fertility is improved and erosion is controlled, the soils of this association are well suited to crops.

Except for steepness of slope and a few wet spots, these soils have few limitations for homesites. The moderately slow permeability, however, is a limitation to some nonfarm uses.

Use and Management of the Soils

In this section the properties of the soils of Richland County are discussed as they relate to management of the soils for crops and pasture, woodland, wildlife, engineering, and community planning.

Crops and Pasture

In this section some general farming practices that apply to the soils of this county are discussed; the capability grouping used by the Soil Conservation Service is explained and the capability units are described; and estimated yields of all the soils under two levels of management are given.

Some principles of management are general enough to apply to all the soils suitable for crops and pasture throughout the county, though the individual soils or groups of soils require different kinds of management, as shown in the descriptions of the capability units in the latter part of this section.

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

Most of the soils of Richland County do not have a high content of organic matter, and to build up the content to a high level is not economically feasible. It is important, however, to return organic matter to the soils by adding farm manure, leaving plant residue on the surface, and growing sod crops, cover crops, and green-manure crops.

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

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

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

Pasture helps to control erosion on all but a few of the soils that are subject to this hazard. To provide an adequate ground cover on some soils, a high level of pasture management is needed, including such practices as applying fertilizer, controlling grazing, and selecting adapted pasture mixtures. Grazing is controlled by rotating the livestock from one pasture field to another and providing rest for the pasture to allow for regrowth of the plants. For some soils, it is important to select pasture mixtures that will require the least amount of renovation to maintain good ground cover and forage.

Irrigation is not used to a great extent in Richland County. For most of the major crops, the cost of irrigation equipment is not justified. Some of the soils in the county, however, are suited to irrigation if economic circumstances warrant it.

Soils that are suitable for sprinkler irrigation and that need only a minimum of artificial drainage have slopes of 6 percent or less. They are soils of the Alexandria, Belmore, Bogart, Chili, Glenford, Haney, Hanover, Mentor, Wheeling, and Wooster series.

Other soils that can be irrigated if adequately drained are the nearly level and gently sloping soils of the Algiers, Canfield, Cardington, Digby, Fitchville, Fitch-

ville gravelly subsoil variant, Landes, Lobdell, Rittman, Shoals, Tiro, and Titusville series.

Carlisle muck and Linwood muck are suited to subsurface irrigation. With use of this method, the level of the naturally high water table is controlled.

The other soils in the county are not well suited to irrigation because of excessive slope, slow intake rate, surface crusting, limited ability to store available moisture, or poor natural drainage.

Capability grouping

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

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

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

Class I soils have few limitations that restrict their use.

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

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

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

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

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

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

Class VIII soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife, or water supply, or to use for esthetic purposes. (None in Richland 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 parts of the United States and not in Richland 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, woodland, wildlife, or recreation.

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 or IIIe-6. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph; and the Arabic numeral specifically identifies the capability unit within each subclass.

In the following pages the capability units in Richland County are described and suggestions for the use and management of the soils are given. The names of soil series represented are mentioned in the description of each capability unit, but this does not mean all soils in a given series are in the unit. To find the names of all the soils in a given capability unit, refer to the "Guide to Mapping Units" at the back of the survey.

CAPABILITY UNIT I-1

This unit consists of nearly level soils of the Bogart, Glenford, and Wheeling series. The Wheeling soil is well drained. The Bogart and Glenford soils are moderately well drained.

The Glenford soil formed in deep, generally silty, water-laid deposits. The areas are in all parts of the county but are most extensive on lake plains in the northwestern part. The Wheeling and Bogart soils formed in loamy deposits over sandy and gravelly material that is at a depth of 20 to 40 inches. They are on terraces along the sides of major stream valleys. All the soils in this unit have a silt loam surface layer and a silt loam or silty clay loam subsoil.

These soils have few limitations to use for crops. They have adequate natural drainage. These soils are excessively wet for brief periods, but installation of

artificial drainage is not warranted. Randomly spaced tile lines can be used in some particularly wet spots. Available moisture capacity is high in the Glenford soil and medium in the Bogart and Wheeling soils.

Roots do not grow into some of the more gravelly layers of the Bogart and Wheeling soils, especially if these layers are dry. Runoff is slow, and erosion is not a serious problem.

These soils are well suited to all crops commonly grown in the county. If the soils are well managed the cropping system can be continuous row crops. Maintaining tilth and fertility are the main management needs. These soils are well suited to pasture but are rarely used for that purpose because they are generally better suited to crops.

These soils are not used extensively for specialty crops, although they are well suited to fruits and vegetables and nursery crops. They are also well suited to sprinkler irrigation.

CAPABILITY UNIT IIe-1

This unit consists of gently sloping soils of the Belmore, Bogart, Chili, and Haney series. The Belmore and Chili soils are well drained. The Bogart and Haney soils are moderately well drained.

The soils of this unit are on terraces, kames, and eskers. They have a loam surface layer. Their subsoil contains some gravel, and a large amount of sand or gravel is below the subsoil. The Belmore and Haney soils are nonacid and are underlain by limy gravel. The Bogart and Chili soils are acid throughout.

A moderate hazard of erosion and droughtiness are limitations to the use of these soils for crops. Runoff is moderate. Permeability is moderate to moderately rapid in the subsoil and rapid below the subsoil. The water table is as close as 2 feet to the surface for brief periods in Bogart and Haney soils, but it is generally below a depth of 3 feet in Chili and Belmore soils. The layers of sand and gravel in and below the subsoil do not hold much water available to plants, and the soils are droughty, especially for shallow-rooted crops. Some of the more sandy and gravelly layers can not be penetrated by the roots of crops during dry periods.

The soils of this unit are suited to all crops commonly grown in the county. Row crops can be grown frequently if the soils are well managed. Tilth is generally good, although the content of organic matter is generally low. Natural drainage is generally adequate for crops. Because of the limited capacity of these soils to store and release plant nutrients, frequent small applications of fertilizer and lime are generally more effective than less frequent large applications.

These soils are well suited to pasture if grazing is controlled. Early grazing is generally possible because these soils are among the first to dry out in spring. These soils are not suited to shallow-rooted pasture plants during long dry periods.

These soils are well suited to fruit and nursery crops, but fruit crops grown in the low valleys are susceptible to damage by frost. The soils are well adapted to irrigation.

CAPABILITY UNIT IIe-2

This unit consists of gently sloping soils of the Bogart, Glenford, Mentor, Wheeling, and Wooster series. It also includes a gently undulating complex of Wooster and Chili soils. The Mentor, Wheeling, and Wooster soils are well drained. The Bogart and Glenford soils are moderately well drained.

All of these soils have a silt loam surface layer and a silt loam, loam, or silty clay loam subsoil. The Bogart, Wheeling, and Mentor soils are on terraces along the sides of major stream valleys The Bogart and Wheeling soils have sand or gravel below the subsoil and within a depth of 40 inches. The Glenford soil is also on terraces, but a large acreage is on low knolls and ridges on lake plains. This soil is generally silty below the subsoil. The Wooster soils are on hilltops or with Chili soils in a gently undulating complex. Their subsoil is underlain by loam glacial till.

A moderate hazard of erosion is a limitation to the use of these soils for crops. Runoff is moderate. The content of organic matter is low. Tilth is generally good in uneroded areas. There is no restriction to growth of roots in the Mentor and Glenford soils. Roots generally can penetrate all layers in the Wheeling and Bogart soils, but in dry periods they cannot penetrate the underlying sand and gravel because of the lack of available water in those layers. The Wooster soils have a weakly expressed fragipan in the lower part of their subsoil. This fragipan, which is very firm when dry, somewhat restricts growth of roots. In most areas of Wooster soils, however, the fragipan is thin or discontinuous.

The soils in this unit are medium to high in available moisture capacity, and droughtiness is seldom a concern. In the Glenford and Bogart soils, the water table is within 2 feet of the surface for brief periods, but in the other soils it is usually below a depth of 4 feet. Natural drainage is adequate for crops.

These soils are suited to all crops commonly grown in the county. If they are used for row crops, intensive management practices are needed to help control erosion. All of the soils are well suited to pasture, but they are generally used for field crops on most farms.

With the exception of the Wooster soils, the soils of this unit are suited to specialty crops. The Wheeling and Mentor soils are well suited to irrigation.

CAPABILITY UNIT IIe-3

This unit consists of the gently sloping, slightly eroded and moderately eroded soils of the Cardington and Alexandria series. The Alexandria soil is well drained, and the Cardington soils are moderately well drained. All the soils have a silt loam surface layer and a silty clay loam subsoil overlying calcareous clay loam glacial till.

A moderate hazard of erosion is a limitation to the use of these soils for crops. Runoff is moderate, even on the gently sloping soils. As the original surface layer is removed by erosion, an increasing amount of material from the subsoil is mixed with that in the plow layer, which is more clayey than the original surface layer and is not so easily worked. The plow layer of the moderately eroded Cardington soil contains some of the material from the subsoil, but that of the uneroded soil consists mainly of the material in the original surface layer.

The soils of this unit are low in content of organic

matter. Although they are calcareous below a depth of 3 feet, they are acid in the root zone. No layers in these soils restrict the growth of roots. Natural drainage is generally adequate for crops. Randomly spaced tile, however, is beneficial in some areas of the Cardington soils.

The soils of this unit are suited to all crops commonly grown in the county. Some erosion-control measures are needed if row crops are grown. These soils are well suited to most pasture crops, but they are not used extensively for this purpose.

Specialty crops are not generally grown on these soils.

CAPABILITY UNIT IIe-4

This unit consists of gently sloping, well-drained soils of the Berks, Loudonville, and Lordstown series. These soils are moderately deep and are underlain by sandstone bedrock at a depth of 20 to 40 inches.

The Berks and Lordstown soils formed in material weathered from sandstone. The Berks soil has a channery silt loam surface layer and a subsoil that is more than 35 percent sandstone fragments. The Lordstown soil has a silt loam surface layer and a silt loam subsoil that is less than 35 percent sandstone fragments. The Loudonville soil formed in glacial till deposited over sandstone. It has a silt loam surface layer and a silt loam or clay loam subsoil that contains only a few sandstone fragments.

The hazard of erosion is a limitation to the use of these soils for crops. Erosion impairs tilth and restricts penetration of roots by reducing the depth to the underlying rock. In all of these soils, the root zone is limited by rock at a depth of 20 to 40 inches. Also, the Berks soil is somewhat droughty. In this soil, rock fragments make up more than 35 percent of the soil volume to a depth of 20 inches. In many areas this percentage is 70 or 80. Roots penetrate between the fragments, but the amount of soil from which they can obtain water is limited. The Loudonville and Lordstown soils are medium to low in available moisture capacity.

The soils in this unit are low in content of organic matter, lime, and plant nutrients. They have good tilth. Most rock fragments on the surface of the Berks soil are too small to interfere with cultivation. Natural drainage is adequate for crops.

These soils can be used for all crops commonly grown in the county. They are suited to most pasture crops, and a large acreage is used for pasture and forage crops. Early grazing is possible because the soils are well drained. These soils, especially the Berks soil, are not suited to some shallow-rooted pasture plants during extended dry periods.

These soils are well suited to orchards because of their good natural drainage. They are mostly on hilltops, so air drainage is good, and frost pockets are few.

CAPABILITY UNIT IIe-5

This unit consists of gently sloping, slightly eroded and moderately eroded soils of the Canfield, Titusville, and Hanover series. These soils are moderately well drained and well drained. They have a fragipan.

These soils are on till plains and in valleys. They formed in glacial till and have a loam, silt loam, or silty clay loam subsoil.

The hazard of erosion is a limitation to the use of these soils for crops. Erosion impairs tilth and reduces the depth to the fragipan. In some areas of the moderately eroded Canfield soil, some of the material from the subsoil is mixed with that in the plow layer. In the slightly eroded soils, the plow layer consists mostly of the material originally in the surface layer.

The rooting depth in these soils is limited by the fragipan, which is at a depth of 2 to 3 feet. This layer also restricts the downward movement of water. After heavy rains the soil above the fragipan is saturated for brief periods, but natural drainage is generally adequate for crops. Randomly spaced lines of tile, however, are beneficial around seeps and springs.

The soils of this unit are low in content of organic matter, lime, and plant nutrients. Tilth is good in the slightly eroded soils and fair in the moderately eroded soil.

These soils are suited to all crops commonly grown in the county. Row crops can be grown frequently if the soils are intensively managed. The soils are suited to most pasture crops. Pasture can be grazed fairly early in spring. Growth of forage crops is moderately good during the dry part of summer. Forage crops are grown on a large acreage because livestock farming is a major enterprise.

Few specialty crops are grown on these soils.

CAPABILITY UNIT IIe-6

This unit consists of gently sloping, slightly eroded and moderately eroded soils of the Latham and Rittman series. These soils are moderately well drained.

The Rittman soils formed in deep glacial till and are on till plains. They have a silt loam surface layer and a silty clay loam subsoil. They have a fragipan. The Latham soil has a silt loam plow layer and a silty clay subsoil. It is underlain by shale at a depth of 20 to 40 inches.

The hazard of erosion is a limitation to the use of these soils for crops. Erosion reduces the depth of soil above the fragipan or shale. In the moderately eroded soil, some of the material in the subsoil is mixed with that in the plow layer. In the slightly eroded soils, the plow layer consists mainly of the material originally in the surface layer. Tilth is good in the slightly eroded soils and fair in the moderately eroded soils. The rooting depth and the downward movement of water are limited by the fragipan or shale. The Rittman soils are saturated above the fragipan after heavy rains.

All of these soils are low in content of organic matter and lime. The Latham soil is especially low in lime.

The soils of this unit are suited to all crops commonly grown in the county. Control of erosion and maintenance of good tilth are the major management needs, especially if row crops are grown. Few areas of the Latham soil are farmed. The Rittman soils are well suited to pasture. The pasture can be grazed early in spring, and forage crops respond well during dry periods.

Specialty crops are not grown to any extent for commerical purposes, although Rittman soils are used for many home gardens and small orchards.

CAPABILITY UNIT IIw-1

This unit consists of nearly level soils of the Algiers, Shoals, Wallkill, and Pewamo series; the Orrville series, moderately shallow variant; and the Shoals series, coarse subsoil variant. The Algiers and Shoals soils and the Orrville and Shoals variants are somewhat poorly drained. The Pewamo soil is poorly drained, and the Wallkill soil is very poorly drained.

Most of these soils are on flood plains and formed in stream deposits laid down during floods. The Pewamo soil is in narrow upland draws and depressions, and the upper part of this soil formed in material washed from adjacent hillsides. The Wallkill soil is similar to the Pewamo soil, but it formed in material deposited over pockets of muck. The soils in this unit have a surface layer of loam or silt loam and a medium-textured subsoil.

These soils are subject to flooding or to overwashing at varying intervals and for varying durations. Observation of a given site over a period of years is necessary to evaluate the frequency and severity of flooding on the site. Not all areas of the Pewamo and Wallkill soils are subject to flooding, but they are subject to overwash during heavy rains.

Wetness is the major limitation to use of the soils in this unit for crops. The soils have a seasonal or permanent high water table. Artificial drainage is beneficial to most crops. These soils respond well to tiling if adequate outlets are available, but outlets are difficult to locate in some areas. The degree of wetness in the Algiers, Wallkill, and Pewamo soils is extremely variable. It depends on the thickness of the lighter colored material over the dark layer. In general, the thicker the lighter colored layer, the better the natural drainage.

All the soils in this unit have good tilth. Erosion caused by runoff is a minor concern, and in places erosion is caused by floodwater. The root zone is deep in most of these soils, but in the Orrville variant rock, is at a depth of 20 to 40 inches. During very dry periods roots cannot penetrate some of the more gravelly layers in the Shoals variant because of the lack of moisture. Available moisture capacity is high in most of the soils, but it is low in the Shoals and Orrville variants.

The fertility of the soils in this unit varies. Heavy surface applications of lime and fertilizer are likely to be partly washed away during floods.

The soils in this unit have potential for crops. The suitability, however, depends on the location of the soils on the landscape, the ease with which the soil can be worked, and the shape and accessibility of the areas. For example, an area of Shoals soil on a broad valley floor might be well suited to crops, but the same soil in a narrow, steep-sided upland valley might be poorly suited because of the size, shape, and inaccessibility of the area.

The soils are suited to all crops commonly grown in the county. The degree of susceptibility to flooding and the shape and accessibility of each area, however, greatly influence the choice of crops. Meadow and winter grain are most likely to be damaged by flooding. Some of the upland draws occupied by Pewamo soils are natural sites for grassed waterways.

The soils are well suited to pasture. Most pasture plants respond well, and native bluegrass is especially well adapted. Grazing needs to be delayed on wet soils early in spring because the surface is soft, and plants will be damaged if trampled. The response of pasture crops is good to fair during the dry part of summer on all the soils except the Orrville and Shoals variants, which are droughty. Many areas of the soils in this unit are too narrow to be cultivated, but they are suitable for summer pasture.

The soils of this unit are not extensively used for specialty crops.

CAPABILITY UNIT IIw-2

This unit consists of nearly level, gently undulating and gently sloping, somewhat poorly drained soils of the Bennington series. The soils formed in glacial till that was originally limy. They have a silt loam surface layer and a subsoil that is mostly silty clay loam. The subsoil is underlain by firm clay loam glacial till.

Wetness is a limitation to use of these soils for crops. The water table is at a depth of only 6 to 15 inches during the wettest time of the year. Permeability is slow. Artificial drainage is needed for crops. Tiling is effective if adequate outlets are provided. In some very large areas of these soils, open ditches are needed as outlets for the tile.

Erosion is a slight hazard on the gently sloping soils of this unit. Runoff is moderate to rapid, even on the gently sloping soils, and erosion is a concern on unprotected sites. As the surface layer is removed by erosion, the plow layer contains an increasing amount of the subsoil, which is clayey and low in content of organic matter. As a result, the plow layer has poor tilth and is difficult to work into a good seedbed. The content of organic matter is low in the slightly eroded soils and very low in the moderately eroded soil. The root zone is moderately deep, and available moisture capacity is medium.

These soils are well suited to pasture. They are muddy in spring, especially in undrained areas. Grazing early in spring is likely to damage pasture seeding. The response of pasture crops is relatively good during the dry part of the summer. The gently sloping soils permit intensive pasture management, and pasture can be included regularly in the cropping system. Only a limited acreage is used for pasture, however, because these soils are used mainly for cash grain farming.

The soils of this unit commonly are not used for specialty crops, although they are used for some small orchards and home gardens.

CAPABILITY UNIT IIw-3

This unit consists of nearly level and gently sloping, somewhat poorly drained soils of the Bennington, Digby, Fitchville, and Tiro series; and the Fitchville series, gravelly subsoil variant.

The Fitchville soils formed in silty lakebed deposits. They have a silt loam surface layer, a silt loam or silty clay loam subsoil, and generally silty material below the subsoil. The Digby soil formed in gravelly outwash deposits. It has a loam surface layer and a loam or gravelly loam subsoil underlain by sand or gravel. It is nonacid. The Bennington soils formed in glacial till and the Tiro soils formed in glacial till and lakebed de-

posits. The Fitchville variant formed in silty deposits over sand gravel.

Wetness is the main limitation to the use of these soils for crops. The water table is at a depth of only 6 to 15 inches during the wettest time of the year. Tiling is effective in removing excess water in most areas. Blinding of tile is desirable in some areas of the Digby soil and Fitchville variants. Some open ditches are needed in the larger areas to provide outlets for the tile drains.

Erosion is a slight hazard on the gently sloping soils. Most of the soils have slopes that are too short or too irregular for application of special erosion-control practices.

If the soils are drained, they are suited to crops. They have good tilth and a moderately deep or deep root zone. They are low in content of organic matter. Available moisture capacity is medium in the Bennington and Digby soils and the Fitchville variants. It is high in the Tiro soils and in the other Fitchville soils. All the soils except Digby are low in content of lime.

These soils are suited to all crops commonly grown in the county. The cropping system can include row crops frequently if the soils are intensively managed. Once drainage is established, the major management needs are the maintenance of tilth and fertility. The soils are suited to most pasture crops. There is a risk of damage to seeding if pastures are grazed early in spring when the soils are wet. The response of pasture crops is relatively good during dry periods.

These soils are not used extensively for specialty crops.

CAPABILITY UNIT IIw-4

This unit consists of nearly level and gently sloping, somewhat poorly drained soils of the Gresham and Ravenna series. These soils formed in glacial till. They have a silt loam surface layer and a loam or silt loam subsoil. A fragipan is in the subsoil.

Wetness is the main limitation to the use of these soils for crops. The water table is at a depth of only 6 to 15 inches during the wettest time of the year. Because of the fragipan, the high water table persists for extended periods in some areas. Some form of artificial drainage is generally needed for crops.

The fragipan not only restricts the root zone but also limits the amount of soil from which plant roots can obtain available water and plant nutrients. The hazard of erosion is slight on the gently sloping soils, and erosion further reduces the volume of soil above the fragipan.

Once adequate drainage is established, the main management needs are the maintenance of fertility and tilth. The soils are low in content of organic matter and lime.

These soils are suited to all crops commonly grown in the county. The cropping system can include row crops frequently if the soils are managed intensively to maintain tilth and fertility. The soils are suited to most pasture crops, though seedings can be damaged by grazing early in spring when the soils are very wet or muddy. The response of pasture crops is relatively good during dry periods.

Specialty crops are not grown on these soils to any great extent.

CAPABILITY UNIT IIw-5

This unit consists of nearly level, poorly drained and very poorly drained soils of the Pewamo and Luray series. The Pewamo soils formed in clay loam to silty clay loam glacial till. They have a silty clay loam or silt loam surface layer and a clay loam or silty clay loam subsoil. The Luray soil formed in lakebed deposits. It has a slightly acid, silty clay loam surface layer and subsoil.

Wetness is the main limitation to the use of these soils for crops. The water table is within 6 inches of the surface for at least 6 months of the year, and some areas are ponded late in winter and in spring. Artificial drainage is generally needed for most crops. Permeability is moderately slow. Tillage is somewhat difficult because of wetness and the fine texture of the surface layer. The soils are high in content of organic matter and commonly have good tilth. Their root zone is deep.

If adequately drained and properly managed, these soils are among the best in the county for crops. They have a high capacity for holding moisture and nutrients available to plants.

These soils are suited to most pasture grasses. The response of pasture crops is relatively good during dry periods. The soils are wet and muddy early in spring, however, and grazing at this time can damage pasture seedings and puddle the soil.

Specialty crops are not grown extensively on these soils, although sugar beets can be grown.

CAPABILITY UNIT IIw-6

This unit consists of nearly level, well drained and moderately well drained soils of the Lobdell and Landes series. These soils are on flood plains. The Lobdell soil has a silt loam surface layer. The Landes soil has a fine sandy loam surface layer.

Occasional flooding is the main limitation to the use of these soils for crops. Natural drainage is adequate. The Lobdell soil is high in available moisture capacity. The Landes soil is low in available moisture capacity, but crops rarely are affected by drought. The Landes soil is high in content of organic matter and natural lime. Erosion caused by runoff is not a concern, but erosion and deposition caused by flooding is a concern in places.

These soils are suited to all crops commonly grown in the county. Row crops can be grown year after year if good management is used and crop residue is returned to the soil. Maintaining tilth and fertility are the main management needs. In places meadow crops and winter grain are damaged by floods. Some areas of the Lobdell soil are in valleys too narrow to be farmed. The soils of this unit are well suited to pasture crops. They are not excessively wet, and the response of pasture crops is good during dry periods. Narrow areas that cannot be cultivated conveniently are well suited to pasture.

The soils are suited to specialty crops, but frost is a severe hazard to fruits and vegetables in many areas. Nursery stock is grown successfully.

CAPABILITY UNIT IIw-7

This unit consists only of Linwood muck. This is a nearly level organic soil that has very poor natural drainage. It formed in muck and peat deposits 20 to 40 inches thick, underlain by silty mineral soil material. This soil is in depressions.

Wetness is the main limitation to the use of this soil for crops. The water table is generally at or near the surface for extended periods. Some areas are ponded. Artificial drainage is needed if the soil is farmed. Wind erosion and fire are hazards on drained areas of this soil, for they can reduce the depth of the organic deposit.

If this soil is drained, it is well suited to crops. It is very high in content of organic matter and has good tilth. The rooting depth is not restricted in the muck layer. This soil has a high available moisture capacity and a high capacity to store and release plant nutrients.

Linwood muck is suited to all crops common to the county. If it is managed intensively, row crops can be grown year after year. It is well suited to vegetables, turf, and other specialty crops. There is a hazard of frost late in spring and early in fall on some of the low areas. Pasture grasses, especially reed canarygrass, grow well on this soil. Grazing must be closely controlled, however, to prevent damage to the seedings when the soil is wet.

CAPABILITY UNIT IIs-1

Bogart loam, 0 to 2 percent slopes, is the only soil in this unit. This soil is moderately well drained. It has a gravelly loam subsoil. A large percentage of gravel is in and below the subsoil. This soil is on terraces.

The droughtiness is a moderate limitation to the use of this soil for crops. The amount of water available for crops is limited during dry periods. There are few other limitations. Natural drainage is adequate. Periods of excessive wetness are brief. Tilth is good, and the root zone is deep. The soil is low in content of organic matter and lime. Lime and plant nutrients are leached rapidly from the soil; consequently, frequent, light applications of these materials are generally more effective than less frequent, heavier applications.

This soil is suited to all crops commonly grown in the county. Row crops can be grown year after year if the content of organic matter and fertility are maintained. The soil is suited to pasture, but only a limited acreage is used for pasture because the soil generally occurs among soils that are better suited to crops. Pasture can be grazed early because of the good natural drainage. Pasture crops, however, do not respond so well on these soils during the dry part of summer, as they do on wetter soils.

The soil is well suited to fruit, vegetables, and nursery crops, but only a small acreage is used for fruits and vegetables, because they are subject to damage by frost. This soil is well suited to irrigation.

CAPABILITY UNIT IIIe-1

This unit consists of sloping, slightly eroded and moderately eroded soils of the Alexandria and Cardington series. The Alexandria soils are well drained, and the Cardington soils are moderately well drained. These soils have a silt loam surface layer and a silty clay loam subsoil.

A severe hazard of erosion is a limitation to the use of these soils for crops. Runoff is rapid because of slow permeability. Erosion causes deterioration of tilth. As erosion continues, an increasing amount of material from the subsoil is mixed with that in the plow layer. The subsoil is clayey and is not so easily worked as the original surface layer. It is also lower in content of organic matter. The plow layer of the slightly eroded soils consists mostly of the material originally in the surface layer and has good tilth. The plow layer of the moderately eroded soils contains some of the material originally in the subsoil and has only fair tilth.

The soils are excessively wet for brief periods, but natural drainage is generally adequate for crops. The soils are deep and have no layers that restrict growth of roots. They have medium available moisture capacity and are rarely droughty. They are low in content of organic matter. Although natural lime is below a depth of 3 feet, the soils are acid in the root zone.

These soils are suited to all crops commonly grown in the county. If row crops are grown, intensive management is needed to help control further erosion and to maintain tilth. The soils are well suited to pasture crops. The pasture can be grazed early in spring because of the good natural drainage, and pasture crops respond fairly well during dry periods. The slopes are gentle enough to permit intensive pasture improvement.

Specialty crops are not grown extensively on these soils, but many home gardens and small orchards are grown.

CAPABILITY UNIT IIIe-2

This unit consists of sloping, slightly eroded, well-drained soils of the Belmore and Chili series. These soils have a loam surface layer and a loam or clay loam subsoil that contains a large percentage of gravel. A mixture of sand and gravel is below the subsoil. The Belmore soil is nonacid. It is on kames, eskers, and terraces. The Chili soil is acid. It is on terraces, mostly along the sides of valleys.

A severe hazard of erosion and moderate droughtiness are limitations to the use of these soils for crops. Runoff is moderate. It causes erosion, which, in turn, causes poor tilth. These soils are droughty. They have a limited available moisture capacity. Some crops, especially those that have shallow roots, are affected by lack of water in dry periods.

Tilth is generally good. Roots do not grow into some of the sandy and gravelly layers during dry periods because of a lack of available water. Natural drainage is adequate for crops. Artificial drainage is needed on soils around springs and seeps. The content of organic matter is low, and in the Chili soil the content of lime is low. Plant nutrients and lime are leached out from these permeable soils in a short time. Therefore frequent, small applications of lime and fertilizer are more effective than less frequent, large applications.

These soils are suited to all crops commonly grown in the county. They are especially well suited to alfalfa and other deep-rooted crops. The response of some shallow-rooted crops on these soils is likely to be poor

in dry years, but in wet years it is likely to be better than on less droughty soils. Intensive management is needed to control erosion in cultivated areas. These soils are suited to many pasture crops, especially those that have deep roots. Grazing is possible early in spring because of the good natural drainage. The response of pasture crops on these soils is somewhat less during extended dry periods than on finer textured soils.

The soils of this unit are well suited to orchards

CAPABILITY UNIT IIIe-3

This unit consists of sloping, slightly eroded and moderately eroded soils of the Rittman and Latham series. These soils are moderately well drained. They have a silt loam surface layer. The Rittman soils have a silty clay loam subsoil and a fragipan. The Latham soil has a silty clay subsoil and is underlain by shale or siltstone bedrock at a depth of 20 to 40 inches. The Rittman and Latham soils are on hillsides and hilltops.

A severe hazard of erosion is a limitation to the use of these soils for crops. As erosion removes the original surface layer, an increasing amount of material from the subsoil is mixed with that in the plow layer, which becomes more clayey and harder to work. The result is poorer tilth and faster runoff. The plow layer of the slightly eroded soils consists mostly of the material originally in the surface layer and has good tilth. The plow layer of the moderately eroded soil contains some material from the subsoil and has fair tilth.

In addition to its adverse effect on tilth, erosion reduces the depth to the restricting fragipan or underlying shale. Consequently, the depth of soil in which roots can grow and from which they can obtain moisture is reduced.

The soils of this unit are low in content of organic matter and lime. The Latham soil is especially low in lime. The rooting depth is restricted by a fragipan at a depth of 2 to 3 feet in the Rittman soils and by shale at a depth of 20 to 40 inches in the Latham soil. The fragipan in the Rittman soils also restricts movement of water. Consequently, the soil above the fragipan is saturated for brief periods after heavy rains. The Latham soil also remains wet after heavy rains because it has a slowly permeable subsoil. These periods of excessive wetness, however, are only temporary. Random tiling is beneficial in some wet spots.

These soils are suited to most crops commonly grown in the county. Row crops can be grown if intensive management is used to control erosion. A large proportion of the acreage is in forage crops because livestock farming is a major enterprise. These soils are well suited to most pasture crops grown in the county. The pasture can be grazed fairly early in spring, and the response of pasture crops is good during the dry part of summer.

Specialty crops are not grown on these soils to any great extent.

CAPABILITY UNIT IIIe-4

This unit consists of sloping, slightly eroded and moderately eroded soils of the Canfield, Hanover, and Titusville series. The Hanover soils are well drained. The Canfield and Titusville soils are moderately well drained. All of these soils have a fragipan. They have a silt loam surface layer and a loam, silt loam, or silty clay loam subsoil.

A severe hazard of erosion is a limitation to the use of these soils for crops. Erosion deteriorates tilth and reduces the depth to the restricting fragipan. Some material from the subsoil is mixed with that in the plow layer of the moderately eroded soils, and tilth is only fair. The plow layer of the slightly eroded soils consists mostly of the material originally in the surface layer, and tilth is good. The content of organic matter and lime is low.

The rooting depth in these soils is limited by the fragipan, which is at a depth of 2 to 3 feet in the slightly eroded soils and at less depth in the moderately eroded soils. Roots have only the volume of soil above the fragipan in which to grow and from which to obtain moisture. The fragipan also restricts the downward movement of water. The soil above the fragipan is saturated for brief periods after heavy rains. Random lines of tile are beneficial in correcting wetness around springs and seeps.

These soils are suited to all crops commonly grown in the county. Intensive management is needed to control erosion in cultivated areas. The soils are well suited to most pasture crops. Pasture can be grazed fairly early, and yields are moderately good through the dry part of summer. A large proportion of the crop acreage is in forage crops.

Few specialty crops are grown on these soils.

CAPABILITY UNIT IIIe-5

This unit consists of sloping, well-drained soils of the Berks, Loudonville, and Lordstown series. These soils are moderately deep and are underlain by sandstone bedrock at a depth of 20 to 40 inches.

The Berks soil formed in material weathered from sandstone. It has a channery silt loam surface layer and a subsoil that is more than 35 percent sandstone fragments. The Lordstown soil also formed in material weathered from sandstone. It has a silt loam surface layer and a silt loam subsoil that is less than 35 percent sandstone fragments. The Loudonville soil formed in glacial till over sandstone. It has a silt loam surface layer and a silt loam or clay loam subsoil in which there are few or no sandstone fragments.

A severe hazard of erosion is the main limitation to the use of these soils for crops. The rooting depth is limited by the underlying rock. Erosion reduces this depth and thus reduces the volume of soil from which plant roots can obtain moisture and nutrients. Erosion also deteriorates tilth.

Berks soils are droughty. Because of the large number of sandstone fragments in the subsoil, a relatively small volume of soil is available from which plant roots can obtain moisture. The Loudonville and Lordstown soils are less droughty than Berks soils because these soils are finer textured.

All the soils in the unit are low in content of organic matter and lime. Tilth is generally good. The sandstone fragments on the surface of the Berks soil are too small to interfere with tillage. These soils, except for the ones around small springs and seeps, have natural drainage that is adequate for crops.

The soils of this unit are suited to most crops com-

monly grown in the county. Row crops can be grown if intensive management is used to control erosion. A large acreage is used for pasture, and the soils are suited to most pasture crops, especially early pasture. A large acreage is in forage crops. Early grazing is possible because of the good natural drainage and general lack of excessive wetness. The response of some shallow-rooted pasture plants are not good during extended dry periods, especially on the Berks soil.

These soils are well suited to tree fruit crops because of their good natural drainage. They are generally on hilltops where air drainage is also good and frost pockets are unlikely.

CAPABILITY UNIT IIIe-6

This unit consists of sloping, slightly eroded and moderately eroded soils of the Chili, Glenford, Mentor, Wheeling, and Wooster series. The Glenford soil is moderately well drained, and the other soils are well drained.

The soils in this unit have a silt loam surface layer and a silt loam, loam, or silty clay loam subsoil. The Mentor and Glenford soils are on the sides of valleys. These soils have a high content of silt to a depth of at least 40 inches. The Wheeling soil is on terraces along the sides of major valleys. Its subsoil has a high content of silt, and below the subsoil is sand and gravel. The lower part of the subsoil in the Wooster soils is a weakly expressed fragipan that slightly restricts the growth of roots and the movement of water. Loam glacial till underlies the subsoil.

A severe hazard of erosion is a limitation to the use of the soils in this unit for crops. Erosion causes deterioration of tilth. As the original surface layer is removed, an increasing amount of material from the subsoil is mixed with that in the plow layer. This layer is not so easy to work as the original surface layer. The slightly eroded soils have good tilth; the moderately eroded soil has fair tilth.

In addition to its adverse effect on tilth, erosion reduces the depth to the fragipan in Wooster soils, and to sand and gravel in the Wheeling soil. The depth of soil from which the roots can obtain moisture is thereby reduced.

The soils in this unit are low in content of organic matter and lime. The rooting depth is not restricted in the Mentor and Glenford soils. A weak fragipan at a depth of 2 to 3 feet in the Wooster soils slightly restricts the penetration of roots. The fragipan is discontinuous in many areas, and the degree of restriction varies. Water is not available in the Wheeling soil during extended dry periods. For this reason, some roots do not penetrate the dry sand and gravel underlying this soil. Moisture is generally adequate in the other soils.

The soils of this unit are suited to all crops commonly grown in the county. Cultivated crops can be grown if intensive management is used to control erosion (fig. 2). The soils are well suited to most pasture crops. Pasture can be grazed early in spring because the soils are not wet for extended periods. During dry weather yields are fairly good, but shallow-rooted plants are affected by a lack of moisture in the Wheeling soil.

Specialty crops are not grown extensively. These soils are suited to tree fruit crops.

CAPABILITY UNIT IIIw-1

This unit consists of nearly level and gently sloping, somewhat poorly drained soils of the Wadsworth series. These soils have a fragipan that restricts the growth of roots and the downward movement of water. They have a slightly acid silt loam surface layer and a strongly acid silty clay loam subsoil. These soils formed

Figure 2.—**Contour stripcropping on Wooster silt loam, 6 to 12 percent slopes.**

in glacial till. They are in depressions along natural drainageways.

Wetness is the major limitation to the use of these soils for crops. The water table is within 6 to 15 inches of the surface in the wettest time of the year. Because of the fragipan, these soils generally stay wet longer than adjacent, more strongly sloping soils. Artificial drainage is needed for crops in most areas.

Erosion is a slight hazard on the gently sloping soils. Erosion reduces the amount of soil from which plants can obtain water and nutrients. Maintaining good tilth and controlling runoff help to control erosion. The slopes are generally long enough to permit application of erosion-control practices.

If they are drained, the soils of this unit are suited to most crops commonly grown in the county. They are generally low in content of lime and organic matter. They are also well suited to pasture grasses. Seedings can be damaged if the pasture is grazed early in spring when the soils are muddy.

Specialty crops are not grown to a great extent on these soils.

CAPABILITY UNIT IIIw-2

Carlisle muck is the only soil in this unit. This is a nearly level, very poorly drained soil consisting of muck and peat more than 40 inches thick. It is in basinlike areas.

Wetness is the main limitation to the use of this soil for crops. The water table is at or near the surface much of the time. Some areas are ponded. Artificial drainage is needed if this soil is farmed. A combination of tile and open ditches is generally needed for adequate drainage.

Drained areas of Carlisle muck are subject to loss of soil by soil blowing and fire. These losses reduce the volume of soil material for plant growth. Winter-cover crops and windbreaks of shrubs help to control soil blowing. There is also a hazard of frost on some pockets of this soil, especially those surrounded by steeper hills.

This soil is very high in content of organic matter. It has a very high capacity to store and release moisture and plant nutrients. The root zone is deep. The soil is very friable and easily worked.

Carlisle muck is suited to all crops commonly grown in the county. It is also suited to potatoes, onions, green vegetables, and other specialty crops. Row crops can be grown year after year if the soil is drained and soil blowing is controlled. Pasture grasses, especially canarygrass, make good growth on this soil, but the soil is soft and animals can damage the seeding.

CAPABILITY UNIT IIIw-3

This unit consists of nearly level, poorly drained soils of the Condit, Frenchtown, and Sebring series.

The Condit and Frenchtown soils formed in glacial till. They are in depressions and other low areas on till plains. The Frenchtown soil has a fragipan in the subsoil that restricts the movement of water and the growth of roots. The Sebring soil formed in silty, waterlaid deposits more than 40 inches thick. It is in low areas on terraces and lake plains. All of these soils have a silt loam surface layer and a silt loam or silty clay loam subsoil.

Wetness is the main limitation to the use of these soils for crops. The water table is within 6 inches of the surface for extended periods. Many depressions are ponded late in winter and early in spring. Artificial drainage is needed for most crops.

These soils are low in content of organic matter and have poor to fair tilth. Some areas of the Condit soil in the northern part of Springfield and Sandusky Townships and in the southern part of Sharon Township are higher in content of organic matter and have better tilth than those elsewhere in the county.

If the soils of this unit are drained, they are suited to all crops commonly grown in the county. Maintaining adequate drainage is a continuing management need. These soils are well suited to bluegrass pasture, and the response is good during the dry part of summer. The soils are wet until late in spring, and grazing at this time is likely to damage pasture seeding.

These soils are not used for specialty crops.

CAPABILITY UNIT IIIw-4

Sloan silty clay loam is the only soil in this capability unit. This soil is nearly level and very poorly drained. It formed in nonacid silt loam and silty clay loam deposited by streams. It has a silt loam or silty clay loam surface layer that is neutral in reaction and a silty clay loam subsoil that is mildly alkaline. This soil is on low bottom lands or in slackwater areas of flood plains.

Wetness is the main limitation to the use of this soil for crops. Early in spring the water table is within 6 inches of the surface. It recedes as the season progresses, but it rises to or near the surface after heavy rains. This soil has moderately slow permeability. It is subject to flooding. Occasionally the floodwater current causes severe erosion. If drainage and flood control are established and maintained, this soil can be used for crops. It has a high content of organic matter, a deep root zone, and good tilth.

This soil is suited to most crops grown in the county. Small areas along narrow stream bottoms are usually in pasture or trees. Some areas are so cut up by old stream channels they are impossible to till. The soil is suited to most pasture grasses commonly grown in the county. If pasture is grazed too early in spring, the seeding is likely to be damaged. Generally the water table is higher early in spring than at other times; and the surface layer is saturated in spots. If this soil is properly managed, pasture crops respond well.

CAPABILITY UNIT IIIw-5

Holly silt loam is the only soil in this capability unit. This soil is nearly level and poorly drained. It formed in deposits laid down by streams and is in low areas of stream valleys. It is silty or loamy in texture.

Wetness is the main limitation to the use of this soil for crops. The water table is within 6 inches of the surface for extended periods. In addition, the soil is subject to flooding. Some areas are flooded every year, others are flooded less frequently. Some areas remain under water for long periods after they are flooded. Inaccessibility is another limitation. Many areas are in narrow valleys that are not easily accessible or they are cut up by old stream channels.

This soil is poorly suited to crops, and only a very

small acreage is used for that purpose. Even if managed intensively, it is difficult to drain. It is well suited to bluegrass pasture, and the response is good throughout the dry part of summer. Grazing early in spring when the soil is wet and muddy is likely to damage pasture seedings.

CAPABILITY UNIT IVe-1

This unit consists of moderately steep, slightly eroded and moderately eroded soils of the Alexandria, Hanover, Mentor, Wheeling, and Wooster series. All of these soils are well drained.

The Alexandria soils formed in clay loam glacial till. They have a silt loam surface layer and a silty clay loam subsoil. The Hanover and Wooster soils also formed in glacial till, but in till that was more acid and less clayey than that in which the Alexandria soils formed. They have a silt loam surface layer and a loam or silt loam subsoil. They have a dense layer, or fragipan, that restricts the growth of roots and the movement of water. The fragipan in the Wooster soils is thin and discontinuous; that in the Hanover soils is thicker and continuous. The Mentor and Wheeling soils formed in silty and loamy waterlaid deposits. These soils have a silt loam surface layer, and a silt loam or silty clay loam subsoil. The Wheeling soils are underlain by sand and gravel; the Mentor soils, by silt loam.

A very severe hazard of erosion is a limitation to the use of these soils for crops. Runoff is rapid, and the hazard of further erosion is severe if the surface is left bare. As the surface layer is removed, an increasing amount of material from the subsoil is mixed with that in the plow layer, which is harder to work and has a poorer tilth than the one made up of material originally in the surface layer. Thus, the tilth of these soils ranges from fair to good, depending on the amount of subsoil material in the plow layer. Erosion also reduces the depth to the fragipan in the Wooster and Hanover soils and to the sand and gravel in the Wheeling soils.

All of these soils are low in content of organic matter and lime. Except where these soils occur around small seeps and springs, natural drainage is adequate for crops. Periods of excessive wetness are too brief to warrant artificial drainage.

These soils are suited to all crops commonly grown in the county. Erosion is difficult to control in cultivated areas. If erosion is controlled, row crops can be grown every 4 to 6 years. The soils are well suited to pasture crops. Pasture can be grazed early in spring because of the good natural drainage. The response of pasture crops is not so good on these soils during dry weather, especially on the Wheeling soil, as on less strongly sloping soils.

Only a small acreage is used for specialty crops. Because of their good drainage, the soils are well suited to tree fruit crops.

CAPABILITY UNIT IVe-2

This unit consists of a moderately steep, slightly eroded soil of the Belmore series and a gently sloping and sloping, slightly eroded soil of the Conotton series. These soils are well drained. The Belmore soil has gravel in and below the subsoil and is nonacid. The Conotton soil has a very gravelly subsoil and is acid.

A very severe hazard of erosion and moderate droughtiness are limitations to the use of these soils for crops. The plow layer consists mostly of material originally in the surface layer. Further erosion results in a reduction of the already low available moisture capacity.

These soils are low in content of organic matter and in plant nutrients. The Conotton soil is also low in content of lime. The soils have a limited capacity to store plant nutrients. Therefore, frequent, light applications of lime and fertilizer are generally more effective than less frequent, heavy applications. Some of the more gravelly layers in these soils cannot be penetrated by roots because these layers lack available water. Natural drainage is adequate for crops.

These soils can be used for most crops commonly grown in the county. Row crops cannot be grown frequently, however, if erosion is to be controlled. The soils are suited to early pasture, but the response of crops is not good during the dry part of summer. Pasture can be grazed early in spring because of the good natural drainage. Shallow-rooted pasture plants are likely to be damaged during extended dry periods.

Tree fruit crops can be grown, but there are few commercial orchards on these soils because of climatic conditions.

CAPABILITY UNIT IVe-3

This unit consists of sloping, severely eroded soils of the Cardington and Hanover series. The Cardington soil is moderately well drained. The Hanover soil is well drained. The Cardington soil formed in clay loam glacial till. The Hanover soil formed in loam glacial till. These soils originally had a silt loam surface layer, but most of this layer has been removed by erosion. The present plow layer consists mostly of material from the subsoil, which is silty clay loam in the Cardington soil and loam or silt loam in the Hanover soil.

A severe hazard of erosion is a limitation to use of these soils for most purposes. Tilth is poor, and preparing a good seedbed is difficult especially for small grain and grasses. In general, these soils are very low in content of organic matter, in nitrogen, and in phosphorus. Natural drainage is adequate for most farming purposes.

These soils are poorly suited to crops. Keeping the larger areas in forage crops as much as possible helps to control further erosion. Some areas of these soils occur as narrow strips through larger areas of less eroded soils, and they are farmed along with those soils. Additions of organic matter are beneficial.

These soils are suited to pasture, but a good seeding is difficult to establish. Once established, pasture aids in controlling erosion and adds needed organic matter to the soil. Pasture can be grazed early in spring because of the good natural drainage.

These soils are generally not used for specialty crops.

CAPABILITY UNIT IVe-4

This unit consists of sloping and moderately steep, slightly eroded to severely eroded soils of the Rittman series. These soils are moderately well drained. They have a fragipan in the lower part of their subsoil. They formed in glacial till. Except for the severely eroded

soil, these soils have a silt loam surface layer and a silty clay loam subsoil.

The severely eroded soil has lost most of its original surface layer. The plow layer has poor tilth because it consists mainly of material originally in the subsoil. Thus, there are special management concerns, regardless of the proposed use of this soil. A good seedbed is difficult to prepare. Runoff is more rapid than that on less eroded soils, and permeability is slower.

The slightly eroded and moderately eroded soils have better tilth than the severely eroded soil, but the hazard of further erosion is severe.

The fragipan in the subsoil restricts the penetration of roots and the movement of water. Erosion reduces the depth to the fragipan and thus reduces the volume of soil from which plants can obtain water and nutrients. Drainage is generally adequate for most crops.

The severely eroded soil is poorly suited to crops. It is very low in content of organic matter, and additions of organic matter are beneficial. Keeping this soil in forage crops most of the time aids in controlling erosion. Some areas of this soil are in narrow strips through areas of less eroded or less strongly sloping soils, and they are generally farmed along with these soils. Extra applications of organic matter to these narrow strips are beneficial.

The slightly eroded and moderately eroded soils are suited to crops. Because of the moderately steep slopes, however, row crops can be grown only occasionally if erosion is to be kept to a minimum.

All of the soils of this unit are suited to pasture crops. Establishing a good seeding is difficult on the severely eroded soil. Once established, a good pasture aids in controlling erosion and increases the content of organic matter. The pasture generally can be grazed early in spring.

These soils are not used extensively for specialty crops.

CAPABILITY UNIT IVe-5

This unit consists of moderately steep and steep, well-drained soils of the Berks, Lordstown, and Loudonville series. These soils are underlain by sandstone bedrock at a depth of 20 to 40 inches.

The Berks soil formed in material weathered from sandstone. It has a channery silt loam surface layer and a loam or silt loam subsoil that is more than 35 percent sandstone fragments. The Lordstown soils also formed in material weathered from sandstone. They have a silt loam surface layer and a silt loam subsoil that is less than 35 percent sandstone fragments. The Loudonville soil formed in glacial till over sandstone. It has a silt loam surface layer and a silt loam or clay loam subsoil that contains few, if any, sandstone fragments.

A very severe hazard of erosion is the main limitation to the use of these soils for crops. Runoff is rapid. The rooting depth is limited by bedrock at a depth of 20 to 40 inches. Erosion reduces the depth of soil over the bedrock and thereby reduces the volume of soil from which plant roots can obtain water and nutrients. Erosion also causes deterioration of tilth.

Droughtiness is a severe limitation in the Berks soil. Because of the sandstone fragments in the subsoil, there is a limited volume of soil from which plant roots can obtain moisture. The Lordstown and Loudonville soils are less droughty than the Berks soil. Although these soils have a limited depth of soil above the bedrock, they have high available moisture capacity. All the soils in this unit have adequate natural drainage, but the soils around small seeps and springs are excessively wet.

The moderately steep Lordstown and Loudonville soils are moderately well suited to most crops grown in the county. They are only slightly eroded and have good tilth. They are low in content of organic matter and lime and in plant nutrients. Some crops on these soils are affected by a lack of moisture during extended dry periods. Including sod crops in the cropping system frequently helps to control erosion. Row crops can be grown occasionally if intensive management is used to control erosion.

The Berks soil is poorly suited to crops because they are droughty. The steeply sloping Lordstown and Loudonville soils are too steep for the use of some farm machinery, and few crops are grown on them. Row crops are grown occasionally as a means of establishing a pasture seeding.

The soils of this unit are well suited to pasture, and a large acreage is used for this purpose. They are especially well suited to early pasture because of their good natural drainage. The response of pasture crops is not so good, especially on the Berks soil, during the dry part of summer. Overgrazing of pasture on the steep soils exposes the soil surface and results in further erosion. If row crops are grown to establish a pasture seeding, intensive management is needed to control further erosion. The slopes do not hinder most pasture improvement practices.

A small acreage of these soils is used for orchards. Air drainage is generally good.

CAPABILITY UNIT IVs-1

This unit consists of gently sloping to moderately steep, well-drained sandy soils of the Schaffenaker series. These soils are underlain by sandstone at a depth of 20 to 40 inches.

The soils of this unit have a very low available moisture capacity and are very droughty. Except during very wet periods, plants are affected by a lack of water. The soils are low in content of organic matter and lime and in plant nutrients. Applications of fertilizer and lime are soon leached out of the porous, sandy soils.

These soils are poorly suited to crops because of droughtiness and low fertility, and only a small acreage is used for crops. It is seldom practical to make the amendments needed to obtain good crop growth. The soils are poorly suited to pasture because of their droughtiness.

The gently sloping and sloping areas have some potential for nursery crops if a supplemental source of water is provided. Nursery seedlings can be removed from the loose, sandy soil with a minimum of root damage.

CAPABILITY UNIT VIe-1

This unit consists of moderately steep, severely eroded soils of the Alexandria, Rittman, and Wooster series; steep, slightly eroded and moderately eroded soils of the Alexandria, Hanover, and Wooster series; and very steep, slightly eroded soils of the Alexandria and Wooster series. These soils are well drained.

All of these soils formed in glacial till. The Alexandria soils are on moraines and on the sides of valleys. The other soils also are mostly on the sides of valleys. The soils of this unit, except the Alexandria and Rittman soils, have a silt loam surface layer. The severely eroded Alexandria and Rittman soils have a silty clay loam surface layer. The subsoil is silty clay loam in the Alexandria soils, loam or silt loam in the Hanover and Wooster soils, and silt loam or silty clay loam in the Rittman soils. The Wooster, Rittman, and Hanover soils have a restrictive fragipan in the lower part of the subsoil.

The moderately steep, severely eroded soils in this unit have very severe limitations for crops. Most of their original surface layer has been removed by erosion, and the present surface layer consists mostly of material from the subsoil. This surface layer has poor tilth. It is hard to work into a good seedbed, especially for small-seeded crops. Runoff is rapid, and further erosion is a hazard if the surface is left bare.

These severely eroded soils have low productivity. They are very low in content of organic matter. Keeping the soils in sod crops most of the time helps to control further erosion. If row crops are grown to establish a seeding of sod crops, intensive management is needed to control erosion. Additions of organic matter are especially beneficial. Many areas of these soils are in narrow strips across areas of less strongly sloping soils, and they are cropped along with those soils.

The hazard of erosion is severe on the steep and very steep, slightly eroded and moderately eroded soils of this unit. Most of the original surface layer, however, remains, mainly because these soils are in grass or trees most of the time. If they are cultivated, the hazard of further erosion is severe. Runoff is rapid because of the steep slopes. Keeping these soils in permanent pasture or trees helps to control further erosion.

All the soils in this unit have good natural drainage. Only the soils around seeps and springs are excessively wet.

These soils are suited to most pasture crops. Establishing a good seeding is difficult on the severely eroded soils. Once established, a good pasture helps to control further erosion and increases the content of organic matter. Some pasture improvement practices are hampered by steepness of slope. Pasture on the soils of this unit generally can be grazed early in spring, but during dry weather, crops do not respond as well as they do on wetter, less strongly sloping soils.

These soils generally are not used for specialty crops.

CAPABILITY UNIT VIe-2

This unit consists of steep and very steep soils of the Schaffenaker, Lordstown, and Loudonville series, and of the Berks-Rock outcrop complex. These soils are well drained. They are underlain by sandstone bedrock at a depth of 20 to 40 inches.

The Schaffenaker, Lordstown, and Berks soils formed in material weathered from sandstone. The Schaffenaker soil has a thin surface layer of loamy sand underlain by sand to the depth of the bedrock. The Lordstown soil has a silt loam surface layer and a silt loam subsoil that is less than 35 percent sandstone fragments. The Berks soil has a channery silt loam surface layer and a silt loam subsoil that is more than 35 percent sandstone fragments. The Loudonville soil formed in glacial till over sandstone. It has a silt loam surface layer and a silt loam or clay loam subsoil.

The soils of this unit are generally too steep for crops. Steepness of slope limits the use of most farm machinery. If these soils are cultivated, the hazard of erosion is severe. The Berks and Schaffenaker soils have low to very low available moisture capacity.

The Lordstown and Loudonville soils are suited to permanent pasture. The response of pasture crops is fair, and the pasture can be grazed early in spring because of the good natural drainage. These soils are better suited to trees and to recreational areas than to most other uses.

CAPABILITY UNIT VIe-3

This unit consists of only Chili and Conotton soils, 12 to 18 percent slopes. These soils are well drained. They have a gravelly or very gravelly loam or sandy loam surface layer.

A very severe hazard of erosion and droughtiness are limitations to the use of these soils for farming. The soils are very low in content of organic matter and lime and in plant nutrients. Their available moisture capacity and productivity are low. The less eroded areas have some loamy soil material over the gravel that can supply a limited amount of moisture to plants.

These soils are poorly suited to crops. They generally occur as narrow strips between less strongly sloping gravelly soils and on isolated hills. Extra applications of organic matter are beneficial.

A few pasture crops can be grown on these soils early in spring. These soils are not suited to pasture crops during the dry part of summer.

These soils are not used for specialty crops.

CAPABILITY UNIT VIIe-1

This unit consists of only Wooster silt loam, 18 to 40 percent slopes, severely eroded. This soil is well drained. It originally had a silt loam surface layer. The subsoil is loam or silt loam. The soil has a dense fragipan that restricts the growth of roots and the movement of water. This soil formed in glacial till. Most areas are on the sides of valleys.

Erosion has removed most of the original surface layer. The present surface layer consists mostly of material from the subsoil and has poor tilth. It is hard to work into a good seedbed. Runoff is rapid, and infiltration is slow. Gullies can form. If not controlled, these gullies can extend into less strongly sloping soils above this soil. The content of organic matter is very low. Cultivating this soil or overgrazing of pasture on it results in further erosion. The use of some equipment is limited by the steepness of slope.

This soil is generally unsuited to crops. Permanent vegetation is needed to aid in controlling further ero-

sion. In places seedings are difficult to establish on this severely eroded soil. In places extra applications of organic matter help to establish seedings. If the areas are grazed, careful management is needed to prevent overgrazing during the dry part of summer.

CAPABILITY UNIT VIIe-2

This unit consists of moderately steep to very steep soils of the Chili and Conotton series. The moderately steep soils are severely eroded. All of the soils are deep, well drained, and gravelly. They are in narrow strips along the edges of terraces and on the lower parts of hills along the sides of major valleys.

A very severe hazard of erosion and droughtiness are limitations to the use of these soils for crops and pasture. Available moisture capacity is low, and the soils tend to be droughty during periods of low rainfall. Erosion reduces the amount of soil from which plants can obtain moisture. It also increases the rate of runoff and thereby reduces the available moisture.

These soils are very low in content of organic matter and lime and in plant nutrients. They are generally unsuited to crops. They can produce a limited amount of forage early in spring.

Permanent vegetation is needed to help control further erosion. Large amounts of organic matter are helpful in establishing seedings. Steepness of slope limits the use of some kinds of equipment.

Estimated yields

Table 1 shows, for most of the soils in the county, the estimated yields per acre of the principal crops under two levels of management. These yields are those that can be expected over a period of several years. Miscellaneous land types and some very steep soils that are rarely used for crops are not included in the table.

The yields in columns A are those that are obtained under the prevailing level of improved management in the county. Under this level of management, some but not all of the practices needed for optimum yields are applied.

The yields in columns B are optimum yields, or those expected under a high level of management, which includes the following practices: Increasing the permeability and the available moisture capacity of the soils; removing excess water; controlling erosion; plowing, preparing the seedbed, and cultivating by methods suited to the soil and the crop; controlling weeds and insects; applying fertilizer that contains needed trace elements, and lime, according to the results of soil tests; conducting all farming operations at the proper time; and choosing improved crop varieties. Irrigation is not included.

The yields in the table are not likely to agree exactly with yields obtained from a specific field in a given year, because soils, management, and weather vary. The yields given are intended to indicate the relative productivity of the soils. As farming advances, the general level of crop yields will increase. The yields on one soil in relation to those on another, however, are unlikely to change much.

The difference between yields in columns A and B indicate a response to management, but yields are also affected by such factors as the purpose for which a crop is planted and by some soil limitations not considered in the estimates. Yields of oats, for example, are likely to be lower when oats is planted as a nurse crop with hay and pasture seedings than when it is grown as a separate crop. Difficulty in establishing a seeding on moderately eroded soils has not been considered in the estimated yields of pasture plants. Pastures are assumed to be a legume-grass mixture, except on those soils where bluegrass pasture is indicated.

The estimates of yields in table 1 are based mainly on the experience of farmers. They are also based on experiments and field trials conducted by the Ohio Agricultural Research and Development Center and on observations made by the county extension staff and work unit and by personnel of the Soil Conservation Service.

Woodland[2]

Nearly all of Richland County was forest land at the time of settlement. Red oak, white oak, black oak, hickory, sugar maple, and other native trees grew on the higher and drier areas. Red maple, green ash, and elm grew in the wetter areas. As a result of clearing, the acreage of woodland has been reduced to about 70,000 acres, or 22 percent of the county. Most of the remaining woodland is in small farm woodlots. There are very few contiguous areas larger than 100 acres. Most of the woodland has been cut over, and much of it has been grazed. Beech trees and weed trees are dominant in many farm woodlots.

Richland County has a sizeable acreage of soils that are not particularly well suited to crops, but they are suited to trees. Consequently, a potential exists for the production of trees in the county.

The soils of Richland County have been placed in 16 woodland suitability groups to assist owners in planning the use of their soils for wood crops. These groups are shown in table 2. Each group is made up of soils that are suited to the same kinds of trees, that need about the same management where the vegetation on them is similar, and that have the same potential for production of trees. Not included in a woodland group are Cut and fill land, Gravel pits, and Urban land, because these miscellaneous land types are variable or are otherwise unsuited to trees. Table 2 shows for each woodland suitability group the potential productivity of the soils for specified trees, the hazards and limitations of the soils affecting management, and the preferred species to favor in existing stands and for planting.

Each woodland group is identified by a three-part symbol, such as 1o1, 2w1, or 3w3. The potential productivity of the soils in the group is indicated by the first number in the symbol—1, very high; 2, high; 3, moderately high; 4, moderate; and 5, low. These ratings are based on field determination of average site index. Site index of a given soil is the height, in feet, that the dominant and codominant trees of a given species reach in a natural, essentially unmanaged stand in 50 years.

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

TABLE 1.—*Estimated average yields per acre of principal crops on arable soils*

[Yields in columns A can be expected under prevailing improved management; those in columns B can be expected under optimum management. Absence of a yield figure means the crop is not commonly grown under the level of management indicated or that the soil is not suited to the crop. Data are not given for land types and for soils not generally used for crops]

Soil	Corn		Wheat		Oats		Soybeans		Alfalfa-grass (hay)		Pasture	
	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Alexandria silt loam, 2 to 6 percent slopes	75	106	33	43	47	74	19	32	2.7	4.2	125	200
Alexandria silt loam, 6 to 12 percent slopes	72	101	31	41	45	72	17	30	2.5	4.0	125	200
Alexandria silt loam, 6 to 12 percent slopes, moderately eroded	63	88	29	39	43	70	15	28	2.5	4.0	125	200
Alexandria silt loam, 12 to 18 percent slopes	62	85	29	39	37	70	15	23	2.0	3.5	100	175
Alexandria silt loam, 12 to 18 percent slopes, moderately eroded	52	73	27	37	35	64	13	21	2.0	3.5	100	175
Alexandria silt loam, 18 to 25 percent slopes									1.5	2.8	75	125
Alexandria silt loam, 18 to 25 percent slopes, moderately eroded									1.5	2.8	75	125
Alexandria silty clay loam, 12 to 18 percent slopes, severely eroded									1.5	3.0	75	150
Algiers silt loam	62	102	20	38	44	64	24	37	2.7	3.7	[2] 135	185
Belmore loam, 2 to 6 percent slopes	72	101	28	41	52	78	24	40	2.7	4.2	135	210
Belmore loam, 6 to 12 percent slopes	60	85	25	37	50	74	20	33	2.7	4.2	135	210
Belmore loam, 12 to 18 percent slopes	46	69	22	32	46	68			2.2	3.6	110	180
Bennington silt loam, 0 to 2 percent slopes	72	105	23	34	38	68	22	35	2.5	4.0	125	200
Bennington silt loam, 2 to 6 percent slopes	72	100	25	36	42	74	20	32	2.5	4.0	125	200
Bennington silt loam, 2 to 6 percent slopes, moderately eroded	61	92	21	33	40	70	20	30	2.5	4.0	125	200
Bennington-Fitchville silt loams, 2 to 6 percent slopes	72	100	23	33	45	72	21	34	2.5	4.0	125	200
Berks channery silt loam, 2 to 6 percent slopes	50	77	20	38	25	48	10	20	2.2	3.7	110	180
Berks channery silt loam, 6 to 12 percent slopes	45	72	16	32	23	44			1.8	3.0	90	150
Berks channery silt loam, 12 to 18 percent slopes			12	22	20	38			1.4	2.6	70	130
Bogart loam, 0 to 2 percent slopes	75	98	28	42	46	76	30	42	3.2	4.5	135	210
Bogart loam, 2 to 6 percent slopes	71	92	25	40	47	74	27	38	3.2	4.5	135	210
Bogart silt loam, 0 to 2 percent slopes	79	120	30	44	52	85	33	45	3.2	4.6	160	220
Bogart silt loam, 2 to 6 percent slopes	76	114	26	42	52	80	30	41	3.2	4.6	160	220
Canfield silt loam, 2 to 6 percent slopes	68	109	28	38	50	70	20	32	3.2	4.5	135	210
Canfield silt loam, 2 to 6 percent slopes, moderately eroded	63	100	27	36	46	66	18	28	3.2	4.5	135	210
Canfield silt loam, 6 to 12 percent slopes	64	104	25	36	47	68	18	30	3.2	4.5	135	210
Canfield silt loam, 6 to 12 percent slopes, moderately eroded	60	93	22	34	42	60	16	26	3.2	4.5	135	210
Cardington silt loam, 2 to 6 percent slopes	72	103	26	38	50	75	19	32	2.5	4.0	125	200
Cardington silt loam, 2 to 6 percent slopes, moderately eroded	67	94	25	36	48	71	17	28	2.5	4.0	125	200
Cardington silt loam, 6 to 12 percent slopes	72	101	24	34	45	72	18	31	2.5	4.0	125	200

TABLE 1.—*Estimated average yields per acre of principal crops on arable soils*—Continued

Soil	Corn		Wheat		Oats		Soybeans		Alfalfa-grass (hay)		Pasture	
	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Cardington silt loam, 6 to 12 percent slopes, moderately eroded	60	85	22	32	44	70	15	25	2.5	4.0	125	200
Cardington silty clay loam, 6 to 12 percent slopes, severely eroded	43	59	18	25	38	65	14	24	2.0	3.4	100	120
Carlisle muck	66	120	28	36	50	74	22	40	2.4	3.2		
Chili loam, 2 to 6 percent slopes	64	92	28	40	50	76	28	37	2.7	4.2	135	210
Chili loam, 6 to 12 percent slopes	56	84	25	36	48	74	23	33	2.7	4.2	135	210
Chili and Conotton soils, 12 to 18 percent slopes	30		19	28	36	52			2.2	3.6	110	180
Chili and Conotton soils, 12 to 18 percent slopes, severely eroded					24	38			1.3	2.5	65	125
Chili and Conotton soils, 18 to 25 percent slopes			15	22	20	34			1.8	3.0	90	150
Chili and Conotton soils, 25 to 40 percent slopes									1.8	3.0	90	150
Condit silt loam	49	82	14	28	24	50	16	30	2.2	3.6	110	180
Conotton gravelly loam, 2 to 12 percent slopes	48	72	18	30	44	70	15	26	2.3	4.0	115	200
Digby loam, 1 to 4 percent slopes	76	105	24	38	50	75	22	36	2.5	4.0	125	200
Fitchville silt loam, 0 to 2 percent slopes	76	110	22	33	46	70	22	36	2.5	4.0	125	200
Fitchville silt loam, 2 to 6 percent slopes	76	108	22	33	48	70	22	35	2.5	4.0	125	200
Fitchville-Bennington silt loams, 0 to 2 percent slopes	74	106	22	33	45	68	22	34	2.5	4.0	125	200
Fitchville silt loam, gravelly subsoil variant, 0 to 2 percent slopes	78	107	22	33	46	70	22	36	2.2	4.0	110	200
Fitchville silt loam, gravelly subsoil variant, 2 to 6 percent slopes	76	105	22	33	48	70	22	35	2.2	4.0	110	200
Frenchtown silt loam	43	65	14	26	24	50		25	2.3	3.8	115	190
Glenford silt loam, 0 to 2 percent slopes	77	120	28	45	55	84	26	40	3.2	4.5	135	210
Glenford silt loam, 2 to 6 percent slopes	72	110	26	43	53	80	26	38	3.1	4.5	135	210
Glenford silt loam, 6 to 12 percent slopes	69	107	23	38	50	76	21	32	3.0	4.2	135	210
Gresham silt loam, 2 to 6 percent slopes	46	72	20	31	40	66	16	25	2.3	3.6	115	180
Haney loam, 2 to 6 percent slopes	71	92	33	45	50	78	26	38	3.2	4.5	135	210
Hanover silt loam, 2 to 6 percent slopes	68	109	25	40	50	74	24	32	3.2	4.5	135	210
Hanover silt loam, 6 to 12 percent slopes	64	105	24	38	48	72	23	31	3.2	4.5	135	210
Hanover silt loam, 6 to 12 percent slopes, moderately eroded	55	95	22	35	46	68	22	30	3.2	4.5	135	210
Hanover silt loam, 6 to 12 percent slopes, severely eroded	45	73	14	26	30	43	16	26	2.3	3.5	110	180
Hanover silt loam, 12 to 18 percent slopes	56	95	20	34	40	65			2.5	3.6	110	180
Hanover silt loam, 12 to 18 percent slopes, moderately eroded	48	81	16	28	38	61			2.2	3.5	110	180
Hanover silt loam, 18 to 25 percent slopes											75	125
Holly silt loam	45	80	13	29	28	52	16	28	2.2	2.7	[2] 110	[2] 135
Landes fine sandy loam	88	115	28	43	56	85	28	42	3.0	4.2	150	210
Latham silt loam, 2 to 6 percent slopes	48	73	15	32	38	54	16	26	1.5	2.2	75	90
Latham silt loam, 6 to 12 percent slopes	38	58	12	26	36	50	14	23	1.5	2.0	75	90
Linwood muck	59	98	23	34	40	75	28	42	2.4	3.6		

TABLE 1.—*Estimated average yields per acre of principal crops on arable soils*—Continued

Soil	Corn		Wheat		Oats		Soybeans		Alfalfa-grass (hay)		Pasture	
	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Lobdell silt loam	72	107	26	40	48	75	26	40	3.0	4.2	150	210
Lordstown silt loam, 2 to 6 percent slopes	60	90	24	38	38	68	18	27	2.2	3.6	110	180
Lordstown silt loam, 6 to 12 percent slopes	52	76	20	85	36	64	16	25	2.2	3.6	110	180
Lordstown silt loam, 12 to 18 percent slopes	38	60	18	28	30	58			1.7	3.0	85	150
Lordstown and Loudonville silt loams, 18 to 25 percent slopes			14	24	24	45			1.5	2.2	75	110
Lordstown and Loudonville silt loams, 25 to 40 percent slopes											60	
Loudonville silt loam, 2 to 6 percent slopes	66	100	24	40	52	76	24	33	2.5	3.8	125	190
Loudonville silt loam, 6 to 12 percent slopes	60	90	22	38	50	72	22	29	2.5	3.8	125	190
Loudonville silt loam, 12 to 18 percent slopes	38	60	18	28	36	62			2.0	3.2	100	160
Luray silty clay loam	80	124	22	40	50	80	25	40	2.7	4.6	135	210
Mentor silt loam, 2 to 6 percent slopes	72	115	27	45	55	85	26	38	2.7	4.2	135	210
Mentor silt loam, 6 to 12 percent slopes	69	107	26	43	51	80	21	34	2.7	4.2	135	210
Orrville loam, moderately shallow variant			16	28	38	62			2.2	2.8	[2] 110	[2] 140
Pewamo silt loam	75	115	25	45	55	82	25	42	2.7	4.6	135	210
Pewamo silt loam, overwash	70	100	20	38	38	64	16	32	2.0	3.0	100	150
Pewamo silty clay loam	73	110	22	42	52	80	25	40	2.7	4.6	135	210
Ravenna silt loam, 0 to 2 percent slopes	55	85	20	34	42	66	18	28	2.3	3.6	115	180
Ravenna silt loam, 2 to 6 percent slopes	55	85	20	34	40	66	18	28	2.3	3.6	115	180
Rittman silt loam, 2 to 6 percent slopes	60	92	24	38	50	70	18	30	2.6	3.7	130	185
Rittman silt loam, 2 to 6 percent slopes, moderately eroded	56	87	22	36	46	64	18	28	2.6	3.7	130	185
Rittman silt loam, 6 to 12 percent slopes	53	82	22	36	44	66	17	28	2.6	3.7	130	185
Rittman silt loam, 6 to 12 percent slopes, moderately eroded	47	78	20	33	40	60	16	26	2.3	3.2	120	175
Rittman silt loam, 12 to 18 percent slopes	43	74	18	30	36	47	15	24	2.1	2.8	105	160
Rittman silt loam, 12 to 18 percent slopes, moderately eroded	39		18	28	32	43	12	22	2.1	2.8	105	160
Rittman silty clay loam, 6 to 12 percent slopes, severely eroded	34	47	11		26		12		2.0	2.8	100	160
Rittman silty clay loam, 12 to 18 percent slopes, severely eroded									1.6	2.7	80	135
Schaffenaker loamy sand, 2 to 12 percent slopes			14	22	15	25			.8	1.0	40	50
Sebring silt loam	49	92	20	31	32	63	18	28	1.8	3.0	90	150
Shoals silt loam	60	108	24	38	46	70	22	36	2.7	4.2	[2] 135	[2] 210
Shoals loam, coarse subsoil variant	50	100	21	30	43	64	18	26	2.6	3.8	[2] 130	[2] 190
Sloan silty clay loam	77	120	20	40	44	78	22	38	2.7	2.8	[2] 135	[2] 140
Tiro silt loam, 0 to 2 percent slopes	74	108	22	33	46	70	22	35	2.5	4.0	125	200
Tiro silt loam, 2 to 6 percent slopes	74	106	22	33	48	70	22	34	2.5	4.0	125	200
Titusville silt loam, 2 to 6 percent slopes	66	106	26	38	48	68	19	32	3.2	4.5	135	210
Titusville silt loam, 6 to 12 percent slopes	62	101	23	36	45	65	17	30	3.2	4.5	135	210
Wadsworth silt loam, 0 to 2 percent slopes	50	80	20	32	40	66	16	26	2.2	3.2	110	160
Wadsworth silt loam, 2 to 6 percent slopes	50	80	20	32	44	66	14	24	2.2	3.2	110	160

TABLE 1.—*Estimated average yields per acre of principal crops on arable soils*—Continued

Soil	Corn		Wheat		Oats		Soybeans		Alfalfa-grass (hay)		Pasture	
	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Cow-Acre-days* [1]	*Cow-Acre-days* [1]
Wallkill silt loam	75	115	20	40	40	70	17	35	1.6	2.8	80	140
Wheeling silt loam, 0 to 2 percent slopes	80	110	32	45	58	80	23	36	3.2	4.6	150	215
Wheeling silt loam, 2 to 6 percent slopes	74	105	28	42	55	78	20	32	3.2	4.7	150	215
Wheeling silt loam, 6 to 12 percent slopes	66	97	25	37	50	74	17	28	3.1	4.5	135	210
Wheeling and Mentor silt loams, 12 to 18 percent slopes	54	82	23	34	46	70			2.2	3.6	110	180
Wooster silt loam, 2 to 6 percent slopes	72	110	27	42	58	78	24	35	3.2	4.5	135	210
Wooster silt loam, 2 to 6 percent slopes, moderately eroded	70	105	25	40	54	72	22	32	3.2	4.5	135	210
Wooster silt loam, 6 to 12 percent slopes	66	105	24	40	54	76	24	34	3.2	4.5	135	210
Wooster silt loam, 6 to 12 percent slopes, moderately eroded	55	95	20	32	50	70	22	30	3.2	4.5	135	210
Wooster silt loam, 12 to 18 percent slopes	55	95	19	31	45	65	18	26	2.5	3.6	110	180
Wooster silt loam, 12 to 18 percent slopes, moderately eroded	51	88	16	28	42	60	15	24	2.2	3.5	110	180
Wooster silt loam, 12 to 18 percent slopes, severely eroded	38								1.8	3.0	90	150
Wooster silt loam, 18 to 25 percent slopes									1.5	2.5	75	125
Wooster silt loam, 18 to 40 percent slopes, severely eroded									1.0	1.6	50	80
Wooster-Chili soils, 2 to 6 percent slopes	70	108	26	40	56	76	24	34	3.2	4.5	135	210
Wooster-Chili soils, 6 to 12 percent slopes	64	197	23	36	51	73	24	32	3.2	4.5	135	210

[1] Cow-acre-days is the number of animal units carried per acre multiplied by the number of days the pasture is grazed during a single grazing season without injury to the sod. An acre of pasture that provides 30 days of grazing for two cows has a carrying capacity of 60 cow-acre-days.

[2] Bluegrass pasture.

The second part of the symbol identifying a woodland group is a small letter. In this survey *w*, *s*, *f*, *r*, and *o* are used. Except for the *o*, the small letter indicates an important soil property that imposes a hazard or limitation in managing the soils of the group for trees. The letter *o* shows that the soils have few limitations that restrict their use for trees. The letter *w* means excessive wetness, either seasonal or all year. The soils have restricted drainage, have a high water table, or are subject to flooding. The letter *s* stands for sandy soils that have little or no difference in texture between surface layer and subsoil (B horizon). These soils have moderate to severe limitations for woodland use. They have low available moisture capacity and are low in available plant nutrients. The letter *f* shows that the soils have a large amount of coarse fragments in their profile. The fragments are more than 2 millimeters in diameter and less than 10 inches in size. The letter *r* shows that the main limitation is steep slopes and that there is a hazard of erosion and possibly a limitation to use of equipment. In this county *r* is used if slopes are greater than 12 percent, unless the soils have also limitations of wetness, sandiness, or large content of coarse fragments.

The last part of the symbol, another number, differentiates woodland suitability groups that have a similar degree of suitability and similar limitations but require somewhat different management, as groups 2w1 and 2w2.

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

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

Equipment limitations depend on soil characteristics that restrict or prohibit the use of harvesting equipment, either seasonally or continually. *Slight* means

there are no restrictions in the kind of equipment or time of year it is used. *Moderate* means that use of equipment is restricted for 3 months of the year or less. *Severe* means that special equipment is 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* means a loss of 0 to 25 percent. *Moderate* means a loss of 25 to 50 percent. *Severe* means a loss of more than 50 percent of the seedlings. It is assumed that seed supplies are adequate.

Plant competition is the degree to which undesirable plants invade openings in the tree canopy. The ratings are based on available moisture capacity, fertility, drainage, and degree of erosion. Competition for conifers and for hardwoods are rated separately in table 2. *Slight* means that plant competition does not prevent adequate natural regeneration and early growth or interfere with seedling development. *Moderate* means that competition delays natural or artificial establishment and rate of growth but does not prevent the development of fully stocked normal stands. *Severe* means that competition prevents adequate natural or artificial regeneration unless the site is properly prepared and burning, spraying, disking, girdling, or other maintenance practices are used.

Hazard of windthrow depends on the soil characteristics that enable trees to resist being blown down by wind. *Slight* means that most trees withstand wind. *Moderate* means that some trees are expected to blow down during execssive wetness and high wind. *Severe* means that many trees are expected to blow down when the soil is wet and winds are moderate or high.

Wildlife

Successful management of wildlife habitat depends on the availability of food, cover, and water. Unless the habitat provides a favorable balance and an adequate distribution of these elements, some desirable wildlife species will be scarce or will seek favorable habitat elsewhere. The habitat for most wildlife can be improved by establishing suitable plantings; by manipulating the existing vegetation so that the natural establishment of plants is induced and the number of desirable plants is increased; and by improving the water supply.

In this section the wildlife interpretations can be used in (1) planning for the use of land as wildlife habitat in parks, wildlife refuges, nature study areas, and other recreational developments; (2) selecting sites for creating, improving, or maintaining wildlife habitat; (3) determining the relative degree of management required for individual habitat elements; (4) eliminating sites on which it is difficult or not feasible to manage for specific kinds of wildlife; and (5) determining areas suitable for acquisition for wildlife land use.

Table 3 lists the soils in the county and rates their suitability for eight elements of wildlife habitat and for three kinds of wildlife (*1*). The ratings are *well suited, suited, poorly suited,* and *not suited.* Soils that are *well suited* have few limitations; those that are *suited* have moderate limitations; and those that are *poorly suited* have severe limitations. Not considered in the ratings are present land use, including the presence of artificial drainage, the location of a soil in relation to other soils, and the mobility of wildlife. Areas that are artificially drained are seldom used as wildlife habitat.

In table 3 soils are rated for kinds of wildlife on the basis of their suitability for the habitat elements in the first part of the table. Soils are rated for open-land wildlife on the basis of their suitability for grain and seed crops, grasses and legumes, wild herbaceous upland plants, hardwoods, and conifers. They are rated for woodland wildlife according to their suitability for all the habitat elements except grain and seed crops. For wetland wildlife, soils are rated on the basis of their suitability for wetland food and cover plants, for shallow-water developments, and for excavated ponds.

The elements of wildlife habitat rated in table 3 are briefly described in the following paragraphs.

Grain and seed crops.—These crops include corn, wheat, barley, oats, rye, buckwheat, and other seed-producing annuals. Soils well suited to these crops are deep, nearly level or very gently sloping, medium textured, well drained, and free or nearly free of stones. They have medium or high available moisture capacity and are not subject to frequent flooding. These soils can be safely planted to the named crops each year.

Grasses and legumes.—These crops are domestic grasses and legumes that are established by planting. Among the plants are bluegrass, fescue, brome, timothy, redtop, orchardgrass, reed canarygrass, clover, trefoil, and alfalfa. On soils that are well suited, many kinds of plants that are adapted to the climate can be maintained in adequate stands for at least 10 years. These soils are well drained or moderately well drained and have medium or high available moisture capacity. Susceptibility to occasional flooding and the presence of surface stones are not serious concerns, for the soils are seldom tilled.

Wild herbaceous upland plants.—In this group are perennial grasses and weeds that generally are established naturally. They include switchgrass, milkweed, daisies, goldenrod, strawberries, nightshade, and dandelion. Soils that are well suited to these plants vary widely in texture, drainage, and slope. If drainage ranges between good and somewhat poor, slope is not a limiting feature. Stoniness and susceptibility to occasional flooding are not serious concerns.

Hardwood woody plants.—These plants are nonconiferous trees, shrubs, and woody vines that produce nuts or other fruits, buds, catkins, twigs, or foliage that wildlife eat. They are generally established naturally but can be planted. Among the native kinds are oak, beech, cherry, maple, hickory, poplar, aspen, and walnut, as well as dogwood, roses, and briers. Soils well suited to these plants are deep or moderately deep, medium textured or moderately fine textured, and moderately well drained to somewhat excessively drained. Slope and surface stoniness are of little significance.

Also in this group are several varieties of fruiting shrubs that are raised commercially for planting. Autumn-olive, Amur honeysuckle, Tatarian honey-

TABLE 2.—*Woodland suitability*

Woodland suitability group and map symbols	Potential productivity		Hazards or limitations of soils affecting management		
	Species	Estimated [1] site index	Hazard of erosion	Equipment limitations	Seedling mortality
Group 1o1: CdB, CdB2, CdC, CdC2, GfA, GfB, GfC, HfB, HfC, HfC2, HfC3, Lo, MeB, MeC, TvB, TvC, WhA, WhB, WhC, WsB, WsB2, WsC, WsC2, WtB, WtC.	Upland oaks Yellow-poplar Sugar maple	85+ 95+ 85+	Slight	Slight	Slight
Group 1r1: HfD, HfD2, HfE, WmD, WsD, WsD2, WsD3, WsE, WsE3, WsF.	Upland oaks	[2] 85–95	Moderate	Moderate	Slight
Group 2o1: AdB, AdC, AdC2, BeB, BeC, BeD, BtA, BtB, BvA, BvB, CgB, CgB2, CgC, CgC2, ChC3, CnB, CnC, HaB, Lo,[3] LvB, LvC.	Upland oaks	75–85	Slight	Slight	Slight
Group 2r1: AdD, AdD2, AdE, AdE2, AdF, AeD3, LrD, LtE, LtF, LvD	Upland oaks	[2] 75–85	Slight	Moderate	Slight
Group 2w1: [4] Ag, Cr, Fr, Ho, Ly, Or, Pa, Pc, Pm, Se, Sh, Sk, Wc	Wetland oaks Upland oaks Yellow-poplar Sugar maple White pine	80–90 75–85 85–95 75–85 85–95	Slight	Severe	Severe
Group 2w2: BnA, BnB, BnB2, BpB, DmB, FcA, FcB, FdA, FgA, FgB, GrB, ReA, ReB, RsB, RsB2, RsC, RsC2, RtC3, RtD3, So,[3] TmA, TmB, WaA, WaB.	Wetland oaks Upland oaks Yellow-poplar Sugar maple White pine	80–90 75–85 85–95 75–85 85–95	Moderate	Moderate	Moderate
Group 2w3: RsD, RsD2	Upland oaks	[2] 75–85	Severe	Moderate	Slight
Group 3o1: LrB, LrC	Upland oaks Yellow-poplar White pine	65–75 75–85 75–85	Slight	Slight	Slight
Group 3f1: CtC	Upland oaks	65–75	Slight	Slight	Moderate
Group 3f2: BrD, CoD, CoD3, CoE, CoF	Upland oaks	[2] 65–75	Slight	Moderate	Moderate
Group 3f3: BsF	Upland oaks	[2] 65–75	Moderate	Severe	Moderate
Group 4f1: BrB, BrC	Upland oaks	55–65	Slight	Slight	Moderate
Group 4s1: SaC	Upland oaks	55–65	Slight	Slight to moderate.	Moderate
Group 4s2: SaD, SaE	Upland oaks	[2] 55–65	Moderate	Severe	Moderate
Group 4w1: LfB, LfC	Upland oaks	55–65	Slight	Moderate	Slight
Group 5w1: Ck, Lk. Not suited to trees; no data given.					

[1] Site index estimates are based on data gathered from individual soils in Ohio and adjoining states. They represented the height that the trees will attain in a natural unmanaged stand at age 50.

[2] Estimates are average heights of trees on protected areas and exposed areas. Site index values range to 5 feet higher on protected slopes and to 5 feet lower on exposed slopes.

groups and factors in management

Hazards or limitations of soils affecting management—Continued			Preferred species	
Plant competition for—		Hazard of windthrow	To favor in existing stands	For planting
Conifers	Hardwoods			
Severe	Moderate	Slight	Red oak, white oak, black oak, yellow-poplar, white pine, black walnut, sugar maple, white ash.	White pine, black walnut, yellow-poplar, white ash, Norway spruce.
Severe	Moderate	Slight	Red oak, white oak, black oak, black walnut, yellow-poplar.	White pine, yellow-poplar, black walnut.
Severe	Generally moderate; severe on severely eroded soils.	Slight	Yellow-poplar, black walnut, red oak, white oak.	White pine, black walnut, yellow-poplar.
Severe	Generally moderate; severe on severely eroded soils.	Slight	White oak, red oak. Protected slopes: Yellow-poplar, black walnut.	White pine. Protected slopes: Black walnut, yellow-poplar. Exposed slopes: Virginia pine, white pine.
Severe	Severe	Severe	Red oak, black oak, yellow-poplar, white ash, sugar maple, black walnut, red maple.	White pine, yellow-poplar.
Severe	Severe	Moderate	Red oak, black oak, yellow-poplar, white ash, sugar maple, black walnut, red maple.	White pine, yellow-poplar.
Severe	Severe	Slight	Protected slopes: Red oak, black walnut, yellow-poplar, white ash, red maple. Exposed slopes: Sugar maple.	Protected slopes: White pine, yellow-poplar. Exposed slopes: Virginia pine.
Moderate	Slight	Slight	Red oak, white oak, yellow-poplar, black walnut.	White pine, yellow-poplar, Virginia pine.
Moderate	Slight	Slight	Red oak, white oak, black oak, yellow-poplar, black walnut.	White pine, Virginia pine, yellow-poplar.
Moderate	Slight	Slight	Protected slopes: Red oak, white oak, black oak, yellow-poplar, black walnut. Exposed slopes: Chestnut oak, Virginia pine.	Protected slopes: White pine, Virginia pine, yellow-poplar. Exposed slopes: White pine, Virginia pine.
Moderate	Slight	Slight	Protected slopes: Red oak, white oak, black oak, yellow-poplar. Exposed slopes: White oak, Chestnut oak, Virginia pine.	Protected slopes: White pine, Virginia pine, yellow-poplar. Exposed slopes: White pine, Virginia pine.
Slight	Slight	Slight	Red oak, white oak, chestnut oak	White pine, Virginia pine.
Moderate	Slight	Slight	White pine, red oak, white oak	White pine, red pine, scotch pine.
Moderate	Slight	Slight	White pine, red oak, white oak, black oak.	White pine, red pine, scotch pine.
Moderate	Slight	Moderate	Red maple, red oak, black oak	White pine, Virginia pine.

[3] Subject to flooding.

[4] Ponding is a hazard on all soils in group 2w1; subject to flooding are Algiers, Holly, Orrville, Shoals, and Wallkill soils and Shoals, coarse subsoil variant.

TABLE 3.—*Estimated suitability of soils for*

Soil series and map symbols	Elements of wildlife habitat			
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood woody plants
Alexandria:				
AdB	Well suited	Well suited	Well suited	Well suited
AdC, AdC2	Suited	Well suited	Well suited	Well suited
AdD, AdD2, AeD3	Poorly suited	Suited	Well suited	Well suited
AdE, AdE2, AdF	Poorly suited	Suited	Well suited	Well suited
Algiers: Ag	Poorly suited	Suited	Suited	Well suited
Belmore:				
BeB	Well suited	Well suited	Well suited	Well suited
BeC	Suited	Well suited	Well suited	Well suited
BeD	Poorly suited	Suited	Well suited	Well suited
Bennington:				
BnA	Suited	Suited	Well suited	Well suited
BnB, BnB2	Suited	Suited	Well suited	Well suited
BpB	Suited	Suited	Well suited	Well suited
Berks:				
BrB, BrC	Suited	Well suited	Well suited	Well suited
BrD	Poorly suited	Suited	Well suited	Well suited
BsF	Not suited	Suited	Suited	Suited
Bogart:				
BtA, BvA	Well suited	Well suited	Well suited	Well suited
BtB, BvB	Well suited	Well suited	Well suited	Well suited
Canfield: CdB, CdB2, CdC, CdC2	Suited	Well suited	Well suited	Well suited
Cardington:				
CgB, CgB2	Suited	Well suited	Well suited	Well suited
CgC, CgC2, ChC3	Suited	Well suited	Well suited	Well suited
Carlisle: Ck	Not suited	Poorly suited	Not suited	Not suited
Chili:				
CnB	Suited	Well suited	Well suited	Suited
CnC	Suited	Well suited	Well suited	Suited
CoD, CoD3	Poorly suited	Suited	Well suited	Suited
CoE, CoF	Not suited	Poorly suited	Well suited	Suited
Condit: Cr	Poorly suited	Suited	Suited	Well suited
Conotton: CtC	Poorly suited	Suited	Suited	Suited
Cut and fill land: Cz. Material variable; no estimates given.				
Digby: DmB	Suited	Suited	Well suited	Well suited
Fitchville:				
FcA	Suited	Suited	Well suited	Well suited
FcB	Suited	Suited	Well suited	Well suited
FdA	Suited	Suited	Well suited	Well suited
Fitchville, gravelly subsoil variant: FgA, FgB.	Suited	Suited	Well suited	Well suited
French town: Fr	Poorly suited	Poorly suited	Suited	Well suited
Glenford:				
GfA, GfB	Well suited	Well suited	Well suited	Well suited
GfC	Suited	Well suited	Well suited	Well suited
Gravel Pits: Gp. Material variable; no estimates given.				
Gresham: GrB	Suited	Suited	Well suited	Well suited
Haney: HaB	Well suited	Well suited	Well suited	Well suited
Hanover:				
HfB	Suited	Well suited	Well suited	Well suited
HfC, HfC2	Suited	Well suited	Well suited	Well suited
HfC3, HfD, HfD2	Poorly suited	Suited	Well suited	Well suited
HfE	Not suited	Suited	Well suited	Well suited
Holly: Ho	Poorly suited	Suited	Suited	Well suited
Landes: La	Suited	Well suited	Well suited	Well suited
Latham:				
LfB	Suited	Well suited	Well suited	Well suited
LfC	Poorly suited	Well suited	Well suited	Well suited
Linwood: Lk	Not suited	Poorly suited	Poorly suited	Not suited
Lobdell: Lo	Suited	Well suited	Well suited	Well suited

wildlife habitat and for kinds of wildlife

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

TABLE 3.—*Estimated suitability of soils for*

Soil series and map symbols	Elements of wildlife habitat			
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood woody plants
Lordstown:				
LrB, LrC	Suited	Well suited	Well suited	Well suited
LrD	Poorly suited	Suited	Well suited	Well suited
LtE	Not suited	Poorly suited	Well suited	Well suited
LtF	Not suited	Not suited	Well suited	Well suited
Loudonville:				
LvB, LvC	Suited	Well suited	Well suited	Well suited
LvD	Poorly suited	Suited	Well suited	Well suited
Luray: Ly	Not suited	Poorly suited	Poorly suited	Well suited
Mentor:				
MeB	Well suited	Well suited	Well suited	Well suited
MeC	Suited	Well suited	Well suited	Well suited
Orrville, moderately shallow variant: Or	Suited	Suited	Well suited	Well suited
Pewamo: Pa, Pc, Pm	Poorly suited	Suited	Suited	Well suited
Ravenna:				
ReA	Suited	Suited	Well suited	Well suited
ReB	Suited	Suited	Well suited	Well suited
Rittman:				
RsB, RsB2, RsC, RsC2, RtC3	Suited	Well suited	Well suited	Well suited
RsD, RsD2, RtD3	Poorly suited	Suited	Well suited	Well suited
Schaffenaker:				
SaC, SaD	Poorly suited	Poorly suited	Suited	Suited
SaE	Not suited	Poorly suited	Suited	Suited
Sebring: Se	Not suited	Poorly suited	Suited	Well suited
Shoals: Sh	Suited	Suited	Well suited	Well suited
Shoals, coarse subsoil variant: Sk	Poorly suited	Suited	Well suited	Well suited
Sloan: So	Not suited	Poorly suited	Poorly suited	Well suited
Tiro:				
TmA	Suited	Suited	Well suited	Well suited
TmB	Suited	Suited	Well suited	Well suited
Titusville: TvB, TvC	Suited	Well suited	Well suited	Well suited
Urban land: Ur. Material variable; no estimates given.				
Wadsworth:				
WaA	Suited	Suited	Well suited	Well suited
WaB	Suited	Suited	Well suited	Well suited
Wallkill: Wc	Not suited	Poorly suited	Poorly suited	Well suited
Wheeling:				
WhA, WhB	Well suited	Well suited	Well suited	Well suited
WhC	Suited	Well suited	Well suited	Well suited
WmD	Poorly suited	Suited	Suited	Well suited
Wooster:				
WsB, WsB2, WsC, WsC2	Suited	Well suited	Well suited	Well suited
WsD, WsD2, WsD3	Poorly suited	Suited	Well suited	Well suited
WsE, WsE3	Not suited	Suited	Well suited	Well suited
WsF	Not suited	Poorly suited	Well suited	Well suited
WtB	Well suited	Well suited	Well suited	Well suited
WtC	Suited	Well suited	Well suited	Well suited

suckle, crabapple, multiflora rose, and dogwood are some of the shrubs that generally are available and can be planted on soils that are rated well suited. Hardwoods that are not available commercially can commonly be transplanted successfully.

Coniferous woody plants.—These cone-bearing, evergreen trees and shrubs are used by wildlife primarily as cover, though they also provide browse and seed. Among these plants are Norway spruce, white pine, arborvitae, redcedar, and juniper. Generally, the plants are established naturally in areas where the cover of weeds and sod is thin. The soils that are well suited to coniferous wildlife habitat are those that cause plants to grow slowly and delay closure of the canopy. It is important that branches be maintained close to the ground so that food and cover are readily available to rabbits, pheasants, and other small animals. If the trees quickly form a dense canopy that shuts out light, the lower branches die.

On soils that are poorly suited to conifers, widely

wildlife habitat and for kinds of wildlife—Continued

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

spaced plants can quickly but temporarily produce desired growth. The establishment or maintenance, however, is difficult because these soils are well suited to competing hardwoods. Unless the stand is carefully managed, hardwoods invade and commonly overtop the conifers.

Wetland food and cover plants.—Making up this group are wild, herbaceous, annual and perennial plants that grow on moist to wet sites. They include smartweed, wild millet, rush, bulrush, spikerush, sedges, burreed, wildrice, buttonbush, rice cutgrass, and cattails. Soils that are well suited are nearly level and poorly drained or very poorly drained. Soils that are suited are nearly level and are somewhat poorly drained or frequently flooded. Depth, stoniness, and texture of the surface layer are of little concern.

Shallow water developments.—These developments are impoundments or excavations that provide a controlled depth of shallow water near food and cover for wetland wildlife. Examples of these are shallow dug-

outs, level ditches, blasted potholes, and marshes where the water is kept to a depth of 6 to 24 inches. Soils that are well suited are nearly level, more than 36 inches deep over bedrock, and poorly drained or very poorly drained. Soils that are suited are nearly level and somewhat poorly drained.

Excavated impoundments.—These impoundments are dugout water areas, or a combination of dugouts and impoundments behind low dikes, in which the water is at a depth suitable for fish or wildlife. If fish are produced, part of the pond should be at least 8 feet deep. Well-suited soils are nearly level, are more than 8 feet deep, and are poorly drained or very poorly drained. In constructing an excavated impoundment, the difficulty or degree of limitation increases with increasing slope, which also reduces the size of pond that is feasible.

The kinds of wildlife rated in table 3 are briefly described in the following paragraphs.

Open-land.—Examples of open-land wildlife are pheasant, quail, meadowlarks, field sparrows, doves, cottontail rabbits, red fox, and woodchuck. These birds and mammals normally make their home in cropland; pasture; meadow; lawns; and areas overgrown by grasses, herbs, and shrubs.

Woodland.—Among the birds and mammals that prefer woodland are ruffed grouse, woodcock, thrushes, vireos, scarlet tanagers, gray squirrel, fox squirrel, gray fox, white-tailed deer, raccoon, opossum, and woodpeckers. They obtain food and cover in stands of hardwoods, conifers, shrubs, or a mixture of these plants.

Wetland.—Duck, geese, rails, herons, shore birds, mink, and muskrat are familiar examples of birds and mammals that generally make their home in ponds, marshes, swamps, and other areas of wetland.

Engineering Uses of the Soils[3]

This section provides information about the suitability of the soils as structural or foundation material in engineering projects. This information can be used by planning commissioners, town and city managers, land developers, engineers, contractors, farmers, and others who plan, design, or construct engineering works.

Among the soil properties that are significant in engineering are permeability, shear strength, compaction characteristics, drainage, shrink-swell potential, grain size, plasticity, and reaction. Also important are slope, depth to water table, and depth to bedrock. These properties, in varying degree and combination, affect construction and maintenance of such engineering works as roads, airports, pipelines, foundations for small buildings, irrigation systems, ponds and small dams, and sewage disposal systems.

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

1. Selecting residential, industrial, commercial, and recreational areas.
2. Evaluating routes for roads, highways, pipelines, and underground cables.
3. Seeking sources of gravel, sand, or clay.
4. Planning farm drainage systems, irrigation systems, ponds, terraces, and other structures for controlling water and conserving soil (fig. 3).
5. Correlating performance of structures already built with properties of the soils 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. Evaluating the trafficability of soils for cross-country movement of vehicles and construction equipment.
7. Developing preliminary estimates pertinent to construction in a particular area.

Most of the information in this section is presented in tables 4 and 5, which show estimates of soil properties significant in engineering and interpretations of the suitability of the soils for various engineering uses.

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

Some of the terms used in this soil survey have a special meaning in soil science that differs from their meaning in engineering. The Glossary defines many of these terms commonly used in soil science.

Figure 3.—**Installing tile in Luray silty clay loam to provide the necessary drainage for farming.**

[3] DEAN F. HIRE, agricultural engineer; DEAN E. SWIGART, soil conservation technician; and PAUL A. WHITEHEAD, civil engineer; Soil Conservation Service assisted in preparing this section.

Engineering soil classification systems

The two systems most commonly used in classifying soils for engineering are the Unified system (*13*), used by Soil Conservation Service engineers, the Department of Defense, and others, and the AASHO system, adopted by the American Association of State Highway 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, ML-CL.

The AASHO system is used to classify soils according to those properties that affect 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.

Estimated Unified and AASHO classifications for all the soils in the county are given in table 4.

Estimated soil properties

Estimated soil properties that are significant to engineering are given in table 4. These estimates are made for representative soil profiles, by layers that are sufficiently different to affect engineering works. The estimates are based on field observations made during soil 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 4.

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

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

Soil texture is described in table 4 in the standard terms used by the Department of Agriculture. These terms take into account relative percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. *Loam*, for example, is soil material that contains 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the soil contains gravel or other particles coarser than sand, an appropriate modifier is added, as for example, *gravelly loamy sand*. *Sand, silt, clay,* and some of the other terms used in USDA textural classification are defined in the Glossary.

Permeability is that quality of a soil that enables it to transmit water or air. It is estimated on the basis of soil characteristics observed in the field, particularly structure and texture. The estimates in table 4 do not take into account lateral seepage or such transient soil features as plowpans and surface crusts.

Available moisture capacity is the ability of soils to hold moisture for use by most plants. It is commonly defined as the difference between the amount of moisture 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.

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

Corrosivity, as used in table 4, pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. Drainage, texture, acidity, and electrical conductivity are soil properties that affect corrosion of uncoated steel. Soil texture and acidity are the main properties that affect corrosion of concrete. 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. A rating of *high* means that there is a high probability of corrosion, and protective measures for steel and concrete should be used to avoid or minimize damage.

Engineering interpretations

Table 5 describes and rates selected characteristics of the soils that affect their use for engineering purposes. The interpretations shown in table 5 are based on test data, on estimated data in table 4, and on field experience. Explanations of the column headings in table 5 are given in the following paragraphs.

Suitability for winter grading.—Because of wetness, plasticity, or susceptibility to frost action, many of the soils are not adapted to grading during parts of the winter season.

Susceptibility to frost action.—Silty and fine sandy soils that are wet most of the winter and that have a readily available source of water are most susceptible to frost action.

Suitability as source of topsoil.—The thickness, texture, and inherent fertility of the surface layer of soil determine its suitability for use as a top-dressing to promote the growth of vegetation in disturbed areas. Only the surface layer of the soil is considered in this rating, except as noted otherwise.

Suitability as source of sand and gravel.—This column rates the soils as a possible source of sand and gravel for construction purposes. A rating of *good* does not necessarily apply to all areas of a soil.

TABLE 4.—*Estimated soil properties*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The the instructions for referring to other series that appear in the first column of this table. Absence of data indicates that the

Soil series and map symbols	Depth to—		Depth from surface (representative profile)	Coarse fraction more than 3 inches	Percentage passing sieve—			
	Seasonal high water table	Bedrock			No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)
	Feet	*Feet*	*Inches*	*Percent*				
Alexandria: AdB, AdC, AdC2, AdD, AdD2, AdE, AdE2, AdF, AeD3.	>4	>6	0–5		95–100	90–100	85–95	70–85
			5–34		95–100	90–100	85–95	70–85
			34–60	3–5	95–100	90–100	85–95	70–80
Algiers: Ag	[1] ½–1½	>6	9–19	0–5	95–100	90–100	85–100	80–90
			19–30	0–5	95–100	90–100	85–100	85–95
			30–47	0–5	95–100	90–100	85–95	85–95
			47–60	0–5	95–100	80–95	75–90	70–85
Belmore: BeB, BeC, BeD	>4	>6	0–9	0–2	95–100	90–100	70–80	45–60
			9–20	2–5	70–85	65–80	55–75	25–45
			20–44	2–6	75–90	65–80	50–65	30–50
			44–60	2–8	70–80	65–75	35–50	10–25
*Bennington: BnA, BnB, BnB2, BpB. For Fitchville part of BpB, see Fitchville series.	½–1½	>6	0–9		95–100	90–100	80–95	70–85
			9–36	0–1	95–100	90–100	85–100	80–90
			36–60	0–5	95–100	90–100	80–95	75–90
Berks: BrB, BrC, BrD, BsF. Rock outcrop part of BsF has bedrock at or within a depth of 1 foot.	>4	1½–3	0–11	10–30	55–65	50–60	45–55	30–40
			11–28	50–70	30–45	30–40	25–35	15–30
			28					
Bogart: BtA, BtB, BvA, BvB	1½–2½	>6	0–10		95–100	90–100	75–90	50–60
			10–34	0–5	90–100	70–80	60–75	30–50
			34–60	0–5	75–90	50–70	35–55	15–35
Canfield: CdB, CdB2, CdC, CdC2	1½–2½	>4	0–10		90–100	85–100	85–100	70–80
			10–22		90–100	85–100	85–100	70–90
			22–45	0–5	85–95	75–90	70–85	55–70
			45–60	0–5	85–95	75–90	70–85	55–65
Cardington: CgB, CgB2, CgC, CgC2, ChC3.	1½–2½	>6	0–15		95–100	90–100	85–100	75–90
			15–34		95–100	90–100	80–95	75–90
			34–60	0–3	85–100	80–95	75–90	70–85
Carlisle: Ck	0	>6	0–60					
*Chili: CnB, CnC, CoD, CoD3, CoE, CoF. For Conotton part of CoD, CoD3, CoE, and CoF, see Conotton series.	>6	>6	0–10	0–2	95–100	80–100	70–85	45–70
			10–28	2–5	70–90	60–80	55–75	40–55
			28–60	5–10	55–70	40–60	30–50	15–25
Condit: Cr	0–½	>6	0–9		95–100	90–100	85–100	75–90
			9–50		95–100	90–100	80–95	75–90
			50–60	0–5	95–100	90–100	75–90	70–85
Conotton: CtC	>6	>6	0–16	5–10	70–90	55–80	40–50	25–40
			16–44	10–15	35–55	30–50	20–35	15–25
			44–60	5–10	25–40	20–35	10–25	5–15
Cut and fill land: Cz. No valid estimates can be made.								
Digby: DmB	½–1½	>6	0–14	0–2	95–100	85–95	75–90	55–70
			14–32	0–5	95–100	85–95	75–90	55–70
			32–60	1–5	90–100	85–95	65–85	25–45
*Fitchville: FcA, FcB, FdA. For Bennington part of FdA, see Bennington series.	½–1½	>5	0–13		100	95–100	95–100	85–100
			13–42		100	95–100	95–100	85–100
			42–60	0–1	95–100	90–100	85–100	65–85

significant to engineering

soils in such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully soil is too variable to be rated or that no estimate was made. The symbol < means less than; the symbol > means more than]

Classification			Permeability	Available moisture capacity	Reaction	Shrink-swell potential	Corrosivity	
USDA texture	Unified	AASHO					Uncoated steel	Concrete
			In. per hr.	*In. per in. of soil*	*pH*			
Silt loam	ML–CL	A–4	0.63–2.0	0.17–0.20	5.1–6.5	Low	Low	Moderate to low.
Silty clay loam	CL	A–7, A–6	0.20–0.63	0.16–0.19	5.1–6.5	Moderate	Moderate	Moderate to low.
Clay loam	CL, ML–CL	A–7, A–6	0.20–0.63	0.08–0.12	6.1–8.0	Moderate	Moderate	Low.
Silt loam	ML–CL	A–4	0.63–2.0	0.17–0.20	6.0–7.3	Low	High	Low.
Silty clay loam	CL	A–7	0.63–2.0	0.16–0.19	6.0–7.3	Moderate	High	Low.
Silty clay loam	CL	A–7	0.63–2.0	0.16–0.19	6.0–7.3	Moderate	High	Low.
Stratified loam and silt loam.	ML–CL	A–6, A–4	0.63–2.0	0.16–0.20	6.6–7.8	Low	High	Low.
Loam	ML–CL, SM	A–4	2.0–6.3	0.14–0.18	6.5–7.5	Low	Low	Low.
Gravelly loam	SM, GM	A–2, A–4	2.0–6.3	0.12–0.16	6.1–7.3	Low	Low	Low to moderate.
Gravelly clay loam	SM, SC	A–4, A–2	2.0–6.3	0.10–0.14	6.5–7.5	Low	Low	Low.
Sandy loam	SM	A–1, A–2	6.3–20.0	0.07–0.10	6.6–8.0	Low	Low	Low.
Silt loam	ML, ML–CL	A–4	0.63–2.0	0.17–0.20	5.8–6.5	Low	High	Moderate to low.
Silty clay loam	ML–CL, CL	A–6, A–7	0.06–0.20	0.16–0.19	5.0–7.5	Moderate	High	Moderate to low.
Silty clay loam	ML–CL, CL	A–6	0.20–0.63	0.08–0.12	7.3–8.2	Moderate	High	Low.
Channery silt loam	SM	A–4, A–2	2.0–6.3	0.12–0.16	5.1–6.0	Low	Low	Moderate.
Very channery silt loam.	GM	A–2	2.0–6.3	0.08–0.10	5.1–6.0	Low	Low	Moderate to high.
Sandstone bedrock.								
Loam or silt loam	ML, ML–CL	A–4	0.63–2.0	0.11–0.15	5.0–6.5	Low	Low	Moderate to low.
Gravelly loam	SM	A–4, A–2	0.63–2.0	0.11–0.15	5.0–6.5	Low	Moderate	Moderate to low.
Gravelly sandy loam.	SM	A–2	2.0–6.3	0.07–0.10	5.5–7.0	Low	Moderate	Moderate to low.
Silt loam	ML	A–4	0.63–2.0	0.17–0.0	5.0–6.0	Low	Moderate	Moderate.
Loam	ML	A–4	0.63–2.0	0.14–0.18	4.5–5.5	Low to moderate	Moderate	High to moderate.
Loam (fragipan)	ML–CL	A–4	0.06–0.20	0.08–0.12	4.5–6.0	Low to moderate	Moderate	High to moderate.
Loam	ML–CL, ML	A–4	0.63–2.0	0.10–0.14	6.5–7.5	Low	Moderate	Low.
Silt loam	ML–CL	A–4	0.63–2.0	0.17–0.20	4.5–6.0	Low	Moderate	Moderate to high.
Silty clay loam	CL	A–7	0.20–0.63	0.16–0.19	4.5–6.0	Moderate	High	Moderate to high.
Clay loam	CL	A–6	0.20–0.63	0.07–0.09	6.5–8.0	Moderate	High	Low.
Muck	PT		2.0–6.3	0.23–0.27	6.0–8.0	Moderate	High	Moderate.
Loam	ML, SM	A–4	2.0–6.3	0.14–0.18	5.0–6.5	Low	Low	Moderate to high.
Gravelly loam	SC, ML	A–4	2.0–6.3	0.08–0.12	4.5–6.0	Low	Low	Moderate to high.
Stratified loamy gravel and sand.	SM	A–1, A–2	6.3–10.0	0.03–0.06	5.5–7.0	Low	Low	Moderate to high.
Silt loam	ML–CL	A–4	0.63–2.0	0.16–0.20	6.0–7.0	Low	High	Low.
Silty clay loam	CL	A–7	0.06–0.20	0.16–0.19	5.5–7.0	Moderate	High	Moderate to high.
Clay loam	CL	A–6	0.20–0.63	0.13–0.16	7.0–8.0	Moderate	High	Low.
Gravelly loam	SM	A–2	6.3–20.0	0.10–0.14	5.0–6.5	Low	Low	Moderate to high.
Very gravelly sandy loam.	GM, SM	A–1, A–2	6.3–20.0	0.04–0.08	5.0–6.5	Low	Low	Moderate to high.
Gravel	GW, GM	A–1	>20.0	0.01–0.03	5.0–6.5	Low	Low	Moderate to high.
Loam	ML	A–4	0.63–2.0	0.14–0.18	6.5–7.5	Low	High	Low.
Loam	ML	A–4	0.63–2.0	0.14–0.18	6.0–7.5	Low	High	Low.
Sandy loam	SM, SM–SC	A–2, A–4	6.30–20.0	0.08–0.12	6.5–7.5	Low	Moderate	Low.
Silt loam	ML, ML–CL	A–4	0.36–2.0	0.17–0.20	5.0–6.5	Low	High	Low to moderate.
Silty clay loam	CL	A–7, A–6	0.20–0.63	0.16–0.19	5.0–6.5	Moderate	High	Moderate to low.
Silt loam	CL, ML–CL	A–4	0.63–2.0	0.17–0.20	6.0–7.5	Low	High	Low.

TABLE 4.—*Estimated soil properties*

Soil series and map symbols	Depth to—		Depth from surface (representative profile)	Coarse fraction more than 3 inches	Percentage passing sieve—			
	Seasonal high water table	Bedrock			No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)
	Feet	*Feet*	*Inches*	*Percent*				
Fitchville, gravelly subsoil variant: FgA, FgB.	½–1½	>5	0–13	0	95–100	90–100	85–100	80–95
			13–30	0	95–100	90–100	85–100	80–90
			30–60	5–10	70–85	55–75	45–65	25–45
Frenchtown: Fr	0–½	>4	0–12	0	95–100	90–100	80–95	70–85
			12–22	2–5	95–100	90–100	80–95	80–95
			22–40	2–5	95–100	90–100	75–90	70–85
			40–60	2–5	90–100	85–95	75–90	65–80
Glenford: GfA, GfB, GfC	1½–2½	>5	0–16		100	95–100	90–100	85–100
			16–40		100	95–100	90–100	85–95
			40–60		100	90–100	85–100	70–85
Gravel pits: Gp. No valid estimates can be made.								
Gresham: GrB	½–1½	>4	0–16		95–100	85–95	80–95	65–80
			16–23		95–100	85–95	80–90	65–80
			23–52	0–3	95–100	85–95	80–90	65–80
			52–60	3–5	90–100	80–95	75–85	60–75
Haney: HaB	1½–2½	>6	0–16		95–100	80–95	70–85	65–80
			16–40	2–5	95–100	80–95	60–75	55–65
			40–60	5–10	75–95	60–80	25–45	15–30
Hanover: HfB, HfC, HfC2, HfC3, HfD, HfD2, HfE.	>4	>4	0–10	0–2	95–100	85–95	75–90	65–80
			10–22	0–2	95–100	85–95	75–90	65–80
			22–34	2–4	95–100	85–95	75–90	65–80
			34–60	3–5	95–100	80–95	75–90	60–75
Holly: Ho	[1] 0–½	>6	0–14	0–2	95–100	95–100	85–100	75–90
			14–32	0–3	95–100	95–100	85–100	75–90
			32–60	0–5	90–100	80–95	75–90	60–75
Landes: La	[1] 3+	>10	0–13		100	95–100	90–100	40–60
			13–27		100	95–100	90–100	40–50
			27–60	1–5	95–100	90–100	75–95	20–35
Latham: LfB, LfC	1½–2½	>3	0–10		95–100	90–100	85–100	65–80
			10–24		95–100	90–100	85–100	80–90
			24–32		95–100	90–100	85–100	80–90
			32					
Linwood: Lk	0	>6	0–24					
			24–40		100	95–100	90–100	75–85
			40–60	0–5	100	95–100	90–100	70–80
Lobdell: Lo	[1] 1½–2½	>5	0–20		100	85–100	80–95	55–75
			20–42		100	95–100	80–95	65–85
			42–60	0–5	95–100	90–100	70–90	55–70
Lordstown: LrB, LrC, LrD, LtE, LtF. For the Loudonville part of LtE and LtF, see the Loudonville series.	>3	2–3	0–12	2–5	90–100	80–95	70–90	65–80
			12–24	8–12	75–90	70–85	60–80	60–75
			24–36	10–20	60–75	55–70	45–65	30–50
			36					
Loudonville: LvB, LvC, LvD	>3	2–3	0–14	0–2	95–100	85–95	70–90	70–85
			14–26	1–5	85–95	80–90	70–90	70–85
			26–38	5–40	70–90	60–80	50–75	25–45
			38					
Luray: Ly	0	>5	0–11	0	100	95–100	90–100	85–95
			11–42	0	100	95–100	90–100	85–95
			42–60	0	100	95–100	90–100	70–80

significant to engineering—Continued

Classification			Permeability	Available moisture capacity	Reaction	Shrink-swell potential	Corrosivity	
USDA texture	Unified	AASHO					Uncoated steel	Concrete
			In. per hr.	*In. per in. of soil*	*pH*			
Silt loam	ML, ML-CL	A-4	0.63–2.0	0.17–0.20	5.0–6.5	Low	High	Moderate to low.
Silty clay loam	CL	A-6	0.20–0.63	0.17–0.20	5.0–6.5	Moderate	High	Moderate to low.
Stratified loam, sandy loam, gravelly loam.	SM-SC	A-2, A-4	6.3–20.0	0.09–0.12	5.0–6.5	Low	Moderate	Moderate to high.
Silt loam	ML	A-4	0.63–2.0	0.18–0.23	5.0–6.5	Low	High	Low to moderate.
Silty clay loam	CL	A-7, A-6	0.20–0.63	0.16–0.19	5.0–6.5	Moderate	High	Moderate to low.
Silt loam	ML-CL, CL	A-4	<0.06	0.07–0.10	4.5–6.0	Low to moderate	High	High to moderate.
Loam	ML-CL, CL	A-4	0.20–0.63	0.08–0.12	6.0–7.0	Low	High	Low.
Silt loam	ML-CL	A-4	0.63–2.0	0.17–0.20	5.0–6.5	Low	Moderate	Moderate to high.
Silty clay loam	ML-CL	A-7, A-6	0.20–0.63	0.16–0.19	5.0–6.5	Moderate	High	Moderate to high.
Silt loam	ML-CL, ML	A-6	0.63–2.0	0.16–0.19	5.5–7.0	Low	Moderate	Low to moderate.
Silt loam	ML-CL	A-4	0.63–2.0	0.17–0.20	5.0–6.0	Low	High	Moderate.
Silt loam	CL	A-6	0.20–0.63	0.16–0.19	5.0–6.0	Low to moderate	High	Moderate.
Silt loam	CL	A-6	0.06–0.20	0.10–0.13	5.0–6.0	Low to moderate	High	Moderate.
Loam	ML-CL	A-4,A-6	0.63–2.0	0.10–0.13	5.0–6.5	Low	High	Moderate.
Loam	ML, ML-CL	A-4	0.63–2.0	0.14–0.18	6.0–7.0	Low	Low	Low.
Gravelly clay loam	ML	A-4	0.63–2.0	0.10–0.14	5.5–6.5	Low	Low	Moderate to low.
Gravelly loamy sand.	SM	A-2	6.3–20.0	0.05–0.08	6.5–8.0	Low	Low	Low.
Silt loam	ML-CL	A-4	0.63–2.0	0.17–0.20	4.5–6.0	Low	Low	Moderate to high.
Loam	CL	A-6, A-4	0.63–2.0	0.14–0.18	5.0–6.0	Low to moderate	Low	Moderate.
Loam	CL	A-6, A-4	0.20–0.63	0.10–0.13	4.5–6.0	Low to moderate	Moderate	High to moderate.
Loam	ML	A-4	0.20–0.63	0.10–0.14	4.5–6.0	Low	Moderate	Moderate to high.
Silt loam	ML-CL	A-4	0.63–2.0	0.18–0.23	5.5–7.0	Low	High	Low.
Silt loam	CL	A-6	0.63–2.0	0.17–0.20	5.5–7.0	Low to moderate	High	Low.
Silt loam	ML, CL	A-6, A-4	0.63–2.0	0.17–0.20	6.0–7.5	Low	High	Low.
Fine sandy loam	ML, SM	A-4	2.0–6.3	0.12–0.15	6.0–7.3	Low	Low	Low.
Fine sandy loam	SM	A-4	2.0–6.3	0.09–0.11	6.0–7.3	Low	Low	Low.
Loamy fine sand	SM	A-2	6.3–20.0	0.07–0.09	6.5–7.5	Low	Low	Low.
Silt loam	ML-CL	A-4	0.63–2.0	0.18–0.21	4.5–6.0	Low	Moderate	Moderate to high.
Silty clay loam	CL, CH	A-7	0.06–0.20	0.16–0.19	4.0–5.0	High	High	High.
Silty clay loam	CL, CH	A-7	0.20–0.63	0.15–0.18	4.0–5.0	High	High	High.
Shale or siltstone bedrock.								
Muck	Pt		6.3–20.0	0.23–0.25	6.0–7.0	Moderate	High	Low to moderate.
Silt loam	ML	A-4	0.63–2.0	0.17–0.20	6.0–7.0	Moderate	High	Low.
Loam	ML-CL	A-6	0.63–2.0	0.16–0.18	6.5–7.5	Low	High	Low.
Silt loam	ML-CL	A-4	0.63–2.0	0.17–0.20	6.0–7.0	Low	Moderate	Low.
Silt loam	CL	A-6	0.63–2.0	0.17–0.20	6.5–7.5	Low to moderate	Moderate	Low.
Stratified loam, silt loam, sandy loam.	CL, ML	A-4, A-6	0.63–2.0	0.12–0.16	6.5–7.8	Low	Moderate	Low.
Silt loam	ML	A-4	0.63–2.0	0.18–0.21	5.5–6.5	Low	Low	Low to moderate.
Silt loam	ML	A-4	0.63–2.0	0.17–0.20	5.0–6.0	Low	Low	Moderate.
Channery loam	SM	A-4, A-2	2.0–6.3	0.08–0.12	5.0–6.0	Low	Low	Moderate.
Bedrock.								
Silt loam	ML-CL	A-4	0.63–2.0	0.18–0.21	5.0–6.5	Low	Low	Moderate to low.
Clay loam	CL	A-6	0.63–2.0	0.16–0.19	5.0–6.0	Moderate	Moderate	Moderate.
Sandy loam	SM, SC	A-4, A-2	2.0–6.3	0.08–0.12	5.0–6.0	Low	Low	Moderate.
Sandstone bedrock.								
Silty clay loam	CL	A-6	0.20–0.63	0.17–0.20	6.0–7.0	Moderate	High	Low.
Silty clay loam	CL	A-7, A-6	0.20–0.63	0.16–0.19	5.0–6.5	Moderate to high	High	Moderate to low.
Silt loam	CL, ML	A-4, A-6	0.63–2.0	0.17–0.20	6.5–8.0	Moderate	High	Low.

TABLE 4.—*Estimated soil properties*

Soil series and map symbols	Depth to—		Depth from surface (representative profile)	Coarse fraction more than 3 inches	Percentage passing sieve—			
	Seasonal high water table	Bedrock			No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)
	Feet	*Feet*	*Inches*	*Percent*				
Mentor: MeB, MeC	>4	>5	0–14		100	95–100	90–100	75–95
			14–36		100	95–100	90–100	75–90
			36–50		100	95–100	90–100	70–85
			50–60	0–5	95–100	75–90	65–85	60–75
Orrville, moderately shallow variant: Or.	[1] ½–1½	2–3	0–14	0–5	95–100	90–100	80–95	55–75
			14–38	10–20	45–70	35–50	30–45	25–35
			38					
Pewamo: Pa, Pc, Pm	0	>6	0–11		100	95–100	90–100	80–95
			11–41		95–100	90–100	90–100	80–95
			41–60	0–5	90–100	80–100	80–90	75–85
Ravenna: ReA, ReB	½–1½	>5	0–16		95–100	85–95	80–90	70–85
			16–23		90–100	85–100	80–95	70–85
			23–50	2–5	90–100	85–95	75–90	60–75
			50–60	2–5	95–100	85–95	75–90	60–75
Rittman: RsB, RsB2, RsC, RsC2, RsD, RsD2, RtC3, RtD3.	1½–2½	>5	0–13	0–3	95–100	90–100	85–100	70–85
			13–18	0–3	95–100	85–95	80–90	75–85
			18–42	0–3	95–100	80–95	75–90	70–85
			42–60	0–3	95–100	85–100	80–95	65–80
Schaffenaker: SaC, SaD, SaE	>4	2–3	0–28	5–10	90–100	90–100	40–70	5–25
			28					
Sebring: Se	0	>5	0–12		100	95–100	90–100	85–95
			12–37		100	95–100	90–100	85–95
			37–60		100	95–100	90–100	70–90
Shoals: Sh	[1] ½–1½	>4	0–16	0–5	100	95–100	90–100	80–95
			16–42	0–5	100	95–100	90–100	80–90
			42–60	0–5	95–100	90–100	85–95	60–80
Shoals, coarse subsoil variant: Sk.	[1] ½–1½	>4	0–10	0–3	95–100	85–95	70–90	60–75
			10–40	2–5	50–75	40–60	25–45	5–20
			40–60	5–10	85–95	50–70	25–45	5–20
Sloan: So	[1] 0	>6	0–19		100	95–100	90–100	85–95
			19–30		100	95–100	90–100	85–95
			30–60	0–5	100	95–100	90–100	70–85
Tiro: TmA, TmB	½–1½	>6	0–8	0	100	90–100	85–100	70–85
			8–32		100	95–100	85–100	80–95
			32–60	2–5	90–100	85–95	75–90	70–85
Titusville: TvB, TvC	1½–2½	>4	0–11	0–2	95–100	85–95	80–95	70–90
			11–21	0–2	95–100	85–95	80–95	70–90
			21–45	2–4	90–100	85–95	80–95	70–85
			45–60	4–8	90–95	85–95	70–90	55–65
Urban land: Ur. No valid estimates can be made.								
Wadsworth: WaA, WaB	½–1½	>5	0–13	0–3	95–100	90–100	90–100	75–90
			13–20	0–3	95–100	90–95	85–90	70–80
			20–38	0–3	85–100	80–100	75–95	60–85
			38–60	0–3	90–100	80–100	75–95	60–85
Wallkill: Wc	[1] 0–½	>10	0–24		100	95–100	90–100	75–85
			24–50					
			50–60		100	95–100	90–100	80–90
*Wheeling: WhA, WhB, WhC, WmD. For Mentor part of WmD, see Mentor series.	>4	>5	0–18	0	95–100	90–100	85–100	70–80
			18–28	0–1	95–100	90–100	85–100	80–90
			28–36	2–5	80–95	75–85	60–75	30–45
			36–60	5–10	70–80	55–65	40–65	10–25
*Wooster: WsB, WsB2, WsC, WsC2, WsD, WsD2, WsD3, WsE, WsE3, WsF, WtB, WtC. For Chili part of WtB and WtC, see Chili series.	>4	>4	0–12	1–3	95–100	90–100	80–95	70–85
			12–24	1–3	95–100	85–95	75–90	65–80
			24–40	3–5	90–100	85–95	75–90	60–75
			40–60	4–8	90–100	80–95	70–85	60–75

[1] Subject to flooding.

significant to engineering—Continued

Classification			Permeability	Available moisture capacity	Reaction	Shrink-swell potential	Corrosivity	
USDA texture	Unified	AASHO					Uncoated steel	Concrete
			In. per hr.	*In. per in. of soil*	*pH*			
Silt loam	ML–CL	A–4	0.63–2.0	0.18–0.21	5.0–6.5	Low	Low	Low to moderate.
Silt loam	CL	A–6	0.63–2.0	0.17–0.20	4.5–6.0	Low to moderate	Low	Moderate to high.
Silt loam	ML, ML–CL	A–4	0.63–2.0	0.17–0.20	5.0–6.5	Low	Low	Low to moderate.
Gravelly sandy loam.	ML	A–4	0.63–2.0	0.11–0.14	5.5–7.0	Low	Moderate	Low.
Loam	ML	A–4	6.3–20.0	0.14–0.18	5.5–6.5	Low	Moderate	Moderate.
Very gravelly loam.	SM, GM	A–2	6.3–20.0	0.04–0.06	5.5–6.5	Low	Moderate	Moderate.
Shale and sandstone bedrock.								
Silt loam or silty clay loam.	ML–CL, ML	A–6	0.20–0.63	0.18–0.21	6.0–7.0	Moderate	High	Low.
Silty clay loam	ML–CL, CL	A–6, A–7	0.20–0.63	0.16–0.19	6.0–7.0	Moderate to high	High	Low.
Silty clay loam	CL	A–6, A–7	0.20–0.63	0.15–0.18	6.5–7.5	Moderate	High	Low.
Silt loam	ML, ML–CL	A–4	0.63–2.0	0.18–0.21	5.0–6.0	Low	High	Moderate.
Silt loam	CL	A–6	0.63–2.0	0.17–0.20	4.5–5.5	Low to moderate	High	High to moderate.
Loam	CL	A–6	0.06–0.20	0.07–0.10	4.5–5.5	Low to moderate	High	High to moderate.
Loam	ML–CL	A–4, A–6	0.63–2.0	0.07–0.10	5.5–6.5	Low	High	Moderate.
Silt loam	ML, ML–CL	A–4	0.63–2.0	0.18–0.21	4.5–6.0	Low	Moderate	Moderate to high.
Silty clay	CL	A–6	0.20–0.63	0.16–0.19	4.5–6.0	Moderate	High	Moderate to high.
Silty clay loam	CL	A–6	0.06–2.0	0.07–0.09	5.0–6.0	Moderate	High	Moderate.
Clay loam	ML–CL	A–4, A–6	0.20–0.63	0.07–0.09	6.0–7.5	Moderate to low	High	Low.
Loamy sand.	SM, SP	A–2, A–1	6.3–20.0	0.05–0.08	4.5–5.5	Low	Low	High.
Sandstone bedrock.								
Silt loam	ML–CL	A–4	0.63–2.0	0.18–0.21	5.0–6.5	Low	High	Moderate to low.
Silty clay loam	CL	A–6, A–7	0.20–0.63	0.16–0.19	5.5–7.0	Moderate	High	Moderate to low.
Silt loam	CL, ML–CL	A–6	0.63–2.0	0.17–0.20	6.5–7.5	Low	High	Low.
Silt loam	ML	A–4	0.63–2.0	0.18–0.21	6.0–7.2	Low	High	Low.
Silt loam	ML–CL	A–6	0.63–2.0	0.17–0.20	6.5–7.5	Low to moderate	High	Low.
Silt loam	ML	A–4, A–6	0.63–2.0	0.16–0.19	6.8–7.8	Low	High	Low.
Loam	ML	A–4	6.3–20.0	0.14–0.18	6.5–7.5	Low	Moderate	Low.
Very gravelly sand	SM, GM	A–2	6.3–20.0	0.03–0.05	6.5–7.5	Low	Moderate	Low.
Gravelly sand	SM, SP	A–2, A–1	6.3–20.0	0.02–0.05	7.0–8.0	Low	Moderate	Low.
Silty clay loam	CL	A–7	0.20–0.63	0.17–0.20	6.0–7.0	Moderate	High	Low.
Silty clay loam	CL	A–7	0.20–0.63	0.16–0.19	6.0–7.0	Moderate	High	Low.
Silt loam	CL, ML	A–6	0.63–2.0	0.17–0.20	6.5–7.5	Low to moderate	High	Low.
Silt loam	ML–CL	A–4	0.63–2.0	0.18–0.23	5.5–6.5	Low	High	Low.
Silty clay loam	CL	A–6, A–7	0.20–0.63	0.17–0.20	5.0–6.5	Moderate	High	Low.
Clay loam	CL	A–6, A–7	0.20–0.63	0.15–0.18	6.5–8.0	Moderate	High	Low.
Silt loam	ML, ML–CL	A–4	0.63–2.0	0.18–0.21	5.0–6.0	Low	Moderate	Moderate.
Silty clay loam	ML–CL, CL	A–6	0.20–0.63	0.16–0.19	4.5–5.5	Moderate	High	High to moderate.
Loam	ML–CL, CL	A–6, A–4	0.20–0.63	0.09–0.12	4.5–5.5	Low	Moderate	High to moderate.
Loam	ML	A–4	0.63–2.0	0.09–0.12	5.0–6.5	Low	Moderate	Moderate to low.
Silt loam	ML	A–4	0.63–2.0	0.18–0.21	5.0–6.5	Low	High	Low to moderate.
Silty clay loam	CL	A–6	0.20–0.63	0.16–0.19	4.5–5.5	Moderate	High	Moderate to high.
Silty clay loam	CL	A–6	<0.06	0.08–0.11	4.5–5.5	Moderate	High	Moderate to high.
Loam	CL, ML–CL	A–6, A–4	0.20–0.63	0.10–0.13	5.5–7.0	Low	High	Low to moderate.
Silt loam	ML–CL	A–4	0.63–2.0	0.18–0.23	6.0–7.0	Low	Moderate	Low.
Muck	Pt		6.3–20.0	0.23–0.25	6.0–7.0	Moderate	High	Low.
Silt loam	ML	A–4	0.63–2.0	0.17–0.20	6.5–7.5	Low to moderate	Moderate	Low to moderate.
Silt loam	ML–CL	A–4	0.63–2.0	0.17–0.20	5.5–7.0	Low	Low	Moderate to low.
Clay loam	ML–CL, CL	A–6	0.63–2.0	0.16–0.19	5.0–6.5	Moderate	Moderate	Moderate to low.
Gravelly sandy clay loam.	SM, SC	A–4, A–2	0.63–2.0	0.10–0.12	5.0–6.5	Low	Moderate	Moderate to high.
Gravelly sandy loam.	SM, GM	A–1, A–2	6.3–20.0	0.07–0.10	5.0–6.5	Low	Low	Moderate to high.
Silt loam	ML–CL	A–4	0.63–2.0	0.17–0.20	5.0–6.0	Low	Low	Moderate.
Silt loam	ML–CL, CL	A–6	0.63–2.0	0.16–0.19	4.5–5.5	Moderate	Low	High to moderate.
Silt loam	CL	A–6	0.20–0.63	0.08–0.12	5.0–6.0	Low	Low	Moderate.
Loam	ML–CL, ML	A–6, A–4	0.63–2.0	0.10–0.14	5.5–6.5	Low	Low	Moderate to low.

TABLE 5.—*Interpretations of engi-*

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

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of—			Soil features affecting—
			Topsoil	Sand and gravel	Road fill	Highway location
Alexandria: AdB, AdC, AdC2, AdD, AdD2, AdE, AdE2, AdF, AeD3.	Fair: moderately fine texture; steep in places.	Moderate to high.	Generally fair: Slope of more than 18 percent in places. Poor where eroded.	Unsuitable	Fair: slope of more than 18 percent in places.	Good natural drainage; irregular slopes and steep in places.
Algiers: Ag	Poor: high water table.	High	Good	Unsuitable	Fair to poor: high water table; subject to flooding.	Subject to flooding and overwashing.
Belmore: BeB, BeC, BeD.	Good: good natural drainage; gravelly.	Low to moderate.	Fair: gravelly in most places.	Fair: extremely variable deposits.	Good	Good natural drainage; short irregular slopes.
*Bennington: BnA, BnB, BnB2, BpB. For Fitchville part of BpB, See Fitchville series.	Poor: seasonal high water table; moderately fine texture.	High	Fair: less than 16 inches of suitable material.	Unsuitable	Poor to fair: clay content higher than optimum.	Seasonal high water table.
Berks: BrB, BrC, BrD, BsF Rock outcrop part of BsF has bedrock at or within a depth of 1 foot.	Fair: channery surface; good natural drainage.	Low to moderate.	Unsuitable: channery.	Unsuitable	Fair: limited amount of material above bedrock.	Bedrock at a depth of 20 to 40 inches; gently sloping to very steep.
Bogart: BtA, BtB, BvA, BvB	Fair: seasonal high water table.	Moderate	Fair: gravelly in places.	Fair to good: seasonally wet.	Good	Seasonal high water table.
Canfield: CdB, CdB2, CdC, CdC2.	Poor: water table above fragipan in winter.	High	Fair: less than 10 inches of suitable material.	Unsuitable	Fair: somewhat clayey.	Seasonal high water table.

neering properties of the soils

soils in such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully that appear in the first column of this table]

Soil features affecting—Continued						
Pipeline construction and maintenance	Ponds		Drainage for crops and pasture	Irrigation	Terraces and diversions	Waterways
	Reservoir areas	Embankments				
Irregular slopes and steep in places; good natural drainage.	Generally moderately slow seepage, but more rapid in layers and pockets of gravelly or sandy material; close investigation needed; steep slopes limit size of impoundments.	Fair to good compaction characteristics; slow permeability if compacted; good resistance to piping.	Good natural drainage; erodible ditchbanks.	Rapid runoff and severe erosion hazard where slope is more than 6 percent.	Irregular slopes and steep in places; moderately clayey subsoil.	Highly erodible; exposed subsoil, difficult to revegetate.
Subject to flooding and overwashing.	High water table; subject to flooding; moderate seepage.	Fair to good compaction characteristics; slow to moderate permeability if compacted; fair resistance to piping.	High water table; subject to flooding; drainage outlets lacking in areas; low gradient in ditches; fair to good ditchbank stability.	Artificial drainage needed; high available moisture capacity.	Level; somewhat poor natural drainage.	High water table; subject to flooding.
Good natural drainage; unstable trench walls.	Moderately rapid seepage; sandy, gravelly material.	Fair stability and compaction characteristics; moderate permeability if compacted; fair resistance to piping.	Good natural drainage; fair ditchbank stability.	Good natural drainage; low available moisture capacity; irregular slopes.	Gently sloping to moderately steep areas; short, irregular slopes.	Gently sloping to moderately steep areas.
Seasonal high water table.	Slow seepage	Fair to good stability and compaction characteristics; slow permeability if compacted; good resistance to piping.	Seasonal high water table; slow permeability; low gradient in ditches; fair to good ditchbank stability.	Artificial drainage needed; slow infiltration; high available moisture capacity.	Channel ponding likely in places.	Seasonal high water table.
Bedrock at a depth of 20 to 40 inches.	High seepage rate into fractured rock; bedrock at a depth of 20 to 40 inches.	Amount of material is limited by bedrock at a depth of 20 to 40 inches; many rock fragments.	Good natural drainage; bedrock at a depth of 20 to 40 inches.	Low available moisture capacity.	Bedrock at a depth of 20 to 40 inches hinders construction.	Bedrock at a depth of 20 to 40 inches hampers construction; exposed subsoil difficult to vegetate.
Trench walls subject to slumping; seasonal high water table.	Excessive seepage; sandy gravelly material.	Fair stability; good to fair compaction characteristics; moderate permeability if compacted; fair resistance to piping.	Moderately well drained; random tiling beneficial in local areas; poor to fair ditchbank stability.	Moderate infiltration; low available moisture capacity.	Slopes typically short and irregular.	Few limitations.
Seasonal high water table.	Slow seepage; limited storage potential in sloping areas.	Good stability and compaction characteristics; slow permeability if compacted; good resistance to piping.	Moderately good natural drainage; random tile beneficial in wet spots; fair to good ditchbank stability; erodible soil material.	Fragipan at a depth of 15 to 28 inches; rooting depth and water movement restricted by fragipan.	Erodible soil material.	Erodible soil material; seepage likely along top of fragipan.

TABLE 5.—*Interpretations of engi-*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of—			Soil features affecting—
			Topsoil	Sand and gravel	Road fill	Highway location
Cardington: CgB, CgB2, CgC, CgC2, ChC3.	Fair: moderately fine texture.	High	Fair: less than 16 inches of suitable material; poor in eroded areas.	Unsuitable	Fair: clay content higher than optimum.	Seasonal high water table.
Carlisle: Ck	Poor: very poor drainage.	High	Good if mixed with mineral soil.	Unsuitable	Unsuitable: organic material.	Very poor drainage; unstable organic material.
*Chili: CnB, CnC, CoD, CoD3, CoE, CoF. For Conotton part of CoD, CoD3, CoE and CoF, see Conotton series.	Good: good natural drainage; gravelly.	Low	Fair: gravelly in places.	Good	Good	Short, steep slopes in places; good natural drainage.
Condit: Cr	Poor: high water table; moderately fine texture.	High	Poor: high water table.	Unsuitable	Poor: poorly drained.	High water table; subjec to ponding.
Conotton: CtC	Good: good natural drainage; gravelly.	Low	Poor: gravelly.	Good	Good	Good natural drainage; stony in places.
Cut and fill land: Cz. No interpretations; material variable.						
Digby: DmB	Poor: seasonal high water table.	High	Fair: somewhat sandy.	Poor: seasonal high water table.	Fair: somewhat poorly drained.	Seasonal high water table.
*Fitchville: FcA, FcB, FdA For Bennington part of FdA, see Bennington series.	Poor: seasonal high water table.	High	Good	Unsuitable	Poor: high silt content; somewhat poorly drained.	Seasonal high water table.

neering properties of the soils—Continued

Soil features affecting—Continued						
Pipeline construction and maintenance	Ponds		Drainage for crops and pasture	Irrigation	Terraces and diversions	Waterways
	Reservoir areas	Embankments				
Seasonal high water table.	Moderately slow seepage; limited storage potential in sloping areas.	Fair to good stability and compaction characteristics; slow permeability if compacted; good resistance to piping.	Random tile beneficial in some wet spots; erodible soil material.	Erosion hazard on sloping areas; slow infiltration.	Short, irregular slopes in many places; erodible soil material.	Short, irregular slopes in many places; erodible soil material.
High water table; organic material; unstable trench walls.	Organic material more than 40 inches thick; seepage rate largely determined by underlying mineral soil; organic material likely to float in ponded areas in places.	Permeable and unstable; generally not suitable.	High water table; rapid permeability; tile subject to subsidence; ditches generally needed for outlets; low ditch gradient; poor ditchbank stability.	Artificial drainage needed; high available moisture capacity; rapid infiltration.	Nearly level soil; very poor drainage.	Nearly level soil; very poor drainage.
Trench walls subject to slumping.	Excessive seepage; sandy, gravelly material.	Fair stability and compaction characteristics; moderate permeability if compacted; poor resistance to piping.	Good natural drainage; fair to poor ditchbank stability.	Low available moisture capacity; good natural drainage; rapid infiltration.	Some areas too steep; irregular slopes in some areas.	Gently sloping to very steep areas; irregular slopes in some areas.
High water table; subject to ponding.	Slow seepage; natural ponding in places.	Fair to good stability and compaction characteristics; slow permeability if compacted; good resistance to piping.	High water table; slow permeability; suitable tile outlets lacking in some areas; fair to good ditchbank stability; low ditch gradient.	Artificial drainage needed; slow infiltration.	Nearly level soil; poor drainage.	Nearly level soil; poor drainage.
Good natural drainage; unstable trench walls.	Excessive seepage; sandy, gravelly material.	Fair stability and compaction characteristics; moderate to rapid permeability if compacted; fair resistance to piping.	Good natural drainage.	Rapid infiltration; very low available moisture capacity; good natural drainage.	Exposed gravelly subsoil difficult to vegetate.	Exposed gravelly subsoil difficult to vegetate.
Seasonal high water table; trench walls subject to slumping.	Rapid seepage; seasonal wetness.	Fair stability; fair to good compaction characteristics; moderate permeability if compacted; poor resistance to piping.	Seasonal high water table; moderate permeability; poor ditchbank stability.	Artificial drainage needed; medium available moisture capacity.	Seasonal high water table; irregular slopes.	Seasonal high water table; irregular slopes.
Seasonal high water table.	Moderately slow seepage.	Poor stability and compaction characteristics; moderate permeability if compacted; poor resistance to piping.	Seasonal high water table; moderately slow permeability; poor ditchbank stability.	Artificial drainage needed; high available moisture capacity; moderate infiltration.	Possible channel ponding; irregular slopes in places.	Seasonal high water table.

TABLE 5.—*Interpretations of engi-*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of—			Soil features affecting—
			Topsoil	Sand and gravel	Road fill	Highway location
Fitchville, gravelly subsoil variant: FgA, FgB.	Poor: seasonal high water table.	High	Good	Fair to poor: generally high in fines.	Poor in upper 20 to 40 inches; fair to good below.	Seasonal high water table.
Frenchtown: Fr	Poor: high water table.	High	Poor: high water table.	Unsuitable	Poor: poorly drained.	High water table; subject to ponding.
Glenford: GfA, GfB, GfC	Fair: moderately well drained.	Moderate to high.	Good	Unsuitable	Poor: high silt content; poor stability.	Level to sloping; short slopes.
Gravel pits: Gp. No interpretations, material variable.						
Gresham: GrB	Poor: high water table.	High	Fair: less than 16 inches of suitable material.	Unsuitable	Fair: somewhat poorly drained.	Seasonal high water table; springs.
Haney: HaB	Fair: seasonal high water table.	Moderate	Fair: less than 10 inches of suitable material.	Fair to good	Good	Short, irregular slopes; seasonal high water table.
Hanover: HfB, HfC, HfC2, HfC3, HfD, HfD2, HfE.	Fair: slope is more than 18 percent in places.	Moderate	Fair: slope is more than 18 percent in places; poor in eroded areas.	Unsuitable	Generally good: Fair where slope is more than 10 percent.	Good natural drainage; some steep areas.
Holly: Ho	Poor: subject to flooding.	High	Good	Unsuitable	Poor: high water table; subject to flooding.	High water table; subject to flooding and ponding.

neering properties of the soils—Continued

Soil features affecting—Continued						
Pipeline construction and maintenance	Ponds		Drainage for crops and pasture	Irrigation	Terraces and diversions	Waterways
	Reservoir areas	Embankments				
Seasonal high water table; unstable trench walls.	Rapid seepage below depth of 20 to 40 inches.	Fair stability; fair to good compaction characteristics; moderate permeability if compacted; fair resistance to piping.	Seasonal high water table; fair ditchbank stability.	Artificial drainage needed; available moisture capacity limited by sandy and gravelly material at depth of 20 to 40 inches.	Short, irregular slopes; seasonal wetness.	Seasonal high water table; sandy and gravelly material below depth of 20 to 40 inches.
High water table; subject to ponding.	Very slow seepage; high water table; some natural ponding.	Fair to good stability and compaction characteristics; slow permeability if compacted; good resistance to piping.	High water table; slow permeability; suitable outlets for tile drains lacking in some areas; fair to good ditchbank stability.	Artificial drainage needed; medium available moisture capacity.	Nearly level, poorly drained soil.	High water table.
Unstable trench walls; seasonal wetness.	Moderately slow seepage; limited storage potential in sloping areas.	Poor stability and compaction characteristics; moderate permeability if compacted; poor resistance to piping.	Moderately well drained soil; random tile helpful in spots; ditchbanks unstable and highly erodible.	High available moisture capacity; medium infiltration.	Erosion hazard on sloping areas.	Erosion hazard on sloping areas.
Seasonal high water table.	Generally slow seepage, but seepage is likely to be more rapid if excavation exposes underlying rock.	Fair to good stability and compaction characteristics; slow permeability if compacted; good resistance to piping.	Seasonal high water table; fragipan restricts vertical water movement; many springs and seeps.	Artificial drainage needed; fragipan restricts vertical water movement.	Seasonal high water.	Seasonal high water table; lateral seepage likely along top of fragipan.
Trench walls subject to slumping; seasonal high water table.	Excessive seepage; sandy material.	Fair stability; fair to good compaction characteristics; moderate permeability if compacted; fair resistance to piping.	Moderately good natural drainage; random tile beneficial in a few wet spots.	Low available moisture capacity; rapid infiltration.	Few limitations.	Few limitations.
Good natural drainage; good stability.	Moderately slow seepage; slopes limit size of impoundments in some areas; deep excavations likely to expose fractured rock in places.	Fair to good stability and compaction characteristics; slow permeability if compacted; good resistance to piping.	Good natural drainage.	Many areas too steep; erosion hazard; fragipan restricts water movement.	Few limitations on gently sloping areas; erosion hazard on steep slopes.	Erosion hazard on steep areas.
High water table; subject to flooding.	Moderate seepage; subject to flooding.	Variable soil material; fair stability and compaction characteristics; moderate permeability if compacted; fair resistance to piping.	High water table; subject to flooding and ponding; suitable outlets for tile lacking in some areas; tile subject to flood damage; low ditchbank gradient.	Artificial drainage needed; high available moisture capacity.	Nearly level, poorly drained soil.	Nearly level, poorly drained soil.

TABLE 5.—*Interpretations of engi-*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of—			Soil features affecting—
			Topsoil	Sand and gravel	Road fill	Highway location
Landes: Lo	Fair: subject to occasional flooding.	Moderate	Good	Poor	Fair to depth of 27 inches. Good at depth of 27 to 60 inches.	Subject to occasional flooding.
Latham: LfB, LfC	Poor: moderately fine-textured subsoil.	High to moderate.	Poor: less than 10 inches of suitable material.	Unsuitable	Poor: high clay content.	Shale bedrock at depth of 20 to 40 inches.
Linwood: Lk	Poor: high water table; organic surface layer.	High	Good if mixed with mineral soil.	Unsuitable	Poor: organic material.	High water table; occasional ponding; upper 20 to 40 inches is organic material.
Lobdell: Lo	Fair: subject to flooding.	Moderate	Good	Unsuitable	Fair: high content of silt.	Subject to occasional flooding.
*Lordstown: LrB, LrC, LrD, LtE, LtF. For Loudonville part of LtE and LtF, see Loudonville series.	Fair: generally channery or stony.	Moderate	Fair to poor: generally channery or stony.	Unsuitable	Fair: bedrock at depth of 20 to 40 inches.	Steep and very steep areas in places; sandstone at depth of 20 to 40 inches.
Loudonville: LvB, LvC, LvD	Fair: stony in places.	Moderate	Fair: less than 14 inches of suitable material.	Unsuitable	Fair: somewhat high content of silt.	Long, uniform slopes; sandstone bedrock at depth of 20 to 40 inches.
Luray: Ly	Poor: high water table.	High	Good	Unsuitable	Poor: very poorly drained.	High water table; subject to occasional ponding.

neering properties of the soils—Continued

Soil features affecting—Continued						
Pipeline construction and maintenance	Ponds		Drainage for crops and pasture	Irrigation	Terraces and diversions	Waterways
	Reservoir areas	Embankments				
Subject to occasional flooding; unstable trench walls.	Excessive seepage; subject to flooding.	Fair stability and compaction characteristics; rapid permeability if compacted; slight compressibility; poor resistance to piping.	Good natural drainage; ditchbank stability.	Low available moisture capacity; rapid infiltration.	Nearly level, well-drained soil.	Nearly level soil on flood plains.
Shale bedrock at depth of 20 to 40 inches; high acidity.	Shale bedrock at depth of 20 to 40 inches interferes with excavation and permits seepage.	Limited amount of soil material; fair to poor stability and compaction characteristics; slow permeability if compacted; good resistance to piping.	Moderately good drainage; random tile useful around springs and seeps.	Rapid runoff; slow infiltration; medium available moisture capacity.	Shale bedrock at depth of 20 to 40 inches interferes with construction; acid, clayey subsoil difficult to vegetate.	Acid, clayey difficult to vegetate.
High water table; occasional ponding; upper 20 to 40 inches is organic material.	Moderate seepage below organic material; high water table; some natural ponding; organic soil material likely to float in ponded areas in places.	Upper 20 to 40 inches is organic material unsuitable for embankment; underlying material has fair stability and compaction characteristics; moderate permeability; poor resistance to piping.	High water table; some areas lack suitable tile outlets; ditches have low gradient.	Artificial drainage needed; high available moisture capacity.	Nearly level, very poorly drained soil.	Nearly level, very poorly drained.
Subject to occasional flooding.	Moderate seepage; subject to occasional flooding; variable soil material.	Fair stability and compaction characteristics; moderate permeability if compacted; fair resistance to piping.	Moderately good natural drainage; fair ditchbank stability.	Near water source; subject to occasional flooding.	Nearly level, soil on flood plains.	Nearly level, soil on flood plains.
Sandstone bedrock at depth of 20 to 40 inches; steep and very steep areas in places.	Sandstone bedrock at depth of 20 to 40 inches interferes with excavation and permits seepage.	Limited amount of soil material; fair to poor stability and compaction characteristics; moderate permeability if compacted; poor resistance to piping.	Good natural drainage; bedrock at depth of 20 to 40 inches.	Erosion hazard on steep areas; bedrock at depth of 20 to 40 inches limits available moisture capacity.	Erosion hazard on steep areas; bedrock at depth of 20 to 40 inches.	Erosion hazard on steep areas.
Sandstone bedrock at depth of 20 to 40 inches.	Sandstone bedrock at depth of 20 to 40 inches interferes with excavation and permits seepage.	Limited amount of soil material; fair to good stability and compaction characteristics; moderately slow permeability if good resistance to piping.	Good natural drainage; bedrock at depth of 20 to 40 inches.	Sandstone bedrock at depth of 20 to 40 inches limits rooting depth and available moisture capacity.	Erosion hazard on steep areas; bedrock interferes with construction in places.	Erosion hazard on steep areas; bedrock interferes with construction in places.
High water table; subject to occasional ponding.	Moderately slow seepage; high water table; some natural ponding.	Fair stability and compaction characteristics; slow permeability if compacted; poor resistance to piping.	High water table; moderately slow permeability; ditches needed for outlets in larger areas.	Artificial drainage needed; high available moisture capacity.	Nearly level, very poorly drained soil.	Nearly level, very poorly drained soil.

TABLE 5.—*Interpretations of engi-*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of—			Soil features affecting—
			Topsoil	Sand and gravel	Road fill	Highway location
Mentor: MeB, MeC	Good: well drained.	Moderate	Good	Unsuitable	Poor: high content of silt.	Good natural drainage; moderately steep areas in places.
Orrville, moderately shallow variant: Or.	Poor: seasonal high water table; subject to flooding.	High	Fair: less than 14 inches of suitable material.	Unsuitable	Fair: bedrock at depth of 20 to 40 inches.	Subject to flooding; bedrock at depth of 20 to 40 inches.
Pewamo: Pa, Pc, Pm	Poor: high water table; moderately fine textured subsoil.	High	Good to fair: some areas clayey.	Unsuitable	Poor: very poor natural drainage.	High water table; subject to ponding.
Ravenna: ReA, ReB	Poor: seasonal high water table.	High	Fair: less than 16 inches of suitable material.	Unsuitable	Fair: high content of silt and clay.	Seasonal high water table.
Rittman: RsB, RsB2, RsC, RsC2, RsD, RsD2, RtC3, RtD3.	Poor: water table above fragipan.	High	Fair in eroded areas; less than 16 inches of suitable material.	Unsuitable	Fair: high content of silt and clay.	Gently sloping to moderately steep; occasional high water table.
Schaffenaker: SaC, SaD, SaE.	Fair: generally sloping.	Low	Poor: sandy	Unsuitable for gravel; good for sand.	Fair: bedrock at depth of 28 inches.	Gently sloping to very steep; bedrock at depth of 20 to 40 inches; rock outcrop common.
Sebring: Se	Poor: high water table.	High	Fair: less than 12 inches of suitable material.	Unsuitable	Poor: poor natural drainage.	High water table; subject to ponding in places.
Shoals: Sh	Poor: seasonal high water table.	High	Good	Unsuitable	Poor: high content of silt.	Seasonal high water table; subject to flooding.

neering properties of the soils—Continued

Soil features affecting—Continued						
Pipeline construction and maintenance	Ponds		Drainage for crops and pasture	Irrigation	Terraces and diversions	Waterways
	Reservoir areas	Embankments				
Unstable trench walls; moderately steep areas in places.	Moderate seepage; limited storage potential in sloping and steep areas.	Fair stability and compaction characteristics; moderately slow permeability if compacted; poor resistance to piping.	Good natural drainage; fairly stable ditchbanks.	High available moisture capacity; moderate infiltration; erosion hazard on sloping areas.	Erosion hazard.	Erosion hazard.
Subject to flooding; bedrock at depth of 20 to 40 inches.	Flooding hazard; bedrock at depth of 20 to 40 inches interferes with construction and permits rapid seepage.	Limited amount of soil material; good to fair stability and compaction; slow permeability if compacted.	Seasonal high water table; bedrock at depth of 20 to 40 inches interferes with tiling and ditching; flood damage to tile likely.	Rooting depth limited by bedrock at depth of 20 to 40 inches.	Nearly level soil on flood plains.	Nearly level soil on flood plains.
High water table; subject to ponding in places.	Moderately slow seepage; high water table.	Good to fair stability and compaction characteristics; slow permeability if compacted; good resistance to piping.	High water table; moderately slow permeability; ditches needed for tile outlets in larger areas; good to fair ditchbank stability.	Artificial drainage needed; slow infiltration; high available moisture capacity.	Nearly level, poorly drained soil.	Erosion hazard in some areas.
Seasonal high water table.	Slow seepage; seasonal wetness.	Fair to good stability and compaction characteristics; slow permeability if compacted; good resistance to piping.	Seasonal high water table; fragipan restricts downward movements of water; lateral movement likely along top of fragipan.	Artificial drainage needed; fragipan restricts movement of water.	Short slopes; channel ponding likely in places.	Seasonal high water table; some seepage likely along top of fragipan.
Seasonal high water table.	Slow seepage; limited storage potential in sloping and steep areas.	Fair to good stability and compaction characteristics; slow permeability if compacted; good resistance to piping.	Moderately good drainage; random tile helpful in wet spots; ditchbanks subject to erosion.	Fragipan restricts water movement and rooting depth; erosion hazard on sloping areas.	Erosion hazard.	Erosion hazard; some seepage likely along top of fragipan.
Bedrock at depth of 20 to 40 inches; steep slopes in places; sandy soil.	Very rapid seepage; bedrock at depth of 20 to 40 inches.	Limited amount of soil material; poor stability and compaction characteristics; rapid permeability if compacted; poor resistance to piping.	Good natural drainage; bedrock at depth of 20 to 40 inches.	Most areas too steep; very low available moisture capacity; limited rooting depth.	Bedrock at depth of 20 to 40 inches interferes with construction; exposed subsoil hard to vegetate.	Subsoil difcult to revegetate; many areas too steep.
High water table; unstable trench walls.	Moderate seepage: high water table; subject to ponding in places.	Poor stability and compaction characteristics; moderately slow permeability if compacted; poor resistance to piping.	High water table; moderately slow permeability; tile outlets lacking in some areas; low gradient and unstable banks in ditches.	Artificial drainage needed; high available moisture capacity.	Nearly level, poorly drained soil.	High water table.
Seasonal high water table; subject to flooding.	Extremely variable soil material; subject to flooding.	Variable soil material; fair stability and compaction characteristics; moderate permeability if compacted; poor resistance to piping.	Seasonal high water table; tile outlets lacking in some areas; tile and ditches subject to flood damage.	Artificial drainage needed; high available moisture capacity; water source available.	Nearly level, soil on flood plains.	Nearly level soil on flood plains.

TABLE 5.—*Interpretations of engi-*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of—			Soil features affecting—
			Topsoil	Sand and gravel	Road fill	Highway location
Shoals, coarse subsoil variant: Sk.	Poor: seasonal high water table.	Moderate	Poor: generally gravelly.	Fair to good	Good	Subject to flooding; seasonal high water table.
Sloan: So	Poor: high water table.	High	Good	Unsuitable	Poor: very poor natural drainage.	Subject to flooding and ponding; high water table.
Tiro: TmA, TmB	Poor: seasonal high water table.	High	Good	Unsuitable	Poor: high content of silt.	Seasonal high water table.
Titusville: TvB, TvC	Fair: seasonal high water table.	High	Fair: less than 16 inches of suitable material.	Unsuitable	Good	Seasonal high water table.
Urban land: Ur. No interpretations; material variable.						
Wadsworth: WaA, WaB	Poor: seasonal high water table.	High	Fair: less than 16 inches of suitable material.	Unsuitable	Fair: somewhat poor natural drainage.	Seasonal high water table.
Wallkill: Wc	Poor: high water table.	High	Good	Unsuitable	Unsuitable: silty material over organic material.	High water table; subject to flooding in some areas; unstable organic layers.
*Wheeling: WhA, WhB, WhC, WmD. For Mentor part of WmD, see Mentor series.	Good: good natural drainage.	Moderate	Good	Fair below depth of 20 to 40 inches.	Fair to depth of 20 to 40 inches; good below.	Good natural drainage; moderately steep slopes in places.
*Wooster: WsB, WsB2, WsC, WsC2, WsD, WsD2, WsD3, WsE, WsE3, WsF, WtB, WtC. For Chili part of WtB and WtC, see Chili series.	Fair: steep slopes in places; occasional wetness.	Moderate	Generally fair: poor in eroded areas; less than 16 inches of suitable material.	Unsuitable	Good	Gently sloping to very steep.

neering properties of the soils—Continued

Soil features affecting—Continued						
Pipeline construction and maintenance	Ponds		Drainage for crops and pasture	Irrigation	Terraces and diversions	Waterways
	Reservoir areas	Embankments				
Subject to flooding; seasonal high water table; unstable trench walls.	Excessive seepage; subject to flooding.	Fair stability and compaction characteristics; moderate permeability if compacted.	Seasonal high water table; tile and ditches subject to flood damage.	Artificial drainage needed; low available moisture capacity.	Nearly level soil on flood plains.	Nearly level soil on flood plains.
Subject to flooding; high water table.	Moderately slow seepage; subject to flooding.	Fair to poor stability and compaction characteristics; moderately slow permeability if compacted; fair resistance to piping.	High water table; suitable outlets lacking in many areas; tile and ditches subject to flood damage.	Artificial drainage needed; high available moisture capacity; generally near water source.	Nearly level, very poorly drained soil.	Nearly level, very poorly drained soil.
Seasonal high water table.	Moderately slow seepage.	Fair to good compaction characteristics; slow permeability if compacted; fair resistance to piping; upper 20 to 40 inches less favorable.	Seasonal high water table; moderately slow permeability; lateral seepage likely along top of till deposit at depth of 20 to 40 inches.	Artificial drainage needed; high available moisture capacity.	Irregular slopes; seasonal high water table.	Seasonal high water table; lateral seepage likely in places.
Seasonal high water table.	Moderately slow seepage; shattered rock within depth of 5 feet in spots.	Fair to good stability and compaction characteristics; slow permeability if compacted.	Moderately good natural drainage; random tile helpful in wet spots.	Fragipan at depth of 18 to 28 inches restricts rooting depth and water movement.	Generally favorable features.	Erosion hazard; seepage likely along top of fragipan.
Seasonal high water table.	Very slow seepage rate; seasonal high water table.	Fair to good stability and compaction characteristics; slow permeability if compacted; good resistance to piping.	Seasonal high water table; fragipan at 16 to 28 inches restricts downward movement of water.	Artificial drainage needed; fragipan restricts water movement, rooting depth, and available moisture capacity.	Short slopes; channel ponding likely in places.	Short slopes; seepage likely along top of fragipan.
High water table; subject to flooding and ponding in places; organic layers.	High water table; subject to ponding in places; moderate seepage; organic material likely to contaminate water in places.	Organic material very unstable; poor compaction characteristics.	High water table; suitable outlets lacking in some areas; low ditch gradient, organic material subject to subsidence.	Artificial drainage needed; high available moisture capacity.	Nearly level, very poorly drained soil.	Nearly level, very poorly drained soil.
Trench walls subject to slumping.	Excessive seepage.	Fair to good compaction characteristics; fair stability; moderate permeability if compacted; fair resistance to piping.	Good natural drainage; fair ditchbank stability.	Good natural drainage; high available moisture capacity; erosion hazard on steeper slopes.	Short slopes; sandy and gravelly below depth of 20 to 40 inches.	Sandy and gravelly below depth of 20 to 40 inches.
Steep slopes in places.	Moderate seepage; storage area limited in steep areas.	Fair to good stability and compaction characteristics; moderately slow permeability if compacted; good resistance to piping.	Good natural drainage; fair to good ditchbank stability.	Good natural drainage; fragipan restricts downward water movement and rooting depth; many areas too steep.	Long slopes; gently sloping areas well suited; erosion hazard on steeper areas.	Gently sloping areas well suited; erosion hazard on steeper areas.

Suitability as source of road fill.—Road fill is soil material used in embankments for roads. The ratings reflect the relative ease of excavating the material at borrow areas and the predicted performance of the soil after it has been placed in an embankment that has been properly compacted and provided with adequate drainage.

Highway location.—Soil features that affect highway location include depth to rock, depth to high water table, steepness of slope, hazard of slippage, and hazard of flooding. Susceptibility to frost action is a hazard that affects highways but is rated separately in table 5.

Pipeline construction and maintenance.—Soil features that affect pipelines are depth to bedrock, depth to high water table, stability, natural drainage, and corrosivity. Corrosivity is rated in table 4.

Ponds.—Under the subheading, *Reservoir area,* consideration is given mainly to the sealing potential of the soil material in the construction of the reservoir. In addition, shallowness to bedrock and hazard of flooding are considered. Stability and permeability are the soil features affecting the construction of pond embankments. The permeability noted in this column is for soil material compacted at optimum moisture.

Drainage.—Drainage of cropland and pasture is affected by such soil properties as permeability, texture, and structure; depth to claypan, rock, or other layers that affect movement of water; depth to high water table; slope; stability; hazard of flooding; salinity or alkalinity; and availability of outlets for drainage.

Irrigation.—This is affected by such features as slope; hazards of flooding, water erosion, and soil blowing; soil texture; stoniness; accumulation of salts and alkali; depth of root zone; rate of infiltration; permeability of soil layers below the surface layer and of fragipans or other layers that restrict movement of water; amount of water held available to plants; need for drainage; and depth to water table or bedrock.

Terraces and diversions.—Embankments or ridges are constructed across the slope to intercept runoff and seepage so that it soaks into the soil or flows slowly to a prepared outlet. Features that affect suitability of a soil for terracing are uniformity and steepness of slope; depth to bedrock or other unfavorable material; stoniness; permeability; and hazards of erosion, of slipping, and of soil blowing. Other factors considered are availability of outlets and ease of establishing vegetation.

Waterways.—Layout and construction of waterways are affected by texture, depth, and erodibility of the soil material; presence of stones or rock outcrops; and steepness of slope. Other factors affecting waterways are seepage, natural drainage, available moisture capacity, susceptibility to siltation, and the ease of establishing and maintaining vegetation.

Soils and Land-Use Planning

Expanding urban development has created a need for broad land-use planning to maintain an orderly, balanced use of the soils for all purposes. Table 6 indicates the suitability of the soils for farming, as well as for many urban uses. The suitability is shown by an estimated rating of the degree and kind of limitations each soil has for specific rural and urban uses.

The ratings are *slight, moderate,* and *severe.* A rating of *slight* means the soil has no important limitations for the specified use. It does not imply that the soil should be used for this purpose but indicates that the soil is better suited for this use than soils that have moderate or severe limitations. A rating of *moderate* means that the soil has limitations for the specific use that should be considered, but the limitations generally can be overcome. A rating of *severe* means the soil limitations cannot be easily overcome or corrected.

The kinds of limitations and the soil properties that determine them differ from one land use to another. Permeability, for example, is important in selecting a soil for use for disposal of septic tank effluent, but it is of much less importance in selcting sites for roads or streets. Similarly, depth to rock is more critical in selecting a site for a cemetery than in selecting a site for a Christmas tree plantation. Some soil properties and limitations, such as slope and depth to water table, affect many land uses. Others, such as hazard of erosion, affect only a few.

The specific land uses in table 6 are explained in the following paragraphs.

Cultivated crops.—The ratings of each soil for cultivated crops are based on the degree of the limitations and not on the potential yield once the limitations are overcome. Some soils, for example, are excessively wet but are productive if they are drained. The ratings in this column are closely related to the land capability classification used by the Soil Conservation Service. Wetness and slope are the main criteria. Soils in capability classes I and II have slight limitations for cultivated crops; soils in capability class III, moderate limitations; and soils in capability classes IV, VI, and VII, severe limitations.

Disposal of sewage effluent from septic tanks.—Many homes are constructed in areas that are not served by public sewage systems, and septic tanks must be installed for the disposal of sewage. Soil features that affect the installation and operation of septic tanks are depth to rock, depth to water table, permeability, slope, and hazard of flooding.

Shallow depth to rock hampers the installation of septic tanks and drain fields. In some areas there is not enough soil material above the rock to properly filter the effluent. Many poorly drained or somewhat poorly drained soils have a high water table for extended periods. Septic tank effluent cannot seep away if it is discharged below the water table. Slowly permeable soils also have limitations for septic tank systems because the effluent seeps away slowly. Slope is another limitation for this use. Effluent from leach fields on steep slopes can cause seepage problems farther down slope.

Sewage lagoons.—Sewage lagoons are shallow ponds constructed to hold sewage within a depth of 2 to 5 feet long enough for bacteria to decompose the solids. A lagoon has a nearly level floor and sides of compacted soil material. It is assumed that the sides, or embankments, are compacted to medium density and the pond is protected from flooding. Soil properties that affect the pond floor are permeability, organic matter, and slope. If the floor needs to be leveled, the depth to and condition of bedrock is important. The properties that

affect the embankments are those interpreted from the Unified Soil Classification, as shown in table 4, and the amount of stones, if any that affect excavation of the lagoon and compaction of the embankment material.

Building sites.—The ratings of soil limitations for building sites apply to residential, commercial, institutional, and light industrial buildings that have basements and are not more than three stories high. Sewage disposal is not considered in these ratings. Soil properties that determine the ratings are depth to water table, depth to rock, frequency of flooding, surface stoniness, and slope.

Soils subject to flooding have severe limitations for homes and other buildings in this category (fig. 4). Flooding, even if infrequent, is costly and damaging.

Many soils of Richland County have poor or somewhat poor natural drainage. The water table is at or near the surface at least part of most years. Homes and other buildings on these soils are likely to have wet basements unless foundation drainage is provided. A high water table is not such a severe limitation where basements are not constructed.

Some soils used for crops have been drained artificially. Excavation for building sites on these soils is likely to disrupt the artificial drainage system and return the seemingly dry soils to their original wet state.

Shallowness to rock interferes with the construction of basements and the installation of utility lines. The degree of limitation depends to some extent on whether the upper few feet of rock are solid or shattered. This varies within the same soil and is not reflected in the ratings.

Steep slopes interfere with the use of some equipment and generally require levelling and earth moving. Steep slopes present the greatest problem in subdivisions, where there is runoff from one lot to the next. Many homesites on slopes, however, are scenic and generally have good natural drainage. In some cases these advantages compensate for the problems caused by the slopes.

Lawns, landscaping, and golf fairways.—These uses are grouped together because the same soil properties and limitations affect them in about the same way. The soil properties and limitations considered are natural drainage, slope, depth to rock, hazard of erosion, hazard of flooding, and available moisture capacity. These determine the amount of excavation needed and the ease with which a good stand of grass can be established. In most cases, the original surface layer of the soil is better suited to growing lawns and ornamental plantings than soil removed from excavations. The surface soil can be scalped, if necessary, before construction and stored away from the area, then returned when grading is completed.

Roads, streets, and parking lots.—The ratings for these uses are based on depth to water table, depth to rock, slope, hazard of flooding, and susceptibility to frost heaving. It is assumed that the roads and streets will carry a minimum of heavy traffic.

Slopes are a greater limitation for subdivision streets

***Figure 4.*—Removal of surface water is needed on the moderately well drained but slowly permeable Rittman soils if they are used for housing.**

TABLE 6.—*Estimated degree and kinds of limita-*

Soil series and map symbols	Cultivated crops	Disposal of sewage effluent from septic tanks	Sewage lagoons	Building sites [1]	Lawns, landscaping, and golf fairways
Alexandria:					
AdB	Slight	Severe: moderately slow permeability.	Moderate: slope	Slight	Slight
AdC, AdC2	Moderate: hazard of erosion.	Severe: moderately slow permeability.	Severe: slope	Moderate: slope	Moderate: slope
AdD, AdD2, AdE, AdE2, AdF, AeD3.	Severe: hazard of erosion.	Severe: slope; moderately slow permeability.	Severe: slope	Severe: slope	Severe: slope
Algiers: Ag	Slight	Severe [3]: subject to flooding.	Severe [3]: subject to flooding.	Severe: subject to flooding.	Moderate: subject to occasional flooding.
Belmore:					
BeB	Slight	Slight [3]	Severe [3]: moderately rapid permeability.	Slight	Slight
BeC	Moderate: hazard of erosion.	Moderate [3]: slope	Severe [3]: slope; moderately rapid permeability.	Moderate: slope	Moderate: slope
BeD	Severe: hazard of erosion.	Severe [3]: slope	Severe [3]: slope	Severe: slope	Severe: slope
Bennington:					
BnA	Slight	Severe: slow permeability.	Slight	Moderate: seasonal high water table.	Moderate: seasonal high water table.
BnB, BnB2	Slight	Severe: slow permeability.	Moderate: slope	Moderate: seasonal high water table.	Moderate: seasonal high water table.
BpB	Slight	Severe: moderately slow permeability.	Moderate: slope	Moderate: seasonal high water table.	Moderate: seasonal high water table.
Berks:					
BrB	Slight	Severe [3]: moderately shallow to bedrock.	Severe [3]: moderately shallow to bedrock; moderately rapid permeability.	Moderate: moderately shallow to bedrock.	Moderate: moderately shallow to bedrock.
BrC	Moderate: erosion.	Severe [3]: moderately shallow to bedrock.	Severe [3]: slope; moderately shallow to bedrock; moderately rapid permeability.	Moderate: moderately shallow to bedrock; slope.	Moderate: moderately shallow to bedrock; slope.

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Roads, streets, and parking lots	Recreation				Sanitary landfill [2]	Cemeteries
	Athletic fields	Picnic and play areas	Campsites			
			Tents	Trailers		
Moderate	Moderate: slope	Slight	Moderate: moderately slow permeability.	Moderate: slope; moderately slow permeability.	Moderate: clay content higher than optimum.	Moderate: moderately slow permeability.
Severe: slope	Severe: slope	Moderate: slope	Moderate: slope; moderately slow permeability.	Severe: slope	Moderate: slope; clay content higher than optimum.	Moderate: slope; moderately slow permeability.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: subject to flooding.	Moderate: occasional flooding during periods of use; seasonally wet.	Moderate: occasional flooding during periods of use; seasonally wet.	Moderate: subject to flooding during periods of use; seasonally wet.	Moderate: subject to flooding during periods of use; seasonally wet.	Severe [3]: subject to flooding.	Severe: subject to flooding.
Moderate: slope	Moderate: slope	Slight	Slight	Moderate: slope	Severe [3]: hazard of pollution; moderately rapid permeability.	Slight.
Severe: slope	Severe: slope	Moderate: slope	Moderate: slope	Severe: slope	Severe [3]: slope; hazard of pollution.	Moderate: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe [3]: slope; hazard of pollution.	Severe: slope.
Moderate: seasonal high water table.	Severe: slow permeability.	Moderate: seasonal high water table.	Severe: slow permeability.	Severe: slow permeability.	Moderate: seasonal high water table; clay content higher than optimum.	Severe: seasonal high water table; slow permeability.
Moderate: seasonal high water table; slope.	Severe: slow permeability.	Moderate: seasonal high water table.	Severe: slow permeability.	Severe: slow permeability.	Moderate: seasonal high water table; clay content higher than optimum.	Severe: seasonal high water table; slow permeability.
Moderate: seasonal high water table; slope.	Moderate: seasonal high water table; moderately slow permeability; slope.	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.
Moderate: moderately shallow to bedrock.	Moderate: slope	Slight	Slight	Moderate: slope	Severe [3]: moderately shallow to bedrock.	Severe: moderately shallow to bedrock.
Severe: slope	Severe: slope	Moderate: slope	Moderate: slope	Severe: slope	Severe [3]: moderately shallow to bedrock.	Severe: moderately shallow to bedrock.

TABLE 6.—*Estimated degree and kinds of limita-*

Soil series and map symbols	Cultivated crops	Disposal of sewage effluent from septic tanks	Sewage lagoons	Building sites [1]	Lawns, landscaping, and golf fairways
Berks: Continued					
BrD	Severe: hazard of erosion.	Severe [3]: slope; moderate depth to rock.	Severe [3]: slope; moderate depth to rock.	Severe: slope	Severe: slope
BsF	Severe: hazard of erosion.	Severe [3]: slope; shallow to rock.	Severe [3]: slope; shallow to rock.	Severe: slope	Severe: slope
Bogart:					
BtA, BvA	Slight	Slight [3]	Severe [3]: rapid permeability in basin floor.	Slight	Slight
BtB, BvB	Slight	Slight [3]	Severe [3]: permeability too rapid in basin floor.	Slight	Slight
Canfield:					
CdB, CdB2	Slight	Severe: slow permeability.	Moderate: slope	Slight	Slight
CdC, CdC2	Moderate: hazard of erosion.	Severe: slow permeability.	Severe: slope	Moderate: slope	Moderate: slope
Cardington:					
CgB, CgB2	Slight	Severe: moderately slow permeability.	Moderate: slope	Slight	Slight
CgC, CgC2	Moderate: hazard of erosion.	Severe: moderately slow permeability.	Severe: slope	Moderate: slope	Moderate: slope
ChC3	Severe: hazard of erosion.	Severe: moderately slow permeability.	Severe: slope	Moderate: slope	Moderate: slope
Carlisle: Ck	Moderate: hazard of wetness.	Severe [3]: high water table.	Severe [3]: moderately rapid permeability; organic material.	Severe: high water table.	Severe: high water table; organic material.
Chili:					
CnB	Slight	Slight [3]	Severe [3]: moderately rapid permeability.	Slight	Moderate: low available moisture capacity.
CnC	Moderate: hazard of erosion.	Moderate [3]: slope	Severe [3]: slope; moderately rapid permeability.	Moderate: slope	Moderate: slope

tions for town and country planning—Continued

Roads, streets, and parking lots	Recreation				Sanitary landfill [2]	Cemeteries
	Athletic fields	Picnic and play areas	Campsites			
			Tents	Trailers		
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe [3]: slope; moderate depth to rock.	Severe [3]: slope; moderate depth to rock.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe [3]: slope; shallow to rock.	Severe: slope; shallow to rock.
Moderate: occasional high water table.	Moderate: occasional high water table.	Slight	Slight	Slight	Moderate [3]: moderate permeability; occasional high water table.	Moderate: occasional high water table.
Moderate: occasional high water table; slope.	Moderate: occasional high water table; slope.	Slight	Slight	Moderate: slope	Moderate [3]: occasional high water table; moderate permeability.	Moderate: occasional high water table.
Moderate: slope	Severe: slow permeability.	Slight	Severe: slow permability.	Severe: slow permeability.	Moderate: occasional high water table.	Severe: slow permeability.
Severe: slope	Severe: slope; slow permeability.	Moderate: slope	Severe: slow permeability.	Severe: slope; slow permeability.	Moderate: slope; slow permeability; occasional high water table.	Severe: slow permeability.
Moderate: slope	Moderate: slope; occasional high water table; moderately slow permeability.	Slight	Moderate: moderately slow permeability.	Moderate: slope; moderately slow permeability.	Moderate: occasional high water table.	Moderate: occasional high water table; moderately slow permeability.
Severe: slope	Severe: slope	Moderate: slope	Moderate: slope; moderately slow permeabiliy.	Severe: slope	Moderate: slope; occasional high water table.	Moderate: slope; occasional high water table; moderately slow permeability.
Severe: slope	Severe: slope	Moderate: slope	Moderate: moderately slow permeability; slope.	Severe: slope	Moderate: slope; occasional high water table.	Moderate: slope; occasional high water table; moderately slow permeability.
Severe: high water table.	Severe: high water table; organic material.	Severe: high water table; organic material.	Severe: high water table; organic material.	Severe: high water table; organic material.	Severe: high water table; organic material.	Severe: high water table; organic material.
Moderate: slope	Moderate: slope	Slight	Slight	Moderate: slope	Severe [3]: moderately rapid permeability.	Slight.
Severe: slope	Severe: slope	Moderate: slope	Moderate: slope	Severe: slope	Severe [3]: moderately rapid permeability.	Moderate: slope.

TABLE 6.—*Estimated degree and kinds of limita-*

Soil series and map symbols	Cultivated crops	Disposal of sewage effluent from septic tanks	Sewage lagoons	Building sites [1]	Lawns, landscaping, and golf fairways
Chili: Continued					
CoD, CoD3	Severe: hazard of erosion.	Severe [3]: slope	Severe [3]: slope	Severe: slope	Severe: slope
CoE, CoF	Severe: slopes too steep for machinery; hazard of erosion.	Severe [3]: slope	Severe [3]: slope	Severe: slope	Severe: slope
Condit: Cr	Moderate: hazard of wetness.	Severe: high water table; slow permeability.	Slight	Severe: high water table.	Severe: high water table.
Conotton: CtC	Severe: hazard of erosion.	Moderate [3]: slope	Severe [3]: rapid permeability; slope.	Moderate: slope	Moderate: slope
Cut and fill land: Cz	([4])	([4])	([5])	([4])	([4])
Digby: DmB	Slight	Moderate [3]: seasonal high water table.	Moderate [3]: moderate permeability.	Moderate: seasonal high water table.	Moderate: seasonal high water table.
Fitchville:					
FcA	Slight	Severe: moderately slow permeability.	Slight	Moderate: seasonal high water table.	Moderate: seasonal high water table.
FcB	Slight	Severe: moderately slow permeability.	Moderate: slope	Moderate: seasonal high water table.	Moderate: seasonal high water table.
FdA	Slight	Severe: moderately slow permeability.	Slight	Moderate: seasonal high water table.	Moderate: seasonal high water table.
Fitchville, gravelly subsoil variant:					
FgA	Slight	Severe: moderately slow permeability.	Severe: permeability of underlying material too rapid.	Moderate: seasonal high water table.	Moderate: seasonal high water table.
FgB	Slight	Severe: moderately slow permeability.	Severe: permeability of underlying material too rapid.	Moderate: seasonal high water table.	Moderate: seasonal high water table.
Frenchtown: Fr	Moderate: hazard of wetness.	Severe: high water table; slow permeability.	Slight	Severe: high water table.	Severe: high water table.
Glenford:					
GfA	Slight	Severe: moderately slow permeability.	Slight	Slight	Slight
GfB	Slight	Severe: moderately slow permeability.	Moderate: slope	Slight	Slight
GfC	Moderate: hazard of erosion.	Severe: moderately slow permeability.	Severe: slope	Moderate: slope	Moderate: slope

tions for town and country planning—Continued

Roads, streets, and parking lots	Recreation				Sanitary landfill [2]	Cemeteries
	Athletic fields	Picnic and play areas	Campsites			
			Tents	Trailers		
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe [3]: slope; rapid permeability.	Severe: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe [3]: slope; rapid permeability.	Severe: slope.
Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.
Severe: slope	Severe: slope	Moderate: slope	Moderate: slope	Severe: slope	Severe [3]: rapid permeability.	Moderate: slope.
(4)	(4)	(4)	(4)	(4)	(5)	(4)
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; slope.	Moderate [3]: seasonal high water table; rapid seepage.	Severe: 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; moderately slow permeability.	Moderate: seasonal high water table.	Severe: seasonal high water table.
Moderate: seasonal high water table; slope.	Moderate: seasonal high water table; moderately slow permeability; slope.	Moderate: seasonal high water table.	Moderate: seasonal high water table; moderately slow permeability.	Moderate: slope; 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.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	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: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Severe: 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.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.
Severe: high water table.	Severe: high water table; slow permeability.	Severe: high water table.	Severe: high water table; slow permeability.	Severe: high water table; slow permeability.	Severe: high water table.	Severe: high water table.
Slight	Moderate: moderately slow permeability.	Slight	Slight	Slight	Slight	Moderate: occasional high water table.
Moderate: slope	Moderate: slope; moderately slow permeability.	Slight	Slight	Moderate: slope	Slight	Moderate: occasional high water table.
Severe: slope	Severe: slope	Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope.

TABLE 6.—*Estimated degree and kinds of limita-*

Soil series and map symbols	Cultivated crops	Disposal of sewage effluent from septic tanks	Sewage lagoons	Building sites [1]	Lawns, landscaping, and golf fairways
Gravel pits: Gp	(4)	(4)	Severe [3]: rapid permeability.	(4)	(4)
Gresham: GrB	Slight	Severe: slow permeability.	Moderate: slope	Moderate: seasonal high water table.	Moderate: seasonal high water table.
Haney: HaB	Slight	Slight	Severe: permeability too rapid in basin floor.	Slight	Moderate: occasional shortage of available water.
Hanover:					
HfB	Slight	Moderate: moderately slow permeability.	Moderate: slope	Slight	Slight
HfC, HfC2	Moderate: hazard of erosion.	Moderate: slope; moderately slow permeability.	Severe: slope	Moderate: slope	Moderate: slope
HfC3	Severe: hazard of erosion.	Moderate: slope; moderately slow permeability.	Severe: slope	Moderate: slope	Moderate: slope
HfD, HfD2	Severe: hazard of erosion.	Severe: slope	Severe: slope	Severe: slope	Severe: slope
HfE	Severe: slope limits use of equipment; hazard of erosion.	Severe: slope	Severe: slope	Severe: slope	Severe: slope
Holly: Ho	Moderate: hazard of wetness.	Severe [3]: high water table; subject to flooding.	Severe [3]: subject to flooding.	Severe: high water table; subject to flooding.	Severe: high water table.
Landes: La	Slight	Severe [3]: flooding.	Severe [3]: moderately rapid permeability.	Severe: subject to flooding.	Slight
Latham:					
LfB	Slight	Severe: slow permeability; moderate depth to shale.	Severe: moderate depth to bedrock.	Moderate: moderate depth to shale.	Moderate: moderate depth to bedrock.
LfC	Moderate: hazard of erosion.	Severe: slow permeability; moderate depth to shale.	Severe: slope; moderate depth to bedrock.	Moderate: slope; moderate depth to bedrock.	Moderate: slope; moderate depth to bedrock.
Linwood: Lk	Slight	Severe [3]: high water table; ponding.	Severe [3]: muck surface.	Severe: high water table.	Severe: high water table; muck surface.
Lobdell: Lo	Slight	Severe [3]: subject to flooding.	Severe [3]: subject to flooding.	Severe: subject to flooding.	Slight
Lordstown:					
LrB	Slight	Severe: shallow to bedrock.	Severe: shallow to bedrock.	Moderate: shallow to bedrock.	Moderate: shallow to bedrock.

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Roads, streets, and parking lots	Recreation				Sanitary landfill [2]	Cemeteries
	Athletic fields	Picnic and play areas	Campsites			
			Tents	Trailers		
(4)	(4)	(4)	(4)	(4)	Severe [3]: rapid permeability.	(4)
Moderate: seasonal high water table.	Severe: seasonal high water table; slow permeability.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table; slope.	Moderate: seasonal high water table.	Severe: seasonal high water table.
Moderate: slope	Moderate: slope	Slight	Slight	Moderate: slope	Moderate: seasonal high water table.	Moderate: seasonal high water table.
Moderate: slope	Moderate: slope; moderately slow permeability.	Slight	Moderate: moderately slow permeability.	Moderate: slope; moderately slow permeability.	Slight	Moderate: moderately slow permeability.
Severe: slope	Severe: slope	Moderate: slope	Moderate: slope; moderately slow permeability.	Severe: slope	Moderate: slope	Moderate: slope; moderately slow permeability.
Severe: slope	Severe: slope	Moderate: slope	Moderate: slope; moderately slow permeability.	Severe: slope	Moderate: slope	Severe: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: high water table; subject to flooding.	Severe: high water table; subject to flooding.	Severe: high water table.	Severe: high water table; subject to flooding.	Severe: high water table; subject to flooding.	Severe [3]: high water table; subject to flooding.	Severe: high water table; subject to flooding.
Slight	Slight: occasional flooding but not during period of use.	Slight: occasional flooding but not during period of use.	Severe: occasional flooding.	Severe: occasional flooding.	Severe [3]: subject to flooding.	Severe: subject to flooding.
Moderate: moderate depth to bedrock; slope.	Severe: slow permeability.	Slight	Severe: slow permeability.	Severe: slow permeability.	Severe: moderate depth to bedrock.	Severe: moderate depth to bedrock.
Severe: slope	Severe: slope; slow permeability.	Moderate: slope	Severe: slow permeability.	Severe: slope; slow permeability.	Severe: moderate depth to bedrock.	Severe: moderate depth to bedrock.
Severe: high water table.	Severe: high water table; muck surface.	Severe: high water table; muck surface.	Severe: high water table; muck surface.	Severe: high water table; muck surface.	Severe [3]: high water table; muck surface.	Severe: high water table; muck surface.
Slight	Moderate: occasional flooding.	Slight	Severe: subject to flooding.	Severe: subject to flooding.	Severe [3]: subject to flooding.	Severe: subject to flooding.
Moderate: slopes; shallow to bedrock.	Moderate: shallow to bedrock.	Slight	Slight	Moderate: slope	Severe: shallow to bedrock.	Severe: shallow to bedrock.

TABLE 6.—*Estimated degree and kinds of limita-*

Soil series and map symbols	Cultivated crops	Disposal of sewage effluent from septic tanks	Sewage lagoons	Building sites [1]	Lawns, landscaping, and golf fairways
Lordstown: Continued					
LrC	Moderate: hazard of erosion.	Severe: shallow to bedrock.	Severe: slope; shallow to bedrock.	Moderate: slope; shallow to bedrock.	Moderate: slope; shallow to bedrock.
LrD	Severe: hazard of erosion.	Severe: slope; shallow to bedrock.	Severe: slope; shallow to bedrock.	Severe: slope	Severe: slope
LtE, LtF	Severe: hazard of erosion; too steep for machinery.	Severe: slope; shallow to bedrock.	Severe: slope; shallow to bedrock.	Severe: slope; shallow to bedrock.	Severe: slope
Loudonville:					
LvB	Slight	Severe: shallow to bedrock.	Severe: shallow to bedrock.	Moderate: shallow to bedrock.	Moderate: shallow to bedrock.
LvC	Moderate: hazard of erosion.	Severe: shallow to bedrock.	Severe: slope; shallow to bedrock.	Moderate: slope; shallow to bedrock.	Moderate: slope; shallow to bedrock.
LvD	Severe: slope; hazard of erosion.	Severe: slope; shallow to bedrock.	Severe: slope; shallow to bedrock.	Severe: slope	Severe: slope
Luray: Ly	Slight	Severe: high water table; moderately slow permeability.	Slight	Severe: high water table.	Severe: high water table.
Mentor:					
MeB	Slight	Slight	Moderate: slope; moderate permeability.	Slight	Slight
MeC	Moderate: hazard of erosion.	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope
Orrville, moderately shallow variant: Or	Slight	Severe [3]: subject to flooding; shallow to bedrock.	Severe [3]: shallow to bedrock.	Severe: subject to flooding.	Moderate: subject to flooding.
Pewamo: Pa, Pc, Pm	Slight	Severe: high water table; moderately slow permeability.	Slight	Severe: high water table.	Severe: high water table.
Ravenna:					
ReA	Slight	Severe: slow permeability.	Slight	Moderate: seasonal high water table.	Moderate: seasonal high water table.
ReB	Slight	Severe: slow permeability.	Moderate: slope	Moderate: seasonal high water table.	Moderate: seasonal high water table.
Rittman:					
RsB, RsB2	Slight	Severe: slow permeability.	Moderate: slope	Slight	Slight
RsC, RsC2	Moderate: hazard of erosion.	Severe: slow permeability.	Severe: slope	Moderate: slope	Moderate: slope
RsD, RsD2, RtD3	Severe: slope; hazard of erosion.	Severe: slope; slow permeability.	Severe: slope	Severe: slope	Severe: slope
RtC3	Severe: hazard of erosion.	Severe: slow permeability.	Severe: slope	Moderate: slope	Moderate: slope

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Roads, streets, and parking lots	Recreation				Sanitary landfill [2]	Cemeteries
	Athletic fields	Picnic and play areas	Campsites			
			Tents	Trailers		
Severe: slope	Severe: slope	Moderate: slope	Moderate: slope	Severe: slope	Severe: shallow to bedrock.	Severe: shallow to bedrock.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: shallow to bedrock; slope.	Severe: shallow to bedrock; slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope; shallow to bedrock.	Severe: slope; shallow to bedrock.
Moderate: shallow to bedrock.	Moderate: shallow to bedrock.	Slight	Slight	Moderate: slope	Severe: shallow to bedrock.	Severe: shallow to bedrock.
Severe: slope	Severe: slope	Moderate: slope	Moderate: slope	Severe: slope	Severe: shallow to bedrock.	Severe: shallow to bedrock.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: shallow to bedrock; slope.	Severe: shallow to bedrock; slope.
Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.
Moderate: slope	Moderate: slope	Slight	Slight	Moderate: slope	Slight	Slight.
Severe: slope	Severe: slope	Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope.
Severe: subject to flooding.	Severe: seasonal high water table.	Moderate: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe [3]: subject to flooding; shallow to bedrock.	Severe: subject to flooding.
Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.
Moderate: seasonal high water table.	Severe: slow permeability.	Moderate: seasonal high water table.	Severe: slow permeability.	Severe: slow permeability.	Moderate: seasonal high water table.	Severe: seasonal high water table.
Moderate: seasonal high water table.	Severe: slow permeability.	Moderate: seasonal high water table.	Severe: slow permeability.	Severe: slow permeability.	Moderate: seasonal high water table.	Severe: seasonal high water table.
Moderate: slope	Severe: slow permeability.	Slight	Severe: slow permeability.	Severe: slow permeability.	Moderate: seasonal high water table.	Severe: slow permeability; occasional high water table.
Severe: slope	Severe: slope; slow permeability.	Moderate: slope	Severe: slow permeability.	Severe: slow permeability; slope.	Moderate: slope; seasonal high water table.	Severe: slow permeability; slope; seasonal high water table.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope; slow permeability.
Severe: slope	Severe: slope; slow permeability.	Moderate: slope	Severe: slow permeability.	Severe: slope; slow permeability.	Moderate: slope; occasional high water table.	Severe: slow permeability; slope; occasional high water table.

TABLE 6.—*Estimated degree and kinds of limita-*

Soil series and map symbols	Cultivated crops	Disposal of sewage effluent from septic tanks	Sewage lagoons	Building sites [1]	Lawns, landscaping, and golf fairways
Schaffenaker: SaC	Severe: droughty.	Severe [3]: shallow to bedrock.	Severe [3]: slope; shallow to bedrock; rapid permeability.	Moderate: shallow to bedrock; slope.	Severe: low available moisture capacity.
SaD	Severe: droughty; slope.	Severe [3]: slope; shallow to bedrock.	Severe [3]: slope; shallow to bedrock; rapid permeability.	Severe: slope	Severe: slope; low available moisture capacity.
SaE	Severe: droughty; hazard of erosion; slope.	Severe [3]: slope; shallow to bedrock.	Severe [3]: slope; shallow to bedrock; rapid permeability.	Severe: slope	Severe: slope; low available moisture capacity.
Sebring: Se	Moderate: high water table.	Severe: high water table; moderately slow permeability.	Slight	Severe: high water table.	Severe: high water table.
Shoals: Sh	Slight	Severe [3]: subject to flooding.	Severe [3]: subject to flooding.	Severe: subject to flooding.	Moderate: subject to flooding; seasonal high water table.
Shoals, coarse subsoil variant: Sk	Slight	Severe [3]: subject to flooding.	Severe [3]: subject to flooding.	Severe: subject to flooding.	Moderate: subject to flooding; seasonal high water table.
Sloan: So	Moderate: high water table; subject to flooding.	Severe [3]: high water table; subject to flooding.	Severe [3]: subject to flooding.	Severe: high water table; subject to flooding.	Severe: high water table.
Tiro: TmA	Slight	Severe: moderately slow permeability.	Slight	Moderate: seasonal high water table.	Moderate: seasonal high water table.
TmB	Slight	Severe: moderately slow permeability.	Moderate: slope	Moderate: seasonal high water table.	Moderate: seasonal high water table.
Titusville: TvB	Slight	Severe: moderately slow perpermeability.	Moderate: slope	Slight	Slight
TvC	Moderate: hazard of erosion.	Severe: moderately slow permeability.	Severe: slope	Moderate: slope	Moderate: slope
Urban land: Ur. No limitations given; onsite inspection needed.					
Wadsworth: WaA	Moderate: hazard of wetness.	Severe: very slow permeability.	Slight	Moderate: seasonal high water table.	Moderate: seasonal high water table.

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Roads, streets, and parking lots	Recreation				Sanitary landfill [2]	Cemeteries
	Athletic fields	Picnic and play areas	Campsites			
			Tents	Trailers		
Severe: slope; shallow to bedrock.	Severe: slope; sandy surface layer; shallow to bedrock.	Moderate: sandy surface layer.	Moderate: sandy surface layer.	Severe: slope	Severe [3]: shallow to bedrock.	Severe: shallow to bedrock.
Severe: slope; shallow to bedrock.	Severe: slope; shallow to bedrock; sandy surface.	Severe: slope	Severe: slope	Severe: slope	Severe [3]: slope; shallow to bedrock.	Severe: slope; shallow to bedrock.
Severe: slope; shallow to bedrock.	Severe: slope; shallow to bedrock; sandy surface layer.	Severe: slope	Severe: slope	Severe: slope	Severe [3]: slope; shallow to bedrock.	Severe: slope; shallow to bedrock.
Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.
Severe: subject to flooding.	Moderate: seasonal high water table; subject to flooding.	Moderate: subject to flooding; seasonal high water table.	Severe: subject to flooding.	Severe: subject to flooding.	Severe [3]: subject to flooding.	Severe: subject to flooding; seasonal high water table.
Severe: subject to flooding.	Moderate: subject to flooding; seasonal high water table.	Moderate: subject to flooding; seasonal high water table.	Severe: subject to flooding.	Severe: subject to flooding.	Severe [3]: subject to flooding.	Severe: subject to flooding; seasonal high water table.
Severe: high water table; subject to flooding.	Severe: high water table; subject to flooding.	Severe: high water table.	Severe: high water table; subject to flooding.	Severe: high water table; subject to flooding.	Severe [3]: high water table; subject to flooding.	Severe: high water table; subject to flooding.
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; moderately slow permeability.	Moderate: seasonal high water table.	Severe: seasonal high water table.
Moderate: seasonal high water table.	Moderate: slope; seasonal high water table; moderately slow permeability.	Moderate: seasonal high water table.	Moderate: seasonal high water table; moderately slow permeability.	Moderate: slope; seasonal high water table; moderately slow permeability.	Moderate: seasonal high water table.	Severe: seasonal high water table.
Moderate: slope	Moderate; slope; moderately slow permeability.	Slight	Moderate: moderately slow permeability.	Moderate: slope; moderately slow permeability.	Slight	Moderate: seasonal high water table.
Severe: slope	Severe: slope	Moderate: slope	Moderate: slope; moderately slow permeability.	Severe: slope	Moderate: slope	Moderate: slope.
Moderate: seasonal high water table.	Severe: very slow permeability.	Moderate: seasonal high water table.	Severe: very slow permeability.	Severe: very slow permeability.	Moderate: seasonal high water table.	Severe: seasonal high water table.

TABLE 6.—*Estimated degree and kinds of limita-*

Soil series and map symbols	Cultivated crops	Disposal of sewage effluent from septic tanks	Sewage lagoons	Building sites [1]	Lawns, landscaping, and golf fairways
Wadsworth: Continued					
WaB	Moderate: hazard of wetness.	Severe: very slow permeability.	Moderate: slope	Moderate: seasonal high water table.	Moderate: seasonal high water table.
Wallkill: Wc	Slight	Severe: high water table.	Moderate: moderate permeability.	Severe: high water table; muck at depth of 24 to 50 inches.	Severe: high water table.
Wheeling:					
WhA	Slight	Slight [2]	Severe [3]: rapid permeability in underlying material.	Slight	Moderate: medium available moisture capacity.
WhB	Slight	Slight [3]	Severe [3]	Slight	Moderate: medium available moisture capacity.
WhC	Moderate: hazard of erosion.	Moderate [3]: slope	Severe [3]: slope; rapid permeability in underlying material.	Moderate: slope	Moderate: slope
WmD	Severe: hazard of erosion.	Severe [3]: slope	Severe [3]: slope	Severe: slope	Severe: slope
Wooster:					
WsB, WsB2	Slight	Moderate: moderately slow permeability.	Moderate: slope	Slight	Slight
WsC, WsC2	Moderate: hazard of erosion.	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope
WsD, WsD2, WsD3	Severe: hazard of erosion.	Severe: slope	Severe: slope	Severe: slope	Severe: slope
WsE, WsE3, WsF	Severe: slope; equipment limitations; hazard of erosion.	Severe: slope	Severe: slope	Severe: slope	Severe: slope
WtB	Slight	Slight [3]	Moderate [3]: slope	Slight	Slight
WtC	Moderate: hazard of erosion.	Moderate [3]: slope	Severe [3]: slope	Moderate: slope	Moderate: slope

[1] The ratings in this column apply to sites for residential, light industrial, institutional, and commercial buildings that have basements and are not more than 3 stories high.

[2] Onsite studies of the underlying strata, water table, and hazards of aquifer pollution and drainage into ground water are needed for landfill deeper than 5 or 6 feet.

and parking lots than for rural roads. Shallowness to rock and steep slopes normally cause higher construction costs. Wet areas that have a high water table require deeper ditches. Pavement deteriorates rapidly where frost heave is severe.

Athletic fields.—The ratings for athletic fields and other intensively used play areas are based on slope, natural drainage, depth to rock, permeability, and hazard of flooding during the period of use. The use of fill is not considered, so sloping soils have severe limitations. Wet soils that have poor natural drainage also have severe limitations.

Picnic and play areas.—These are public picnic and play areas used by groups. They do not include individual picnic sites along highways or streams. Water supply and sewage disposal are not considered. Wetness, depth to rock, slope, and frequency of flooding during the period of use are the features considered.

Campsites.—In this category separate ratings are given for tents and for trailers. It is assumed that the

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Roads, streets, and parking lots	Recreation				Sanitary landfill [2]	Cemeteries
	Athletic fields	Picnic and play areas	Campsites			
			Tents	Trailers		
Moderate: seasonal high water table.	Severe: very slow permeability.	Moderate: seasonal high water table.	Severe: very slow permeability.	Severe: very slow permeability.	Moderate: seasonal high water table.	Severe: seasonal high water table.
Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.
Slight	Slight	Slight	Slight	Slight	Severe [3]: rapid permeability in underlying material.	Slight.
Moderate: slope	Moderate: slope	Slight	Slight	Moderate: slope	Severe [3]: rapid permeability in underlying material.	Slight.
Severe: slope	Severe: slope	Moderate: slope	Moderate: slope	Severe: slope	Severe [3]: rapid permeability in underlying material.	Moderate: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe [3]: slope	Severe: slope.
Moderate: slope	Moderate: slope	Slight	Slight	Moderate: slope	Slight	Slight.
Severe: slope	Severe: slope	Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Moderate: slope	Moderate: slope	Slight	Slight	Moderate: slope	Severe: moderately rapid permeability.	Slight.
Severe: slope	Severe: slope	Moderate: slope	Moderate: slope	Severe: slope	Severe [3]: moderately rapid permeability.	Moderate: slope.

[3] There is a hazard of environmental pollution if this soil is developed for this use. Some of these soils are porous, including the substratum. If the alluvial soils and other soils subject to flooding are developed for this use, extensive pollution of surface water can be expected.

[4] Practice commonly not applicable.

[5] Practice feasible only in places.

sites will be used by large groups of people and will be subject to heavy foot traffic; that parking areas will be provided; and that tentsites will have platforms or be level. Water supply, sewage disposal, and access roads are not considered.

Natural drainage, permeability, slope, texture of the surface soil, and frequency of flooding during the period of use are considered in the ratings. Wetness, permeability, and soil texture affect the degree of muddiness and the trafficability of the soil. Slopes affect parking, especially where trailers are used.

Sanitary landfill.—It is assumed that the landfill will be made by the trench method and that no fill will be brought in. Depth to water table, permeability, slope, depth to rock, and frequency of flooding determine the ratings. Nearly level, well-drained soils that are deep and slowly permeable are best for areas of sanitary landfill. Although slowly permeable soils are difficult to work and have poor trafficability when wet, they do not present the pollution problems incurred in permeable soils, and the wetness can be overcome by properly designed access roads and drainage systems.

Cemeteries.—Deep, well-drained, permeable soils have few limitations for cemeteries. Natural drainage and depth to rock are important. Slope, permeability, depth to water table, soil texture, and the hazard of flooding also must be considered.

Descriptions of the Soils

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

An important part of a soil series description is the description of the soil profile, which is the sequence of layers from the surface downward to rock or other underlying material. This is described briefly in general terms and then in more detail for soil scientists, engineers, and others who need to make technical studies of the soils. The profile is representative of the mapping units in the series. If there are differences, they are stated in the descriptions of the mapping units or are apparent in the name of the mapping units. Color terms are for moist soil unless otherwise stated.

Following the name of each mapping unit is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each mapping unit description are the capability unit and woodland group to which the unit has been assigned. The "Guide to Mapping Units" at the back of this publication lists the pages on which the capability units are described and refers to the table in the section on woodland that contains information about the woodland groups. Many of the terms used in describing the soils are defined in the Glossary, and more information about the terminology and the methods of soil mapping can be obtained from the Soil Survey Manual (*12*).

The acreage and proportionate extent of each mapping unit are shown in table 7.

Alexandria Series

The Alexandria series consists of gently sloping to very steep, well-drained soils. These soils formed in glacial till that was originally limy. They are in the northern part of the county.

A representative profile of this series, in a pasture, has a thin surface layer of very dark grayish-brown silt loam. The subsoil is firm, yellowish-brown silty clay loam and clay loam, and it extends to a depth of 40 inches. Below this is firm clay loam glacial till that is calcareous at a depth of less than 4 feet. Pebbles are in all layers of the profile.

Permeability is moderately slow, and available moisture capacity is medium. The root zone is moderately deep. If these soils are not limed, the upper part of the root zone is medium acid to strongly acid. Natural drainage is adequate for farming.

Most areas of Alexandria soils are used for crops and pasture. Small areas are wooded. Most crops are grown on the gently sloping soils, and the steeper soils are used mainly for pasture. Control of erosion and maintenance of tilth are the major management needs.

Representative profile of Alexandria silt loam, 6 to 12 percent slopes, moderately eroded, in pasture, in the NE1/4 SE1/4 sec. 25, T. 23 N., R. 19 W. (Cass Township) :

A1—0 to 2 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, fine, granular structure; friable; few pebbles; strongly acid; abrupt, wavy boundary.

B1—2 to 5 inches, yellowish-brown (10YR 5/4) silt loam; weak, fine, subangular blocky structure; friable; few grainy silt coatings; few fine pebbles; strongly acid; clear, wavy boundary.

B21t—5 to 16 inches, yellowish-brown (10YR 5/4) heavy silty clay loam; moderate, medium, subangular blocky structure; firm; thin, patchy, brown (10YR 5/3) clay films on ped surfaces; 3 percent pebbles; strongly acid; gradual, smooth boundary.

B22t—16 to 34 inches, yellowish-brown (10YR 5/6) heavy silty clay loam; moderate, medium, subangular blocky structure; firm; thin, patchy, yellowish-brown (10YR 5/4) clay films on ped surfaces; 4 percent pebbles; medium acid; clear, wavy boundary.

B3—34 to 40 inches, yellowish-brown (10YR 5/4) light clay loam; weak, medium, subangular blocky structure; friable; 6 percent pebbles; slightly acid; clear, wavy boundary.

C1—40 to 45 inches, dark yellowish-brown (10YR 4/4) clay loam; massive; firm; 6 percent pebbles; neutral; gradual boundary.

C2—45 to 60 inches, dark yellowish-brown (10YR 4/4) clay loam; massive; firm; 6 percent pebbles; strongly calcareous; mildly alkaline.

In cultivated areas the color of the Ap horizon ranges from dark grayish brown (10YR 4/2) in uneroded areas to yellowish brown (10YR 5/4) in severely eroded areas. The A1 horizon in uncultivated areas ranges from 2 to 4 inches in thickness. An A2 horizon that is as much as 4 inches thick is in some uncultivated areas and in a very few cultivated areas. It is brown (10YR 5/3) silt loam and has weak, platy structure. The A horizon is silt loam or loam in texture.

The B1 horizon is not present in all areas. Where present, it is as much as 6 inches thick. The B2t horizon is 20 to 30 inches thick. Its base color has a hue of 10YR or 7.5YR, a value of 4 or 5, and a chroma of 4, 5, or 6. The upper 10 inches is free of mottles that have a chroma of 2 or less, but in places such mottles are in the lower few inches of the B2t horizon. The texture of the B2t horizon is heavy silty clay loam or heavy clay loam. The B2t horizon is medium acid or strongly acid in the upper part and becomes medium acid to neutral with depth. The B3 horizon is not present in some areas.

Depth to the calcareous C horizon is 27 to 46 inches. The C horizon is glacial till that is clay loam or silty clay loam in texture. White or light-gray carbonate concretions are in some areas. Small, sharp pebbles are in all parts of the profile, and a few stones are present in some areas.

Alexandria soils are similar to Cardington soils in texture, but they have better natural drainage and are not mottled at so shallow a depth. Alexandria soils have a higher clay content than Wooster or Rittman soils, and they lack the dense fragipan. Other well-drained soils that occur near Alexandria soils are the Mentor and Belmore soils. Alexandria soils have a more clayey subsoil than Mentor soils and a more clayey, less gravelly subsoil than Belmore soils.

Alexandria silt loam, 2 to 6 percent slopes (AdB).—This gently undulating soil is in the northeastern part of the county, mainly next to the valleys of the Black

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

Soil	Acres	Percent
Alexandria silt loam, 2 to 6 percent slopes	361	0.1
Alexandria silt loam, 6 to 12 percent slopes	494	.2
Alexandria silt loam, 6 to 12 percent slopes, moderately eroded	880	.3
Alexandria silt loam, 12 to 18 percent slopes	1,556	.5
Alexandria silt loam, 12 to 18 percent slopes, moderately eroded	2,084	.7
Alexandria silt loam, 18 to 25 percent slopes	640	.2
Alexandria silt loam, 18 to 25 percent slopes, moderately eroded	182	.1
Alexandria silt loam, 25 to 40 percent slopes	233	.1
Alexandria silty clay loam, 12 to 18 percent slopes, severely eroded	147	(1)
Algiers silt loam	361	.1
Belmore loam, 2 to 6 percent slopes	854	.3
Belmore loam, 6 to 12 percent slopes	633	.2
Belmore loam, 12 to 18 percent slopes	269	.1
Bennington silt loam, 0 to 2 percent slopes	13,167	4.1
Bennington silt loam, 2 to 6 percent slopes	37,132	11.7
Bennington silt loam, 2 to 6 percent slopes, moderately eroded	2,091	.7
Bennington-Fitchville silt loams, 2 to 6 percent slopes	328	.1
Berks channery silt loam, 2 to 6 percent slopes	406	.1
Berks channery silt loam, 6 to 12 percent slopes	325	.1
Berks channery silt loam, 12 to 18 percent slopes	932	.3
Berks-Rock outcrop complex, steep	231	.1
Bogart loam, 0 to 2 percent slopes	251	.1
Bogart loam, 2 to 6 percent slopes	673	.2
Bogart silt loam, 0 to 2 percent slopes	825	.3
Bogart silt loam, 2 to 6 percent slopes	1,347	.4
Canfield silt loam, 2 to 6 percent slopes	20,473	6.4
Canfield silt loam, 2 to 6 percent slopes, moderately eroded	824	.3
Canfield silt loam, 6 to 12 percent slopes	1,567	.5
Canfield silt loam, 6 to 12 percent slopes, moderately eroded	971	.3
Cardington silt loam, 2 to 6 percent slopes	20,084	6.3
Cardington silt loam, 2 to 6 percent slopes, moderately eroded	5,108	1.6
Cardington silt loam, 6 to 12 percent slopes	4,203	1.3
Cardington silt loam, 6 to 12 percent slopes, moderately eroded	4,693	1.4
Cardington silty clay loam, 6 to 12 percent slopes, severely eroded	299	.1
Carlisle muck	1,412	.4
Chili loam, 2 to 6 percent slopes	2,478	.8
Chili loam, 6 to 12 percent slopes	2,198	.7
Chili and Conotton soils, 12 to 18 percent slopes	1,427	.4
Chili and Conotton soils, 12 to 18 percent slopes, severely eroded	138	(1)
Chili and Conotton soils, 18 to 25 percent slopes	400	.1
Chili and Conotton soils, 25 to 40 percent slopes	104	(1)
Condit silt loam	5,158	1.6
Conotton gravelly loam, 2 to 12 percent slopes	247	.1
Cut and fill land	5,434	1.7
Digby loam, 1 to 4 percent slopes	189	.1
Fitchville silt loam, 0 to 2 percent slopes	2,565	.8
Fitchville silt loam, 2 to 6 percent slopes	802	.3
Fitchville-Bennington silt loams, 0 to 2 percent slopes	1,243	.4
Fitchville silt loam, gravelly subsoil variant, 0 to 2 percent slopes	759	.2
Fitchville silt loam, gravelly subsoil variant, 2 to 6 percent slopes	295	.1
Frenchtown silt loam	583	.2
Glenford silt loam, 0 to 2 percent slopes	447	.1
Glenford silt loam, 2 to 6 percent slopes	2,012	.6
Glenford silt loam, 6 to 12 percent slopes	245	.1
Gravel pits	422	.1
Gresham silt loam, 2 to 6 percent slopes	111	(1)
Haney loam, 2 to 6 percent slopes	658	.2
Hanover silt loam, 2 to 6 percent slopes	1,729	.5
Hanover silt loam, 6 to 12 percent slopes	2,023	0.6
Hanover silt loam, 6 to 12 percent slopes, moderately eroded	629	.2
Hanover silt loam, 6 to 12 percent slopes, severely eroded	173	.1
Hanover silt loam, 12 to 18 percent slopes	1,048	.3
Hanover silt loam, 12 to 18 percent slopes, moderately eroded	403	.1
Hanover silt loam, 18 to 25 percent slopes	173	.1
Holly silt loam	2,566	.8
Landes fine sandy loam	61	(1)
Latham silt loam, 2 to 6 percent slopes	406	.1
Latham silt loam, 6 to 12 percent slopes	301	.1
Linwood muck	527	.2
Lobdell silt loam	4,954	1.6
Lordstown silt loam, 2 to 6 percent slopes	1,259	.4
Lordstown silt loam, 6 to 12 percent slopes	2,035	.6
Lordstown silt loam, 12 to 18 percent slopes	4,945	1.6
Lordstown and Loudonville silt loams, 18 to 25 percent slopes	4,738	1.5
Lordstown and Loudonville silt loams, 25 to 40 percent slopes	876	.3
Loudonville silt loam, 2 to 6 percent slopes	3,373	1.1
Loudonville silt loam, 6 to 12 percent slopes	6,002	1.9
Loudonville silt loam, 12 to 18 percent slopes	6,122	1.9
Luray silty clay loam	6,908	2.2
Mentor silt loam, 2 to 6 percent slopes	267	.1
Mentor silt loam, 6 to 12 percent slopes	198	.1
Orrville loam, moderately shallow variant	132	(1)
Pewamo silt loam	809	.3
Pewamo silt loam, overwash	364	.1
Pewamo silty clay loam	13,883	4.4
Ravenna silt loam, 0 to 2 percent slopes	847	.3
Ravenna silt loam, 2 to 6 percent slopes	1,754	.6
Rittman silt loam, 2 to 6 percent slopes	13,917	4.4
Rittman silt loam, 2 to 6 percent slopes, moderately eroded	1,170	.4
Rittman silt loam, 6 to 12 percent slopes	2,972	.9
Rittman silt loam, 6 to 12 percent slopes, moderately eroded	2,846	.9
Rittman silt loam, 12 to 18 percent slopes,	617	.2
Rittman silt loam, 12 to 18 percent slopes, moderately eroded	776	.2
Rittman silty clay loam, 6 to 12 percent slopes, severely eroded	159	(1)
Rittman silty clay loam, 12 to 18 percent slopes, severely eroded	103	(1)
Schaffenaker loamy sand, 2 to 12 percent slopes	392	.1
Schaffenaker loamy sand, 12 to 18 percent slopes	802	.3
Schaffenaker loamy sand, 18 to 40 percent slopes	1,026	.3
Sebring silt loam	1,967	.6
Shoals silt loam	10,706	3.4
Shoals loam, coarse subsoil variant	968	.3
Sloan silty clay loam	1,287	.4
Tiro silt loam, 0 to 2 percent slopes	568	.2
Tiro silt loam, 2 to 6 percent slopes	708	.2
Titusville silt loam, 2 to 6 percent slopes	2,194	.7
Titusville silt loam, 6 to 12 percent slopes	625	.2
Urban land	1,420	.4
Wadsworth silt loam, 0 to 2 percent slopes	1,984	.6
Wadsworth silt loam, 2 to 6 percent slopes	3,509	1.1
Wallkill silt loam	69	(1)
Wheeling silt loam, 0 to 2 percent slopes	755	.2
Wheeling silt loam, 2 to 6 percent slopes	3,008	.9
Wheeling silt loam, 6 to 12 percent slopes	775	.2
Wheeling and Mentor silt loams, 12 to 18 percent slopes	301	.1
Wooster silt loam, 2 to 6 percent slopes	8,485	2.7
Wooster silt loam, 2 to 6 percent slopes, moderately eroded	806	.3
Wooster silt loam, 6 to 12 percent slopes	9,298	2.9

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

Soil	Acres	Percent	Soil	Acres	Percent
Wooster silt loam, 6 to 12 percent slopes, moderately eroded	6,375	2.0	Wooster silt loam, 18 to 40 percent slopes, severely eroded	174	0.1
Wooster silt loam, 12 to 18 percent slopes	5,836	1.8	Wooster silt loam, 25 to 40 percent slopes	593	.2
Wooster silt loam, 12 to 18 percent slopes, moderately eroded	2,836	.9	Wooster-Chili soils, 2 to 6 percent slopes	236	.1
Wooster silt loam, 12 to 18 percent slopes, severely eroded	330	.1	Wooster-Chili soils, 6 to 12 percent slopes	309	.1
Wooster silt loam, 18 to 25 percent slopes	2,200	.7	Water	1,522	.5
			Total	318,080	100.0

[1] Less than 0.1 percent.

Fork and Brubaker Creeks and their tributaries in Weller and Franklin Townships. Some areas have characteristics of till plains and some have characteristics of stream terraces. Slopes are short and irregular. The glacial till in which this soil formed shows evidence of weak stratification.

This soil has a profile similar to the one described as representative of the series, but its subsoil is less clayey. Thin layers of sandy loam or gravelly loam are within a depth of 3 feet in some areas. Layers of sand, gravel, or broken rock are at a depth of 5 to 8 feet in most areas.

Included with this soil in mapping are small areas of somewhat poorly drained Bennington soils and very poorly drained Pewamo soils in depressions. Also included on knolls are a few eroded soils that have a lighter colored surface layer than this soil. A few spots of soils that have gravel on the surface are also included.

This soil is better suited to crops than the more strongly sloping Alexandria soils. Also, it is more rapidly permeable in the sandy or gravelly layers where they are present. The hazard of erosion is moderate, but most of the slopes are too short and irregular for the application of special erosion-control practices. The good natural drainage and gentle slope of this soil are favorable for many nonfarm uses. Moderately slow permeability is a limitation to some nonfarm uses. Capability unit unit IIe-3; woodland suitability group 2ol.

Alexandria silt loam, 6 to 12 percent slopes (AdC).—This soil is on hillsides in the northern part of the county. Most of these hillsides adjoin minor natural drainageways. This soil has a profile similar to the one described as representative of the series, but it is less eroded.

Included with this soil in mapping are many areas of soils that have thin layers of sandy or gravelly loam below a depth of 3 feet. Permeability is more rapid in these soils than in this Alexandria soil. Also included on bottom lands along narrow, natural drainageways are soils that are similar to Pewamo soils. Around a few seeps and springs, soils that are gray and mottled are also included.

Most areas of this soil are in permanent pasture. Unprotected areas are subject to severe erosion. This soil is better suited to crops than the moderately eroded Alexandria soil that has the same gradient of slope. Slope is a limitation to many nonfarm uses. Capability unit IIIe-1; woodland suitability group 2ol.

Alexandria silt loam, 6 to 12 percent slopes, moderately eroded (AdC2).—Most areas of this soil are on the sides of valleys, along natural drainageways, or around pockets of muck. A few areas are on isolated hills.

This soil has the profile described as representative of the series. Erosion has removed a part of the surface layer, and the plow layer is a mixture of the material originally in the surface layer and that from the subsoil.

Included with this soil in mapping are areas of soils that have layers of sandy or gravelly loam below a depth of 30 inches. Permeability is more rapid in these soils than in this Alexandria soil. Also included are small areas of moderately well drained Cardington soils on the lower part of some hills and some areas of soils on bottom lands along small natural drainageways. The bottom land soils are similar to Pewamo soils. A few areas of gray and mottled soils are included around seeps and springs.

Most areas of this soil are used for crops or pasture. This soil has somewhat poorer tilth and a lower content of organic matter than the uneroded Alexandria soil that has the same gradient of slope, and it is less well suited to crops. Slope is a limitation to many nonfarm uses. Capability unit IIIe-1; woodland suitability group 2ol.

Alexandria silt loam, 12 to 18 percent slopes (AdD).—Most areas of this soil are on the sides of valleys and minor natural drainageways. Included with this soil in mapping are areas of soils that have pockets of gravelly or sandy loam below a depth of 3 feet. Permeability is more rapid in these soils than in this Alexandria soil. Also included on bottom lands along narrow, natural drainageways, are areas of soils that are similar to Pewamo soils. Gray and mottled soils are included around a few seeps and springs.

Most areas of this soil are in trees or pasture. Unprotected areas are subject to severe erosion. This soil is better suited to crops and pasture than the eroded Alexandria soil that has the same gradient of slope. Slope is the main limitation to most nonfarm uses. Capability unit IVe-1; woodland suitability group 2rl.

Alexandria silt loam, 12 to 18 percent slopes, moderately eroded (AdD2).—Most areas of this soil are on the sides of valleys or natural drainageways. A few areas are on isolated hills. Erosion has removed a part of the surface layer, and the plow layer is a mixture of the material originally in the surface layer and that from the subsoil.

Included with this soil in mapping are many small areas of slightly eroded soils that have a dark grayish-

brown surface layer. Also included are small areas of severely eroded soils that have a brown or yellowish-brown surface layer. Included in most areas are soils that have pockets and thin layers of gravelly or sandy loam below a depth of 3 feet. The depth and thickness of these layers vary greatly within small areas. Permeability is more rapid in these soils than in this Alexandria soil. Also included on bottom lands along small natural drainageways are soils that are similar to Pewamo soils. Gray and mottled soils are included around a few springs and seeps.

Most areas of this soil are used for crops or pasture. This soil has poorer tilth and a lower content of organic matter than the uneroded Alexandria soil that has the same gradient of slope, and it is less well suited to crops. Further erosion can be expected if the soil remains unprotected, and gullies that form in this soil can extend into areas of more nearly level soils that occupy higher positions. Slope is the main limitation to most nonfarm uses. Capability unit IVe-1; woodland suitability group 2rl.

Alexandria silt loam, 18 to 25 percent slopes (AdE).—This soil is on the sides of valleys. A few areas are on the sides of isolated hills. This soil has generally been protected from erosion by grass or forest cover.

Included with this soil in mapping are a few small areas of eroded soils that have a lighter colored surface layer than this soil. Also included are many areas of soils that have pockets of gravel below a depth of 3 feet. Included around a few springs and seeps are soils that are gray and mottled. On some very narrow areas of bottom lands are soils that are similar to the Pewamo, Holly, and Shoals soils.

This soil is generally too steep for crops, but it is suitable for improved pasture or woodland. The hazard of erosion is severe if this soil is not protected by vegetative cover. Gullies can form along cattle paths or logging roads and extend into areas of more nearly level soils that occupy higher positions. Slope is a severe limitation to most nonfarm uses. Capability unit VIe-1; woodland suitability group 2rl.

Alexandria silt loam, 18 to 25 percent slopes, moderately eroded (AdE2).—The areas of this soil are in the northern part of the county. Included in mapping are a few spots of slightly eroded soils and a few spots of severely eroded soils in which the subsoil is exposed. Also included are a few areas on nearly vertical streambanks.

A few areas of this soil are in crops, or were formerly cropped, but most areas are in pasture or trees. Gullies have formed along cowpaths and logging roads. This soil is generally too steep for crops, but it is suitable for improved pasture and woodland. Slope is a limitation to most nonfarm uses. Capability unit VIe-1; woodland suitability group 2rl.

Alexandria silt loam, 25 to 40 percent slopes (AdF).—This soil is on the sides of valleys. It is protected from erosion by a cover of grass or trees.

Included with this soil in mapping are a few small areas of eroded soils that have a lighter colored surface layer than this soil and some areas on nearly vertical streambanks are severely eroded, and the subsoil is exposed. Also included are many areas of soils in which pockets of gravel are below a depth of 3 feet. Around a few springs and seeps are included soils that are gray and mottled. In some areas on very narrow stream bottoms and along drainageways are soils that are similar to the Pewamo, Holly, and Shoals soils.

This soil is generally too steep for crops, and improvement of pasture or woodland is difficult. It is subject to erosion if not protected by vegetative cover. Gullies can start along cattle paths or logging roads and extend into more nearly level areas of soils that occupy higher positions. Slope is a limitation to most nonfarm uses. Capability unit VIe-1; woodland suitability group 2rl.

Alexandria silty clay loam, 12 to 18 percent slopes, severely eroded (AeD3).—Most areas of this soil are on the sides of valleys or natural drainageways. A few areas are on isolated hills. Erosion has removed most of the original surface layer. The plow layer consists mainly of yellowish-brown silty clay loam from the subsoil. Below the plow layer the profile of this soil is similar to the one described as respresentative of the series.

Included with this soil in mapping are many small areas of less eroded soils that have a darker surface layer than this soil. Also included are areas of soils that have gravelly or sandy loam below a depth of 3 feet. On bottom lands along some small natural drainageways are areas of soils that are similar to the Pewamo soils. Around a few springs and seeps are included soils that are gray and mottled.

Most areas of this soil are used for crops. Some areas are in permanent pasture that has been overgrazed. This soil has poorer tilth and a lower content of organic matter than uneroded Alexandria soils that have the same gradient of slope, and it is less well suited to crops and pasture. Runoff is more rapid on this soil than on less eroded soils. Slope is a limitation to most nonfarm uses. Capability unit VIe-1; woodland suitability group 2rl.

Algiers Series

The Algiers series consists of nearly level, somewhat poorly drained soils. These soils formed in light-colored soil material deposited by flooding streams on top of an older, dark-colored, very poorly drained soil. For this reason, the darkest layer in Algiers soils is not at the surface, as in most soils, but at a depth of 15 to 30 inches. These soils are on flood plains in all parts of the county.

A representative profile of this series, in a cultivated field, has a dark grayish-brown silt loam plow layer 8 inches thick. Below this, between depths of 8 and 19 inches, is dark grayish-brown silt loam. Between depths of 19 and 30 inches, is very dark gray silty clay loam. This layer was originally the surface layer, but it has been covered by more recent alluvial deposits. Between depths of 30 and 43 inches is dark-gray silty clay loam mottled with dark yellowish brown. This layer is underlain by 4 inches of black silty clay loam. Below this second buried surface layer, between depths of 47 and 60 inches, is firm, stratified loam and silt loam that is dark gray mottled with strong brown.

Permeability is moderate, and available moisture capacity is high. Runoff is slow. Periodic flooding gen-

erally is a hazard, but some areas are rarely flooded because of stream channel improvement or other flood-prevention measures. New soil material is deposited on the surface during floods, and seedlings are likely to be washed out or buried. In most areas natural drainage is not adequate for good growth of crops.

The areas of Algiers soils are used about equally for crops and permanent pasture.

Representative profile of Algiers silt loam, in a cultivated field, in the NE 1/4 SE 1/4 sec. 5, T. 23 N., R 17 W. (Mifflin Township) :

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

C—8 to 19 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium, crumb structure; friable; neutral; abrupt, smooth boundary.

IIAp—19 to 30 inches, very dark gray (10YR 3/1) light silty clay loam; moderate, fine, granular structure; firm; neutral; abrupt, smooth boundary.

IICg—30 to 43 inches, dark-gray (5Y 4/1) stratified silty clay loam; many, coarse, faint, dark-gray (10YR 4/1) mottles and common, medium, prominent, dark yellowish-brown (10YR 4/4) mottles; massive; firm; neutral; abrupt, smooth boundary.

IIIA1b—43 to 47 inches, black (N 2/0) silty clay loam; massive; firm; neutral; abrupt, smooth boundary.

IIICg—47 to 60 inches, dark-gray (10YR 4/1) stratified loam and silt loam; many, coarse, prominent, strong-brown (7.5YR 5/6) mottles; massive; friable; mildly alkaline.

In uncultivated areas the A1 horizon ranges from 1 to 3 inches in thickness. It is typically very dark grayish brown (10YR 3/2). The C horizon is dark brown (10YR 4/3), dark grayish brown (10YR 4/2), or grayish brown (10YR 5/2). Its texture is loam, silt loam, or fine sandy loam. The buried, dark-colored IIAp horizon is at a depth of 15 to 30 inches and is 10 to 18 inches thick. It has a hue of 10YR, a value of 2 or 3, and a chroma of 0 to 2. It is faintly mottled below a depth of 20 inches in some areas. The IICg horizon is typically stratified, and the texture of the major strata is silt loam, loam, or silty clay loam. A thin, buried A horizon is present in the C horizon in some places. Reaction throughout the profile is neutral to mildly alkaline. Carbonates are seldom present within a depth of 60 inches.

Algiers soils differ from most other soils in the county in having a light-over-dark color sequence. The only other soils that have this color sequence are the Wallkill soils and the Pewamo soils, overwash. Algiers soils are on flood plains, and Pewamo soils, overwash are in upland depressions. In Algiers soils, the buried, dark layer is silt loam or silty clay loam, but in Wallkill soils it is muck or peat. Algiers soils differ from the included Sloan soils in having a light-colored surface layer deposited over the dark layer. The darker layer is the surface layer in Sloan soils.

Algiers silt loam (Ag).—This soil is on flood plains where floods have deposited light-colored soil material on top of a dark-colored soil.

Included with this soil in mapping are spots where a buried soil is at a depth of 10 to 15 inches. Also included are many small areas of soils that have a loam, gravelly loam, or sandy loam surface layer and soils that have layers of sandy loam or gravelly loam below a depth of 3 feet. Other inclusions are areas of Holly and Sloan soils in depressions and in abandoned stream channels and areas of Algiers soils on small knolls and ridges. The Algiers soils have slopes as much as 5 percent.

Drained areas of this soil are used for crops and undrained areas for permanent pasture. This soil is suited to crops, but it is susceptible to frequent flooding. Susceptibility to flooding is a severe limitation to most nonfarm uses. Capability unit IIw-1; woodland suitability group 2wl.

Belmore Series

The Belmore series consists of gently sloping to moderately steep, well-drained soils that formed in gravelly outwash deposits that were originally calcareous. These soils are on hills, knolls, and ridges in the northwestern part of the county.

A representative profile of this series, in a cultivated field, has a dark grayish-brown loam plow layer 9 inches thick. The upper part of the subsoil, between depths of 9 and 13 inches is yellowish-brown gravelly loam. The lower part, between depths of 13 and 44 inches, is brown gravelly loam and gravelly clay loam. Below the subsoil, between depths of 44 and 60 inches, is brown sandy loam. This layer is very friable and calcareous and contains a few thin layers that are gravelly.

Permeability is moderately rapid, and available moisture capacity is medium. Runoff is slow to moderate. Erosion is a hazard on sloping areas. Tilth is generally good, and the root zone is deep. Reaction in the root zone ranges from slightly acid to mildly alkaline.

Most areas of Belmore soils are used for crops or improved pasture. The less strongly sloping areas are better suited to crops than the steeper ones.

Representative profile of Belmore loam, 6 to 12 percent slopes, in a cultivated field, SW 1/4 SE 1/4 sec. 20, T. 21 N., R. 19 W. (Sharon Township) :

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) loam; weak, medium, granular structure; friable; 10 percent gravel; neutral; abrupt, smooth boundary.

B1—9 to 13 inches, yellowish-brown (10YR 5/4) gravelly loam; weak, medium, subangular blocky structure; very friable; 30 percent gravel; slightly acid; clear, irregular boundary.

B21t—13 to 20 inches, brown (7.5YR 5/4) gravelly loam; weak, medium, subangular blocky structure; very friable; few, discontinuous, brown (10YR 5/3) clay films; coarse fragments coated and bridged with clay; 35 percent gravel; slightly acid; clear, irregular boundary.

B22t—20 to 34 inches, brown (7.5YR 4/4) gravelly clay loam; weak, coarse, subangular blocky structure; firm; few brown (10YR 5/3) clay films; coarse fragments coated and bridged with clay; 25 percent gravel; neutral; gradual, smooth boundary.

B23t—34 to 44 inches, brown (7.5YR 4/4), stratified gravelly loam and gravelly clay loam; weak, coarse, subangular blocky structure; friable; yellowish-brown (10YR 5/4) clay films; coarse fragments coated and bridged with clay; 20 percent gravel; neutral; gradual, smooth boundary.

C—44 to 60 inches, brown (7.5YR 5/4 and 10YR 5/3) sandy loam; massive; very friable; contains thin strata of gravelly sandy loam; mildly alkaline; calcareous.

The plow layer is dark brown (10YR 4/3), dark grayish brown (10YR 4/2), or brown (10YR 5/3). In uncultivated areas the A1 horizon is 1 to 5 inches thick and is very dark grayish brown (10YR 3/2) or very dark brown (10YR 2/2). An A2 horizon, as much as 7 inches thick, is present in uncultivated areas and in some cultivated areas. It is brown (10YR 5/3) or pale brown (10YR 6/3) and is free of mottles. The A horizon is typically loam in texture, but ranges to sandy loam.

The B1 horizon is 4 to 10 inches thick. It is brown or yel-

lowish brown and is loam or gravelly loam in texture. The B2t horizon is 20 to 40 inches thick. It has a hue of 7.5YR or 10YR, a value of 4 or 5, and a chroma of 3 or 4. It is gravelly loam, gravelly clay loam, sandy clay loam, or gravelly sandy clay loam. The gravel content is 35 percent or less, and the structure is weakly developed, especially in the more gravelly Belmore soils. Much of the evidence of clay movement is in the form of clay films on, and bridging between, coarse fragments. Clay films, where present, have a color range similar to that of the ped interiors.

The C horizon is stratified. In some places it is dominantly sandy, and in others it is gravelly. It commonly is sandy loam, gravelly loam, loamy sand, and loamy gravel. The gravel content ranges from almost none to 80 percent. The color of the C horizon is brown or yellowish brown. Adjacent strata in this horizon generally differ slightly in color.

Reaction in the solum is medium acid to neutral. The C horizon is calcareous within a depth of 55 inches.

Belmore soils are similar to Haney soils in texture, but they have better natural drainage and are free of mottles to a greater depth. They are also similar to Chili soils in texture, but they are less acid. They have a more gravelly and less clayey subsoil than Alexandria soils and a more gravelly and less silty subsoil than Mentor soils.

Belmore loam, 2 to 6 percent slopes (BeB).—This soil is on gravelly ridges and hilltops.

Included with this soil in mapping are many small areas of soils that have a silt loam or gravelly loam surface layer. Also included are a few small areas of soils that have clay loam glacial till at a depth of 3 to 5 feet and a few areas of eroded soils that have a light grayish-brown surface layer.

If this soil is farmed, the hazard of erosion is moderate. This soil is less droughty than steeper Belmore soils, and it is better suited to crops. The good natural drainage of this gently sloping soil is favorable for many nonfarm uses. Capability unit IIe-1; woodland suitability group 2o1.

Belmore loam, 6 to 12 percent slopes (BeC).—This soil is on ridges and knolls. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of soils that have a sandy loam, gravelly loam, or silt loam surface layer. Also included are a few areas of soils in which the upper 2 to 3 feet are almost free of gravel and a few areas of soils that have clay loam glacial till at a depth of 3 to 5 feet. A few spots of eroded soils that have a light grayish-brown plow layer are also included. Also, some areas of soils have layers of clean sand and gravel, 2 to 5 feet thick, below a depth of 5 feet.

If this soil is farmed, the hazard of erosion is severe. Most areas are used for crops or for improved pasture. Slope is a limitation to most nonfarm uses. Capability unit IIIe-2; woodland suitability group 2o1.

Belmore loam, 12 to 18 percent slopes (BeD).—This soil is on hillsides. Included in mapping are many small areas of soils that have a gravelly loam or silt loam surface layer and a few areas in which the upper 2 to 3 feet are almost free of gravel. Also included are a few small areas of eroded soils that have a light brownish-gray to brown surface layer and soils that have pockets of clay loam glacial till at a depth of 2 to 5 feet. Around some springs and seeps, are included soils that are gray and mottled.

Most areas of this soil are used for permanent pasture. The hazard of erosion is very severe if this soil is farmed. Slope is a limitation to many nonfarm uses. Capability unit IVe-2; woodland suitability group 2o1.

Bennington Series

The Bennington series consists of nearly level to gently sloping, somewhat poorly drained soils that formed in calcareous glacial till. These soils are on till plains in the northern part of the county.

A representative profile of this series, in a cultivated field, has a dark grayish-brown silt loam plow layer 6 inches thick. The upper part of the subsoil, between depths of 6 and 9 inches, is yellowish-brown silt loam mottled with gray, grayish brown, and yellowish brown. Between depths of 9 and 14 inches, the subsoil is brown silty clay loam mottled with grayish brown and yellowish brown; and between depths of 14 and 36 inches, it is yellowish-brown, very firm silty clay loam mottled with grayish brown. The substratum, between depths of 36 and 60 inches, is yellowish-brown clay loam mottled with yellowish red and light brownish gray. The upper part of the subsoil is strongly acid or very strongly acid, and the lower part is medium acid to mildly alkaline. There are small pebbles throughout the soil profile.

Permeability is slow, and available moisture capacity is medium. Runoff is slow to moderate. The root zone is moderately deep if these soils are drained. Reaction in the root zone ranges from strongly acid to very strongly acid in the upper part to mildly alkaline in the lower part. Artificial drainage is generally needed for most crops.

Most areas of Bennington soils are artificially drained and used for crops, mainly corn, soybeans, and small grain.

Representative profile of Bennington silt loam, 2 to 6 percent slopes, in a cultivated field in the SE1/4SE1/4 sec. 25, T. 23 N., R. 18 W. (Butler Township) (laboratory data sample RC-23):

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

B1—6 to 9 inches, yellowish-brown (10YR 5/4) silt loam; common, medium, distinct mottles of gray (10YR 5/1), grayish brown (10YR 5/2), and yellowish brown (10YR 5/8); weak, medium, subangular blocky structure; friable; strongly acid; clear, wavy boundary.

B21t—9 to 14 inches, brown (10YR 5/3) silty clay loam; common, medium, faint mottles of grayish brown (10YR 5/2) and many, coarse, distinct mottles of yellowish brown (10YR 5/6); moderate, medium, prismatic structure; firm; grayish-brown (10YR 5/2) ped coatings; very thick clay films on vertical ped faces and thick clay films on horizontal ped faces; few pale-brown (10YR 6/3) silt coatings on ped faces in upper 2 inches; few small pebbles; very strongly acid; clear, wavy boundary.

B22t—14 to 22 inches, yellowish-brown (10YR 5/4) heavy silty clay loam; many, coarse, faint mottles of yellowish brown (10YR 5/6) and common, coarse, distinct mottles of grayish brown (10YR 5/2); moderate, coarse, prismatic structure that parts to moderate, fine, subangular blocky structure; very firm; continuous, thick, grayish-brown (10YR 5/2) ped coatings that include clay films on ped faces; few coarse fragments; very strongly acid; diffuse, wavy boundary.

B23t—22 to 29 inches, yellowish-brown (10YR 5/6) silty clay loam; many, coarse, distinct mottles of grayish

brown (10YR 5/2); weak, coarse, prismatic structure that parts to weak, fine, subangular blocky structures; very firm; grayish-brown (10YR 5/2) ped coatings that include clay films; few coarse fragments; medium acid; diffuse, irregular boundary.

B3—29 to 36 inches, yellowish-brown (10YR 5/4) silty clay loam; many, medium, faint mottles of grayish brown (10YR 5/2) and yellowish brown (10YR 5/6); moderate, medium, subangular blocky structure; firm; few patches of grayish-brown (10YR 5/2) clay films on ped surfaces; mildly alkaline; very weakly calcareous; abrupt, wavy boundary.

C—36 to 60 inches, yellowish-brown (10YR 5/4) clay loam; few, coarse, prominent mottles of yellowish red (5YR 4/8); strongly laminar; firm; 10 percent coarse fragments; many, coarse, prominent lime concentrations of light brownish gray (10YR 6/2); mildly alkaline; very strongly calcareous.

In unplowed areas the A1 horizon is very dark grayish brown (10YR 3/2) and is 2 to 4 inches thick. An A2 horizon is present in uncultivated areas and in some cultivated areas. It is typically grayish-brown (10YR 5/2 or 2.5Y 5/2), friable silt loam that has mottles of a high chroma.

The total thickness of the Bt horizon is 12 to 36 inches. Its texture is heavy clay loam, heavy silty clay loam, or light silty clay. The ped interiors have a hue of 10YR or 2.5Y, a value of 4 or 5, and a chroma of 4 to 6. The mottles have a low chroma. Ped surfaces are coated with gray (10YR 5/1) or grayish brown (10YR 5/2). These coatings include some clay films. The B3 horizon is not present in all Bennington profiles. Reaction ranges from strongly acid to very strongly acid in the upper part of the B horizon to slightly acid in the lower part. The depth to calcareous glacial till is 27 to 40 inches. This till is clay loam or silty clay loam that is yellowish brown and grayish brown in color. The content of coarse fragments is 2 to 10 percent throughout the profile.

Bennington soils are similar to Cardington and Condit soils in texture, but Cardington soils are moderately well drained and Condit soils are poorly drained. Their subsoil is grayer than that of Cardington soils and less gray than that of Condit soils. Bennington soils are similar to Wadsworth, Fitchville, and Digby soils in color. Bennington soils have a higher clay content in the subsoil than Wadsworth soils, and they lack the dense fragipan of Wadsworth soils. Bennington soils contain more clay, more pebbles, and less silt than Fitchville soils, and less gravel than Digby soils.

Bennington silt loam, 0 to 2 percent slopes (BnA).—This soil is on till plains. Included in mapping are small areas of poorly drained Condit and Pewamo soils that are commonly in depressions and along minor natural drainageways. Also included are a few areas of soils that have more silt or gravel in the upper 1 to 3 feet than this soil. A few areas of soils in Northern Butler Township that have silty clay in the upper part of the subsoil are also included.

Wetness is a moderate limitation if this soil is farmed. Wetness and slow permeability are limitations to many nonfarm uses. Capability unit IIw-2; woodland suitability group 2w2.

Bennington silt loam, 2 to 6 percent slopes (BnB).—This soil is on till plains. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of poorly drained Condit and Pewamo soils in low spots and depressions and along minor natural drainageways and small areas of soils, generally along minor natural drainageways, that have more silt or gravel in the upper 1 to 3 feet than this soil. Also included are a few areas of soils that have a dark surface layer 6 to 10 inches thick; areas of soils, north of Clear Creek in Butler Township, that have silty clay in the upper part of the subsoil; and small areas of soils, in the northern part of Plymouth Township, that have a reddish surface layer.

If this soil is farmed, wetness is a moderate limitation, and erosion is a hazard. Erosion-control practices are difficult to follow on this soil because slopes are short and irregular. Wetness and slow permeability are limitations to use of this soil for many nonfarm purposes. Capability unit IIw-2; woodland suitability group 2w2.

Bennington silt loam, 2 to 6 percent slopes, moderately eroded (BnB2).—This soil is on till plains. It is on low knolls and ridges and in intervening low spots or depressions. Erosion has removed a varying amount of the original surface layer, generally in areas on knolls. Where erosion is greater, the plow layer consists mainly of brown or yellowish-brown silty clay loam from the subsoil, and tilth is poor. The less eroded spots have a dark grayish-brown silt loam plow layer. Most of the soil material removed by erosion from areas of this soil on knolls has accumulated in low spots. The color of the surface layer varies in plowed fields.

Included with this soil in mapping are poorly drained Condit and Pewamo soils in a few small depressions and along minor natural drainageways. Also included are small areas of moderately well drained Cardington soils on some of the higher knolls.

Most areas of this soil are used for crops. Tilth is poorer in this soil than in the uneroded Bennington soils, and the content of organic matter is lower. Runoff is moderate, and further erosion is a hazard. Wetness is a moderate limitation if this soil is farmed. Seasonal wetness and slow permeability are limitations to many nonfarm uses. Capability unit IIw-2; woodland suitability group 2w2.

Bennington-Fitchville silt loams, 2 to 6 percent slopes (BpB).—This complex is in areas that have characteristics of both the lake plains and the till plains. A combination of water action and ice action has produced a very complex pattern of soils.

About 50 percent of the complex is Bennington soils. About 30 percent is Fitchville soils. The remaining 20 percent of the complex is Tiro soils around the base of knolls; Cardington, Haney, Glenford soils on high knolls and ridges; and Sebring and Luray soils in depressions and along minor natural drainageways.

The Bennington soils have a profile similar to that described as representative of the Bennington series, but layers of sand, gravel, or silt are below a depth of 3 feet. The Fitchville soils have a profile similar to that described as representative of the Fitchville series, but the content of coarse sand and gravel, is commonly greater, especially below a depth of 3 feet.

Soil conditions are extremely variable within short distances. Irregularly shaped lenses and pockets of sandy loam or gravelly loam are at a depth of 3 to 6 feet in about 75 percent of the areas mapped.

If adequately drained, areas of this complex are well suited to crops. Commonly grown crops are corn, soybeans, small grain, and hay. If the soils are cropped, wetness is a moderate limitation. Seasonal wetness and slow permeability are limitations to many nonfarm uses. Capability unit IIw-3; woodland suitability group 2w2.

Berks Series

The Berks series consists of gently sloping to steep, well-drained soils that formed in material weathered from sandstone bedrock. Much of the soil volume is made up of sandstone pieces, and solid sandstone bedrock is at a depth of 20 to 40 inches. These soils are mostly in the southeastern part of the county.

A representative profile of this series, in a cultivated field, has a dark grayish-brown channery silt loam plow layer 7 inches thick. The upper part of the subsoil, between depths of 7 and 11 inches, is yellowish-brown channery silt loam. The lower part, between depths of 11 and 28 inches, a yellowish-brown very channery silt loam. The substratum extends to a depth of 38 inches and consists of weathered sandstone bedrock and a little soil material between the rock fragments. It is underlain by slightly fractured bedrock that extends to a depth of 60 inches.

Permeability is moderately rapid, and available moisture capacity is low. Crops are affected by lack of moisture in some years. Runoff is moderate to rapid. The root zone is moderately deep. Roots penetrate into the cracked or broken upper part of the rock. Reaction in the root zone is strongly acid.

A few areas of the less strongly sloping soils are in crops. Areas of the steeper soils are in permanent pasture or trees.

Representative profile of Berks channery silt loam, 2 to 6 percent slopes, in a cultivated field, in the NE1/4 NW1/4 sec. 7, T. 21 N., R. 17 W. (Worthington Township):

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) channery silt loam; moderate, medium, granular structure; friable; 20 percent sandstone fragments; strongly acid; abrupt, smooth boundary.

B1—7 to 11 inches, yellowish-brown (10YR 5/4) channery silt loam; weak, fine, subangular blocky structure; friable; 30 percent sandstone fragments; strongly acid; gradual boundary.

B2—11 to 28 inches, yellowish-brown (10YR 5/4) very channery silt loam; moderate, fine, subangular blocky structure; friable; 60 percent angular sandstone fragments; strongly acid; gradual boundary.

C—28 to 38 inches, weathered sandstone bedrock; 90 percent sandstone fragments 1 to 2 inches thick and 6 to 10 inches across; 10 percent yellowish-brown (10YR 5/4) loam partly filling the interstices.

R—38 to 60 inches, solid sandstone bedrock, slightly fractured.

In unplowed areas the A1 horizon is very dark grayish-brown (10YR 3/2) and is 2 to 4 inches thick. It is underlain by a thin, brown (10YR 5/3) A2 horizon. The solum is 18 to 30 inches thick, and the depth to bedrock is 20 to 40 inches. The content of sandstone channers is 15 to 30 percent in the A horizon, 25 to 40 percent in the upper part of the B horizon, 50 to 70 percent in the lower part of the B horizon, and more than 80 percent in the C horizon. The average size of the channers increases with depth. Channers make up more than 50 percent of the soil volume within 20 inches of the surface. The soil between the channers is silt loam or loam. It fills the interstices that are larger than 1 millimeter. Its color has a hue of 10YR or 7.5YR, a value of 4 or 5, and a chroma of 4 to 6. The solum is strongly acid or very strongly acid.

Berks soils contain more sandstone fragments in their subsoil than Lordstown or Loudonville soils. Berks and Conotton soils contain many coarse fragments, but those in Berks soils are angular sandstone fragments, whereas those in Conotton soils are rounded cobbles. Also, Berks soils are underlain by bedrock, and Conotton soils are not. Berks soils contain more silt, clay, and rock fragments in their subsoil and less sand than Schaffenaker soils.

Berks channery silt loam, 2 to 6 percent slopes (BrB).—This soil is on the rounded tops of steep hills. It has the profile described as representative of the series.

Included with this soil in mapping are a few small areas of Lordstown soils that contain fewer sandstone fragments in the surface layer and in the upper part of the subsoil than this soil. Also included are a few small areas of soils that have a very stony or very channery surface layer. In many included areas are soils that have no solid bedrock within a depth of 40 inches; in these areas broken rock makes up more than 90 percent of the soil volume within a depth of 40 inches. A few small included areas of soils have solid rock within a depth of 20 inches.

This soil is generally less droughty than steeper Berks soils. A few areas are used for crops, but most are used for pasture or trees. If this soil is farmed, the hazard of erosion is moderate. Solid bedrock at a depth of 20 to 40 inches is a limitation to some nonfarm uses. Capability unit IIe-4; woodland suitability group 4f1.

Berks channery silt loam, 6 to 12 percent slopes (BrC).—Most areas of this soil are on rounded hilltops and are surrounded by steeper soils on hillsides.

Included with this soil in mapping are a few small areas of Lordstown soils that contain fewer sandstone fragments in the surface layer and in the upper part of the subsoil than this soil. Also included are some small areas of soils that have a very stony surface layer. These areas are mostly in cultivated fields where erosion has removed the finer material of the original surface layer. These eroded areas are lighter colored than surrounding areas. Also included around springs and seeps on the lower slopes are soils that are grayer and more mottled than this soil. In many included areas are soils that have no solid bedrock within a depth of 40 inches; in these areas, broken rock makes up more than 90 percent of the soil volume within a depth of 40 inches.

If this soil is farmed, the hazard of erosion is severe. Steepness of slope and solid bedrock at a depth of 20 to 40 inches are limitations to many nonfarm uses. Capability unit IIIe-5; woodland suitability group 4f1.

Berks channery silt loam, 12 to 18 percent slopes (BrD).—This soil is on hillsides in the southern part of the county. In some areas this soil occupies the entire hillside, but in other areas it occurs below steeper areas or is on a rounded hilltop above steeper side slopes.

Included with this soil in mapping are soils around seeps and springs on the lower part of some hillsides. These soils are grayer and more mottled than this soil. Also included are spots of Lordstown soils, in which the surface layer and the upper part of the subsoil contain fewer sandstone fragments than this soil. Many included areas of soils have no solid bedrock within a depth of 40 inches, but broken rock makes up more than 90 percent of the soil volume within a depth of 40 inches in these areas. A few areas of soils that have solid bedrock within a depth of 20 inches and small areas where the surface layer is very stony or gravelly are included.

If this soil is farmed, the hazard of erosion is very severe. Steepness of slope and solid bedrock at a depth

of 20 to 40 inches are limitations to most nonfarm uses. Capability unit IVe-5; woodland suitability group 3f2.

Berks-Rock outcrop complex, steep (BsF).—This complex is on the sides of valleys where streams have cut into the bedrock and on the sides of hills underlain by bedrock. Slope ranges from 18 to 60 percent.

About 60 percent of the complex is Berks soils and about 20 percent is very stony soils that are less than 20 inches deep over bedrock. Making up the remaining 20 percent are nearly vertical rock escarpments and rock outcrop.

The Berks soils have a profile similar to the one described as representative of the Berks series. The soils on the upper 5 to 15 feet of the hillsides are commonly more than 40 inches deep over bedrock. Included in this complex are some very narrow drainageways in which the streams run on solid rock. Along these drainageways rock fragments, gravelly deposits, and large sections of broken rock have accumulated at the base of hills.

Slope is the main limitation to use of this complex for farm or nonfarm purposes. Capability unit VIe-2; woodland suitability group 3f3.

Bogart Series

The Bogart series consists of nearly level to gently sloping, moderately well drained soils that formed in glacial outwash deposits. These soils are mostly on stream terraces and alluvial fans in the southern part of the county.

A representative profile of this series, in a cultivated field, has a dark grayish-brown silt loam plow layer 8 inches thick. The subsurface layer is 2 inches thick and is pale-brown silt loam. The subsoil is yellowish-brown silt loam between depths of 10 to 14 inches, yellowish-brown heavy silt loam mottled with grayish brown between depths of 14 and 22 inches, yellowish-brown light silty clay loam mottled with grayish brown between depths of 22 and 31 inches, and yellowish-brown gravelly loam mottled with yellowish brown between depths of 31 and 34 inches. The substratum, between depths of 34 and 60 inches, is yellowish-brown and grayish-brown, stratified very gravelly sandy loam and gravelly loamy sand.

Permeability is moderate in the upper 34 inches and rapid below. Available moisture capacity is medium, and runoff is slow. The root zone is deep, and it ranges from slightly acid to strongly acid. Natural drainage is generally adequate for crops, although these soils are seasonally wet for brief periods. Tilth is generally good.

Bogart soils are well suited to crops. The areas are used mostly for crops or improved pasture.

Representative profile of Bogart silt loam, 0 to 2 percent slopes, in a cultivated field, in the NE1/4 SW1/4 sec. 7, T. 19 N., R. 18 W. (Jefferson Township):

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

A2—8 to 10 inches, pale-brown (10YR 6/3) silt loam; weak, fine, subangular blocky structure; friable; medium acid; clear, wavy boundary.

B1—10 to 14 inches, yellowish-brown (10YR 5/4) silt loam; moderate, medium, subangular blocky structure; friable; strongly acid; clear, wavy boundary.

B21t—14 to 22 inches, yellowish-brown (10YR 5/4) heavy silt loam; common, coarse, faint mottles of grayish brown (10YR 5/2); moderate, fine, subangular blocky structure; friable; discontinuous brown (10YR 5/3) clay films on ped faces; strongly acid; gradual boundary.

B22t—22 to 31 inches, yellowish-brown (10YR 5/4) light silty clay loam; many, medium, faint mottles of grayish brown (10YR 5/2); moderate, fine, subangular blocky structure; firm; grayish-brown (10YR 5/2) and brown (10YR 5/3) clay films on ped faces; medium acid; clear, smooth boundary.

IIb3—31 to 34 inches, yellowish-brown (10YR 5/6) gravelly loam; common, coarse, faint mottles of yellowish brown (10YR 5/4) and common, medium, distinct mottles of grayish brown (10YR 5/2); weak, coarse, subangular blocky structure; friable; 20 percent gravel; slightly acid; clear, wavy boundary.

IIC—34 to 60 inches, mottled yellowish-brown (10YR 5/4) and grayish-brown (10YR 5/2), stratified very gravelly sandy loam and gravelly loamy sand; single grain; loose; few thin strata of loamy material; 60 percent gravel; slightly acid.

In uncultivated areas the A1 horizon is very dark grayish brown (10YR 3/2) or very dark brown (10YR 2/2) and is 1 to 5 inches thick. The A2 horizon is 2 to 6 inches thick in uncultivated areas, and 0 to 4 inches thick in cultivated areas. It is pale brown (10YR 6/3) or brown (10YR 5/4) and is not mottled. The A horizon is silt loam or loam, and the gravel content is 5 to 15 percent in the loam and less than 5 percent in the silt loam.

The B1 horizon is 2 to 8 inches thick. It is brown or yellowish-brown silt loam, loam, or gravelly loam and is free of mottles. The B2t horizon is 16 to 35 inches thick. It is typically stratified, and the matrix color has a hue of 10YR or 7.5YR, a value of 4 or 5, and a chroma of 3 to 6. The texture of this horizon is loam, gravelly loam, silt loam, or light silty clay loam. The gravel content ranges from almost none to 40 percent. Ped coatings, where present, have colors similar to those of the ped interiors. Part of the evidence of clay movement in the more gravelly strata is in the form of clay bridging between coarse fragments.

The C horizon is typically stratified. Texture is generally gravelly loam, very gravelly loam, very gravelly sandy loam or gravelly loamy sand, but it is either clean sand or gravel, or both, in places. The gravel content of the C horizon ranges from 25 to 80 percent but is commonly 40 to 60 percent. Individual strata are brown or yellowish brown and are friable, very friable, or loose. Mottling is evident in the more consolidated strata.

Reaction in the solum is medium acid or strongly acid. Reaction in the C horizon is slightly acid to strongly acid. No carbonates are within a depth of 60 inches.

Bogart soils are similar to Wheeling and Chili soils in texture but are mottled at a shallower depth and have poorer natural drainage. Bogart soils are similar to Fitchville soils, gravelly subsoil variant, in texture but have better natural drainage, are deeper to mottling, and have a browner, less gray subsoil. Bogart soils are more acid than Haney soils. They are more gravelly in and below the subsoil than Glenford soils.

Bogart loam, 0 to 2 percent slopes (BtA).—This soil is on terraces. Its profile differs from that described as representative of the series in having a loam surface layer and a loam or gravelly loam subsoil. The gravel content is 5 to 15 percent in the plow layer and 15 to 40 percent in the subsoil.

Included with this soil in mapping are spots of soils in which the subsoil is not mottled. Also included are spots of the Fitchville soils, gravelly subsoil variant, in shallow depressions and natural drainageways. A few other included spots of soils have a silt loam or gravelly loam surface layer.

If this soil is farmed, droughtiness is a moderate limitation. In most years, however, rainfall is timely and there is little or no damage to crops. Seasonal wetness is a limitation to some nonfarm uses. Capability unit IIs-1; woodland suitability group 2o1.

Bogart loam, 2 to 6 percent slopes (BtB).—This soil is on terraces and alluvial fans. Its profile differs from that described as representatvie of the series in having a loam surface layer and a loam or gravelly loam subsoil. The gravel content is 5 to 15 percent in the plow layer and 15 to 40 percent in the subsoil.

Included with this soil in mapping are a few areas of soils that have a gravelly loam surface layer and a few small areas of soils that have glacial till or weathered rock at a depth of 3 to 5 feet. Also included in some low spots are somewhat poorly drained Fitchville soils, gravelly subsoil variant. Included in some areas around seeps and springs are soils that are grayer and more mottled than this soil.

If this soil is farmed, the hazard of erosion is moderate. It tends to be droughty, but generally rainfall is timely, and there is little or no damage to crops. Seasonal wetness and slope are limitations to some nonfarm uses. Capability unit IIe-1; woodland suitability group 2o1.

Bogart silt loam, 0 to 2 percent slopes (BvA).—This soil is on terraces. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of Fitchville soils, gravelly subsoil variant, in depressions and low spots. Also included are a few areas of Bogart soil that has a loam surface layer.

This soil has few limitations for farming. Seasonal wetness is a slight limitation to some nonfarm uses. Capability unit I-1; woodland suitability group 2o1.

Bogart silt loam, 2 to 6 percent slopes (BvB).—This soil is on terraces and in a few valleys on till plains.

Included with this soil in mapping are spots of the somewhat poorly drained Fitchville soils, gravelly subsoil variant, in depressions and low areas and along natural drainageways. Also included are spots of the well-drained Wheeling soils on some of the higher knobs. In a few small areas of these soils, depth to sandy or gravelly material is less than 20 inches and in many others it is more than 40 inches. Also included are a few areas of the more gravelly Chili and Bogart soils that have a loam surface layer.

If this soil is farmed, the hazard of erosion is moderate. Seasonal wetness and slope are limitations to some nonfarm uses. Capability unit IIe-2; woodland suitability group 2o1.

Canfield Series

The Canfield series consists of nearly level to sloping, moderately well drained soils. These soils formed in glacial till that was originally low in content of lime. They have a fragipan that restricts the downward movement of water. Canfield soils are in the southwestern and central parts of the county.

A representative profile of this series, in a wooded area, has a very dark grayish-brown silt loam surface layer 3 inches thick. The subsurface layer is also silt loam, 3 inches thick, but it is brown. Beginning at a depth of 6 inches, the subsoil extends to a depth of 50 inches. In sequence, the color and texture of the subsoil are yellowish-brown silt loam to a depth of 10 inches; yellowish-brown loam mottled with grayish brown to a depth of 22 inches; yellowish-brown, very firm loam mottled with gray to a depth of 34 inches; yellowish-brown, very firm loam mottled with grayish brown and strong brown to a depth of 45 inches; and yellowish-brown loam mottled with grayish brown and strong brown to a depth of 50 inches. The substratum, between depths of 50 and 60 inches, is yellowish-brown loam mottled with yellowish red. Many small pebbles and a few stones are throughout the profile.

Permeability is slow in the fragipan. Available moisture capacity is medium. Runoff is moderate. The root zone is only moderately deep because the depth is restricted by the dense fragipan. Reaction in the root zone is strongly acid or medium acid. Natural drainage is generally adequate for crops, but there are brief periods of seasonal wetness.

The use of Canfield soils depends to some extent on their slope and degree of erosion. In general, they are well suited to crops, and much of the acreage is used for crops, mainly corn, soybeans, and small grain. Smaller acreages are used for trees or permanent pasture.

Representative profile of Canfield silt loam, 2 to 6 percent slopes, in a wooded area, in the NW1/4NW1/4 sec. 13, T. 19 N., R. 19 W. (Perry Township) (laboratory data sample profile given in section "Laboratory Test Data"):

A1—0 to 3 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, medium, granular structure; friable; strongly acid; clear, wavy boundary.

A2—3 to 6 inches, brown (10YR 5/3) silt loam; weak, medium, platy structure; friable; strongly acid; clear, irregular boundary.

B1—6 to 10 inches, yellowish-brown (10YR 5/4) silt loam; weak, fine, subangular blocky structure; friable; strongly acid; gradual, smooth boundary.

B2t—10 to 22 inches, yellowish-brown (10YR 5/6) loam; few, fine, distinct, grayish-brown (10YR 5/2) mottles; weak, medium, subangular blocky structure; firm; thin, patchy, brown (10YR 5/3) clay films on ped faces; few fine pebbles; strongly acid; clear, wavy boundary.

Bx1—22 to 34 inches, yellowish-brown (10YR 5/4) loam; many, coarse, faint, yellowish-brown (10YR 5/6) mottles and common, medium, distinct, gray (10YR 5/1) mottles; weak, very coarse, prismatic structure that parts to weak, fine, subangular blocky structure; very firm, brittle; brown (10YR 5/3) clay films and light brownish-gray (10YR 6/2) silt coatings on ped faces; clay films increase and silt coatings decrease in amount and thickness with depth; 8 percent pebbles; strongly acid; clear, smooth boundary.

Bx2—34 to 45 inches, yellowish-brown (10YR 5/4) loam; many, coarse, faint, yellowish-brown (10YR 5/6) mottles and grayish-brown (10YR 5/2) mottles and common, medium, prominent, strong-brown (7.5YR 5/8) mottles; moderate, very coarse, prismatic structure that parts to moderate, medium, platy structure; very firm, brittle; thick, dark grayish-brown (10YR 4/2) clay films on prism faces; common, medium, distinct, very dark grayish-brown manganese stains in ped interiors; 8 percent pebbles; medium acid; clear, wavy boundary.

B3—45 to 50 inches, yellowish-brown (10YR 5/4) loam; common, medium, faint, grayish-brown (10YR 5/2) mottles and few, fine, prominent, strong-brown

(7.5YR 5/8) mottles; weak, medium, platy structure; friable; few dark grayish-brown (10YR 4/2) clay films; neutral; 10 percent pebbles; clear, wavy boundary.

C—50 to 60 inches, yellowish-brown (10YR 5/4) loam; common, medium, prominent, light-gray (10YR 7/2) lime concretions; few, fine, prominent, yellowish-red (5YR 5/8) mottles; massive; friable; 10 percent pebbles and small stones; mildly alkaline, weakly calcareous.

In cultivated areas, the Ap horizon is dark grayish-brown (10YR 4/2) silt loam. The A2 horizon is absent in most cultivated areas, but it is as thick as 6 inches in some uncultivated areas. The A horizon is typically silt loam or loam.

The B1 horizon is 3 to 8 inches thick. In some areas it contains silt coatings. The B2t horizon, which is above the fragipan, is 8 to 16 inches thick. Its color has a hue of 10YR, a value of 4 or 5, and a chroma of 4 to 6. The texture is loam or silt loam.

The ped interiors are brown (10YR 4/3), dark yellowish brown (10YR 4/4), or yellowish brown (10YR 5/4 or 5/6), and have mottles of a low chroma. The exteriors of the polygons or prisms are coated with dark grayish-brown (10YR 4/2) or grayish-brown (10YR 5/2) clay films. The fragipan is at a depth of 15 to 28 inches and is 15 to 30 inches thick. Light brownish-gray (10YR 6/2) or pale-brown (10YR 6/3) silt coatings are present in the upper part of the fragipan in many areas. The fragipan commonly contains dark-colored manganese stains or concretions. The texture of the fragipan is loam or silt loam.

A B3 horizon, 4 to 8 inches thick, is below the fragipan in most areas. The underlying till is loam or silt loam.

Reaction in and above the fragipan is strongly acid or very strongly acid. Acidity decreases below the fragipan. Carbonates are at a depth of 44 to 70 inches. Reaction at a depth of 60 inches is slightly acid to mildly alkaline where the till is not calcareous. Coarse fragments make up 5 to 15 percent of the soil volume in and below the fragipan.

Canfield soils are similar to Wooster and Ravenna soils in texture. They have gray mottles at a shallower depth, have poorer natural drainage, and are in lower or more concave positions than Wooster soils. They have a browner and less gray subsoil, better natural drainage than Ravenna soils, and they are generally in higher positions. Canfield soils are lower in clay content than Rittman soils, especially in the subsoil. They are less gravelly than Bogart soils and have a denser and more gravelly subsoil than Glenford soils. Canfield soils are similar to Titusville soils, but they are not acid to as great a depth.

Canfield silt loam, 2 to 6 percent slopes (CdB).—Most areas of this soil are on hilltops. A small acreage is at the base of steeper hillsides and in the bottom of narrow draws that have small streams of water for brief periods. This soil has the profile described as representative of the series.

Included with this soil in mapping are small spots of the somewhat poorly drained Ravenna soils and poorly drained Frenchtown soils that are wetter and grayer than this soil. These soils are generally in the lower part of draws and around springs and seeps. Also included are a few very small areas of soils that have weathered bedrock within a depth of 40 inches; a few small areas of soils that are stony or bouldery; a few areas of soils that have slopes of 1 to 2 percent; and many areas of soils, below steeper areas and in narrow draws, that have gravel in the lower part of their subsoil.

If this soil is farmed, the hazard of erosion is moderate. Slow permeability is a limitation to many nonfarm uses. Capability unit IIe-5; woodland suitability group 1ol.

Canfield silt loam, 2 to 6 percent slopes, moderately eroded (CdB2).—This soil is on hillsides. Erosion has removed a part of the surface layer, and the plow layer is a mixture of material originally in the surface layer and the subsoil. The degree of erosion varies greatly within small areas. The color of the surface layer ranges from very dark grayish brown in the least eroded places to brown or yellowish brown where erosion is greater. Below the plow layer, this soil has a profile similar to that described as representative of the series.

Included with this soil in mapping are small areas of the somewhat poorly drained Ravenna soils in depressions and along natural drainageways and around springs and seeps. Also included are small areas of soils that have slopes of slightly more than 6 percent. These soils are more eroded than this soil.

This soil is not so well suited to crops as the less eroded Canfield soil that has the same gradient of slope. It has slower permeability, faster runoff, and less depth to the restricting fragipan than the less eroded soil. If this soil is farmed, the hazard of erosion is moderate. Slow permeability is a limitation to many nonfarm uses. Capability unit IIe-5; woodland suitability group 1ol.

Canfield silt loam, 6 to 12 percent slopes (CdC).—Most areas of this soil are on the lower sides of small valleys that carry a small flow of water during the wettest time of the year. A few areas, however, are on hilltops, and these areas are periodically wet because they receive runoff and seepage from steeper areas.

Included with this soil in mapping are some areas of soils that have a thin layer of gravel or broken rock below a depth of 30 inches. Also included on the bottom of valleys and around springs and seeps are areas of soil that are grayer than this soil and a few areas of lighter colored, eroded soils on hilltops.

If this soil is farmed, the hazard of erosion is severe. Slope, seasonal wetness, and slow permeability are limitations to many nonfarm uses. Capability unit IIIe-4; woodland suitability group 1ol.

Canfield silt loam, 6 to 12 percent slopes, moderately eroded (CdC2).—This soil is in areas that are subject to seepage. Erosion has removed a part of the surface layer, and the plow layer is light grayish brown. It is a mixture of the material originally on the surface layer and that from the subsoil. The degree of erosion differs greatly within small areas, and the color of the surface layer ranges from dark grayish brown in the least eroded spots to brown or yellowish brown in the most eroded. Below the plow layer, the profile of this soil is similar to the one described as representative of the series.

Included with this soil in mapping are spots of the well-drained Wooster soils, which are not mottled in the upper part of the subsoil. Also included are a few spots of wet soils around seeps.

Depth to the fragipan is slightly less in this Canfield soil than in uneroded Canfield soils, and runoff is slightly faster, permeability is slightly slower, and tilth is somewhat poorer.

If this soil is farmed, the hazard of erosion is severe. Slope, seasonal wetness, and slow permeability are limitations to many nonfarm uses. Capability unit IIIe-4; woodland suitability group 1ol.

Cardington Series

The Cardington series consists of gently sloping to sloping, moderately well drained soils that formed in glacial till. These soils are on till plains in the northern part of the county.

A representative profile of this series, in a cultivated field, has a dark grayish-brown silt loam plow layer 8 inches thick. The upper part of the subsoil, between depths of 8 and 15 inches, is yellowish-brown silt loam. The lower part, between depths of 15 and 34 inches, is yellowish-brown silty clay loam mottled with grayish brown. The substratum, between depths of 34 and 60 inches, is yellowish-brown clay loam mottled with grayish brown. There are a few pebbles throughout the profile.

Permeability is moderately slow, and available moisture capacity is medium. Runoff is moderate to rapid. The water table is high in winter and in spring. Natural drainage is generally adequate for crops, although these soils are wet for brief periods. The root zone is moderately deep, and it is very strongly acid in the upper part and neutral or mildly alkaline in the lower part.

Most areas of Cardington soils are used for crops, mainly corn, soybeans, small grain, and hay.

Representative profile of Cardington silt loam, 2 to 6 percent slopes, in a cultivated field, in the SE1/4 NE1/4 sec. 14, T. 22 N., R. 19 W. (Jackson Township) (laboratory data sample RC-9):

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

B1—8 to 15 inches, yellowish-brown (10YR 5/4) silt loam; moderate, medium, subangular blocky structure; firm; few, pale-brown (10YR 6/3), degradational silt coatings on ped surfaces; 2 percent pebbles; very strongly acid; diffuse, wavy boundary.

B21t—15 to 25 inches, yellowish-brown (10YR 5/4) silty clay loam; few, fine and medium, distinct, grayish-brown (10YR 5/2) mottles; strong, medium, angular blocky structure; firm; brown (10YR 5/3) clay coatings on ped faces; 3 percent pebbles; very strongly acid; clear, wavy boundary.

B22t—25 to 34 inches, yellowish-brown (10YR 5/4) heavy silty clay loam; common, fine, distinct, grayish-brown (10YR 5/2) mottles; strong, fine, angular blocky structure; firm; brown (10YR 4/3) clay films on ped faces; 3 percent pebbles; strongly acid; clear, wavy boundary.

C—34 to 60 inches, yellowish-brown (10YR 5/4) clay loam; common, medium, faint, yellowish-brown (10YR 5/6) and grayish-brown (10YR 5/2) mottles; massive; firm; 5 percent pebbles; few white lime blotches; mildly alkaline, strongly calcareous.

In uncultivated areas an A1 horizon is very dark grayish brown (10YR 3/2) and is 1 to 4 inches thick. An A2 horizon is present in uncultivated areas and in some cultivated areas. It is 2 to 6 inches thick and is typically brown (10YR 5/3) to pale-brown (10YR 6/3), friable silt loam that has weak, platy or subangular blocky structure.

The B2t horizon has a total thickness of 12 to 30 inches. It is typically heavy silty clay loam in texture, but individual subhorizons range from clay loam to light silty clay. The color of ped interiors has a hue of 10YR or 7.5YR, a value of 4 or 5, and a chroma of 4 to 6. Degradational silt coatings are present in the upper part of the B2t horizon in some areas. In some areas a B3 horizon, 2 to 8 inches, thick is below the B2t horizon.

Reaction is medium acid to very strongly acid in the upper part of the B horizon and strongly acid to neutral in the lower part.

Depth to the calcareous C horizon is 27 to 44 inches. The C horizon is glacial till of clay loam or silty clay loam texture. Small pebbles are present in all horizons and typically make up 2 to 10 percent of the soil volume.

Cardington soils are intermediate in natural drainage between the well-drained Alexandria soils and the somewhat poorly drained Bennington soils and are similar to these soils in texture. Cardington soils are mottled at a shallower depth than Alexandria soils. They are less gray than Bennington soils, and their subsoil is browner. Their subsoil has a higher clay content than that of Rittman soils, and they lack the dense fragipan that is in the subsoil of those soils. Cardington soils are more clayey, more pebbly, and less silty than Glenford soils, and they are less gravelly than Haney soils.

Cardington silt loam, 2 to 6 percent slopes (CgB).—This soil is on till plains. It is mainly on small knolls that rise above surrounding wetter soils. Large areas, however, adjoin the valleys of the Black Fork and Brubaker Creek. This soil has the profile described as representative of the series.

Included with this soil in mapping are a few small areas of moderately eroded soils that have a lighter colored surface layer than this soil; a few spots of soils in the northern part of Plymouth Township that have a reddish color when plowed; small areas of the somewhat poorly drained Bennington soils in low places and along minor natural drainageways, mainly where slopes are undulating; and a few spots of the well-drained Alexandria soils on the higher knolls. Also included are some areas of soils that have pockets or thin layers of gravel or silt below a depth of 3 feet, especially adjoining the valleys of the Black Fork and Brubaker Creek; and a few spots of soils that have a gravelly surface layer.

If this soil is farmed, the hazard of erosion is moderate. Moderately slow permeability and seasonal wetness are limitations to some nonfarm uses. Capability unit IIe-3; woodland suitability group 2o1.

Cardington silt loam, 2 to 6 percent slopes, moderately eroded (CgB2).—This soil is on till plains. A part of the surface layer has been removed by erosion and the plow layer consists of a mixture of material originally in the surface layer and that from the subsoil. The color of the plow layer ranges from dark grayish brown in the least eroded spots to brown or yellowish brown where erosion is greater. The profile below the plow layer is similar to that described as representative of the series.

Included with this soil in mapping are small areas of the somewhat poorly drained Bennington soils in low spots and along minor natural drainageways, mostly in undulating areas. Also included are a few areas of well-drained Alexandria soils in high places, some areas of soils that have pockets of gravel or silt below a depth of 3 feet, and a few spots of gravelly soils.

This soil has poorer tilth than the uneroded Cardington soil, and it is not so well suited to crops. The irregular shape of some of the slopes hinders the application of erosion-control practices.

If this soil is farmed, the hazard of further erosion is moderate. Moderately slow permeability and seasonal wetness are limitations to some nonfarm uses. Capability unit IIe-3; woodland suitability group 2o1.

Cardington silt loam, 6 to 12 percent slopes (CgC).—This soil is on till plains. Most areas are on small, isolated hills or on the sides of natural drainageways.

Included with this soil in mapping are a few spots of eroded soils that have a lighter colored surface layer than this soil. Also included are a few areas of the somewhat poorly drained Bennington soils that occupy positions below this soil, a few areas of well-drained Alexandria soils that occupy higher positions, and some areas of soils that have pockets of silt and gravel below a depth of 3 feet. A few spots of soils that have a gravelly surface layer; some soils, on bottom lands, along narrow natural drainageways, that are similar to Pewamo, Holly, and Shoals soils; and a few wet soils around springs and seeps are other inclusions.

If this soil is farmed, the hazard of erosion is moderate. Slope and moderately slow permeability are limitations to many nonfarm uses. Capability unit IIIe-1; woodland suitability group 2o1.

Cardington silt loam, 6 to 12 percent slopes, moderately eroded (CgC2).—This soil is on till plains. Most areas are on the sides of minor natural drainageways. A few areas are on knolls and ridges. Erosion has removed a part of the surface layer, and the plow layer consists of a mixture of material originally in the surface layer and that from the subsoil. The color of the plow layer generally is light gray and brown, but it ranges from dark grayish brown in the least eroded areas to yellowish brown where erosion is greater. The profile below the plow layer is similar to the one described as representative of the series.

Included with this soil in mapping are small areas of the somewhat poorly drained Bennington soils that occupy positions below this soil, small areas of well-drained Alexandria soils that occupy higher positions and areas of soils that have pockets of silt, sand, or gravel below a depth of 3 feet. Also included are a few areas of soils that have a gravelly surface layer and a few areas of soils that have gravel in the upper 2 feet. On bottom lands, along some narrow natural drainageways, areas of soils that are similar to Pewamo soils are included.

If this soil is farmed, the hazard of further erosion is severe. Slope and moderately slow permeability are limitations to many nonfarm uses. Capability unit IIIe-1; woodland suitability group 2o1.

Cardington silty clay loam, 6 to 12 percent slopes, severely eroded (ChC3).—This soil is on till plains. Most areas are on the sides of minor natural drainageways. A few areas are on knolls and ridges. Erosion has removed most of the surface layer, and the plow layer consists mainly of silty clay loam from the subsoil. The dominant color of the plow layer is brown or yellowish brown, but in less eroded spots the plow layer is grayish-brown silt loam. The profile below the plow layer is similar to the one described as representative of the series.

Included with this soil in mapping are areas of soils that have pockets of silt, sand, or gravel below a depth of 3 feet. Also included on bottom lands along some narrow natural drainageways are areas of soils that are similar to Pewamo soils.

This Cardington soil has poorer tilth and a lower content of organic matter than less eroded Cardington soils. Runoff is rapid, and if this soil is cultivated, further erosion is a hazard. Slope and moderately slow permeability are limitations to many nonfarm uses. Capability unit IVe-3; woodland suitability group 2o1.

Carlisle Series

The Carlisle series consists of dark-colored, very poorly drained, organic soils. These soils formed in muck and peat deposits, more than 51 inches thick, under lowland hardwood trees and marshgrass. They are in basinlike areas on till plains, moraines, and flood plains, mainly in the northern and central parts of the county.

A representative profile of this series, in a cultivated field, consists of black muck to a depth of 31 inches. Below is very dark brown muck that extends to a depth of 60 inches. Some partly decomposed plant material can be recognized.

Permeability is moderately rapid, and available moisture capacity is very high. Runoff is very slow. Some areas are ponded in winter and in spring, and the water table is generally at or near the surface for extended periods. Artificial drainage is needed before these soils can be cultivated. If these soils are drained they are well suited to crops. They are very high in content of organic matter and have good tilth. Soil blowing is a slight hazard in large areas that are drained.

Some of the large areas and a few small pockets are drained artificially and are used for vegetable and field crops. Many of the small pockets are undrained and are not farmed.

Representative profile of Carlisle muck, in a cultivated field, in the NW1/4SW1/4 sec. 23, T. 23 N., R. 19 W. (Cass Township):

Oap—0 to 8 inches, sapric material; black (10YR 2/1) on broken faces; no fiber evident before or after rubbing; moderate, medium, granular structure; friable; about 35 percent mineral material; slightly acid; clear, smooth boundary.

Oa2—8 to 18 inches, sapric material; black (10YR 2/1) on broken faces and rubbed; moderate, coarse, subangular blocky structure; somewhat brittle; about 30 percent mineral material; neutral; clear, smooth boundary.

Oa3—18 to 31 inches, sapric material; black (10YR 2/1) on broken faces, very dark brown (10YR 2/2) rubbed; about 15 percent fiber, less than 2 percent rubbed; weak, coarse, angular blocky structure; friable; about 25 percent mineral material; neutral; clear, smooth boundary.

Oa4—31 to 43 inches, sapric material; very dark brown (10YR 2/2) on broken faces and rubbed; about 25 percent fiber, about 5 percent rubbed; massive; friable; about 20 percent mineral material; neutral; clear, smooth boundary.

Oa5—43 to 60 inches, sapric material very dark brown (10YR 2/2) on broken faces and rubbed; about 35 percent fiber, 5 to 10 percent when rubbed; massive; friable; about 15 percent mineral material; mildly alkaline.

The thickness of organic material is at least 51 inches. Reaction in the subsurface layer (12 to 36 inches) is neutral to mildly alkaline.

The surface and subsurface layers (upper 36 inches) consist of sapric (decomposed) organic material. The color of this material has a hue of 10YR or 7.5YR, a value of 2 or 3, and a chroma of 0 to 3. On rubbing, the value of the color increases by one unit or less. The fiber content in the subsurface layer is 5 to 30 percent before rubbing and less than

10 percent after rubbing. The surface layer is 30 to 50 percent mineral soil material, and the subsurface layer is 20 to 35 percent mineral soil material.

The bottom layer is dominantly sapric organic material but contains thin layers of less decomposed, or hemic, material in some areas. Limnic material is present below a depth of 6 to 10 feet in some areas.

Carlisle soils are similar to Linwood soils in that they have a surface layer of muck. The muck and peat layers are more than 51 inches thick in Carlisle soils and 20 to 51 inches thick in Linwood soils. Carlisle soils have a muck surface layer, whereas Wallkill soils have a mineral surface layer over muck or peat. Carlisle soils differ from Sloan, Luray, Pewamo, and other dark-colored soils in having a muck, rather than a mineral, surface layer.

Carlisle muck (Ck).—This nearly level soil is in depressions on till plains, moraines, and flood plains. Included with this soil in mapping are a few areas of soils in which the organic deposit is less than 51 inches thick. Most of these included soils are toward the edges of the muck areas.

If this soil is farmed, wetness is a severe limitation. Wetness is a limitation to most nonfarm uses. Capability unit IIIw-2; woodland suitability group 5wl.

Chili Series

The Chili series consists of gently sloping to very steep, well-drained soils that formed in outwash deposits. The largest areas of Chili soils are on terraces along the sides of valleys in the southern part of the county.

A representative profile of this series, in a cultivated field, has a dark grayish-brown loam plow layer about 7 inches thick. The upper part of the subsoil, between depths of 7 and 10 inches, is yellowish-brown loam; the lower part of the subsoil, between depths of 10 and 44 inches, is strong-brown gravelly loam. The substratum, between depths of 44 and 60 inches, is yellowish-brown, stratified loamy sand and gravel.

Available moisture capacity is low, and permeability is moderately rapid. Runoff is slow to moderate. Crops occasionally are damaged by a lack of available moisture in dry years. Tilth is generally good, and the root zone is moderately deep.

The areas of Chili soils that are gently sloping to sloping are used for crops. The principal crops are corn, soybeans, small grain, and hay. Chili soils are a potential source of sand and gravel.

Representative profile of Chili loam. 2 to 6 percent slopes, in a cultivated field, in the NW1/4NE1/4 sec. 5, T. 20 N,. R. 19 W. (Troy Township):

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) loam; weak, fine, crumb structure; friable; medium acid; abrupt, smooth boundary.

B1—7 to 10 inches, yellowish-brown (10YR 5/4) loam; weak, medium, subangular blocky structure; friable; 10 percent gravel; strongly acid; clear, wavy boundary.

B21t—10 to 16 inches, strong-brown (7.5YR 5/6) gravelly loam; weak, coarse, subangular blocky structure; friable; moderately thick, patchy, yellowish-brown (10YR 5/4) clay films on ped faces; 15 percent gravel; strongly acid; clear, smooth boundary.

B22t—16 to 28 inches, strong-brown (7.5YR 5/6) gravelly loam; very weak, medium, subangular blocky structure; friable; few, patchy, yellowish-brown (10YR 5/4) clay films on ped faces; coarse fragments coated and bridged with clay; 25 percent gravel; strongly acid; clear, smooth boundary.

B3—28 to 44 inches, strong-brown (7.5YR 5/6) gravelly loam; massive; very friable; few coarse fragments bridged with clay; 40 percent gravel; strongly acid; clear, smooth boundary.

C—44 to 60 inches, yellowish-brown (10YR 5/4), stratified loamy sand and gravel; single grain; loose; 40 percent gravel; 15 percent silt and clay; medium acid.

The Ap horizon is dark grayish brown (10YR 4/2) or dark brown (10YR 4/3). In uncultivated areas the A1 horizon is very dark grayish brown (10YR 3/2) or very dark brown (10YR 2/2). This horizon is loam or gravelly loam and is less than 25 percent gravel. An A2 horizon is present in some areas and is as much as 5 inches thick in some uncultivated areas. The texture is similar to that of the A1 and Ap horizons. The A2 horizon is brown (10YR 5/3) and is free of mottles.

The B1 horizon is 2 to 8 inches thick and is brown or yellowish-brown loam or gravelly loam that is 10 to 30 percent gravel. The B2t horizon is 18 to 30 inches thick. Its color has a hue of 10YR or 7.5YR, a value of 4 or 5, and a chroma of 4 to 6. It is gravelly loam or gravelly sandy clay loam and is 15 to 35 percent gravel.

The C horizon is highly stratified. It varies in texture and is 40 to 80 percent gravel. Individual strata vary widely in content and size of gravel. The C horizon ranges from gravelly loam and gravelly sandy loam to clean sand or gravel. The gravel in all horizons consists mainly of rounded sandstone fragments. The C horizon is typically brown or yellowish brown, but adjacent strata differ.

Reaction is strongly acid to medium acid in the solum and slightly acid in the C horizon. Depth to carbonates is more than 60 inches.

Chili soils are similar to Bogart soils in texture, but they have better natural drainage and are free of mottles to a greater depth. Chili soils are also similar to Belmore soils in texture, but they are more acid. The upper part of Chili soils is more gravelly and less silty than that of Wheeling soils. Chili soils resemble Conotton soils but have a less gravelly subsoil. Chili and Conotton soils that have slopes of more than 12 percent are mapped together. Chili soils are more gravelly than Wooster and Hanover soils and lack their dense fragipan.

Chili loam, 2 to 6 percent slopes (CnB).—This soil is mainly on terraces along the valleys of major streams. A few areas are on till plains and in higher valleys. This soil has the profile described as representative of the series.

Included with this soil in mapping are a few small areas of eroded soils that have a light-brown surface layer. Most of these soils have a surface layer of gravelly loam. Also included are small areas of moderately well drained Bogart soils and somewhat poorly drained Fitchville soils, gravelly subsoil variant, in low spots, depressions, and minor natural drainageways. Small areas of Wheeling soils and a few higher areas of soils that have broken rock or glacial till at a depth of 3 to 5 feet are included.

If this soil is farmed, the hazard of erosion is moderate. This soil is somewhat droughty. Except for slope, it has few limitations for many nonfarm uses. Capability unit IIe-1; woodland suitability group 2ol.

Chili loam, 6 to 12 percent slopes (CnC).—This soil is on terraces and sides of valleys. It is mainly in narrow strips that separate less strongly sloping areas on terraces.

Included with this soil in mapping are areas of soils that have a gravelly loam surface layer. Also included are a few areas of severely eroded soils that have a

light-brown surface layer; these areas are shown on the map by the erosion symbol. The surface layer in most areas of these eroded soils is gravelly loam. Spots of the more gravelly Conotton soils and the less gravelly, more silty Wheeling soils are included. Moderately well drained Bogart soils are included in some low areas and around seeps and springs. A few areas of soils that are underlain by broken rock or by glacial till at a depth of 3 to 5 feet are also included.

If this soil is farmed, the hazard of erosion is severe. Slope is a limitation to many nonfarm uses. Capability unit IIIe-2; woodland suitability group 2o1.

Chili and Conotton soils, 12 to 18 percent slopes (CoD).—These soils are on the sides of valleys and on isolated hills and kames. The areas vary in size. Both Chili and Conotton soils are in most of the mapped areas. Chili soils are the major soils in some areas and Conotton soils in others; there is no set pattern. A few areas are entirely Chili soils, and a few are entirely Conotton soils.

Included with these soils in mapping are a few areas of eroded soils that have a light-brown surface layer and some areas of soils that have broken rock at a depth of 4 to 5 feet. Also included around a few seeps and springs are soils that are grayer and more mottled than Chili and Conotton soils.

Most large areas of Chili and Conotton soils are in permanent pasture or trees, but some of the smaller ones are cultivated along with other soils. Some areas are a potential source of gravel for commercial purposes.

If these soils are farmed, the hazard of erosion is very severe. Slope is a limitation to most nonfarm uses. Capability unit VIe-3; woodland suitability group 3f2.

Chili and Conotton soils, 12 to 18 percent slopes, severely eroded (CoD3).—These soils are on the sides of valleys and on isolated hills and kames in stream valleys. Most areas are small. Erosion has removed most of the original surface layer, and the plow layer consists mainly of material from the subsoil. It is brown gravelly or very gravelly loam or sandy loam. Both Chili and Conotton soils are in most of the mapped areas. Chili soils are the major soils in some areas, and Conotton soils in others; there is no set pattern. A few areas are entirely Chili soils, and a few are entirely Conotton soils.

Included with these soils in mapping are small areas of less eroded soils that have a darker surface layer than these soils. Also included are some areas of soils that have broken rock at a depth of 3 to 5 feet. Included around some seeps and springs are soils that are grayer and more mottled than is typical of Chili or Conotton soils.

Most areas of these Chili and Conotton soils are used for crops or were formerly used for crops. Some areas are a potential source of gravel for commercial purposes.

These soils are poorly suited to crops because of droughtiness and a very severe hazard of erosion. Further erosion can be expected if the soils are not protected by vegetation. Slope is a limitation to most nonfarm uses. Capability unit VIIe-2; woodland suitability group 3f2.

Chili and Conotton soils, 18 to 25 percent slopes (CoE).—These soils are mainly in long, narrow areas and are on the sides of valleys and on isolated knolls and kames. Most areas have been protected from erosion by vegetation. A few small areas are eroded, and the soils in these areas have a light grayish-brown surface layer. Both Chili and Conotton soils are in most of the mapped areas. Chili soils are the major soils in some areas, and Conotton soils in others; there is no set pattern. Some areas are entirely Chili soils and some are entirely Conotton soils.

Included with these soils in mapping are a few areas of soils that have broken rock at a depth of 3 to 5 feet. Also included around some seeps and springs are soils that are grayer and more mottled than is typical of Chili or Conotton soils.

Most areas of Chili and Conotton soils are in permanent pasture or trees. Some areas are a potential source of gravel for commercial purposes.

These soils are generally too steep for cultivation but are suited to improved pasture and woodland. Slope is a limitation to most nonfarm uses. Capability unit VIIe-2; woodland suitability group 3f2.

Chili and Conotton soils, 25 to 40 percent slopes (CoF).—These soils are on the sides of valleys. Areas are long and narrow. Most areas are protected from erosion by plant cover but a few are eroded, and the soils have a light-brown surface layer. Both Chili and Conotton soils are in most of the areas mapped. Chili soils predominate in some areas, Conotton soils in others; there is no set pattern. A few areas are entirely Chili soils, and some are entirely Conotton soils.

Included with these soils in mapping are spots of the less gravelly Wheeling, Wooster, and Loudonville soils. Also included are some areas of soil that have broken rock at a depth of 3 to 5 feet. Around a few seeps and springs are included soils that are grayer and more mottled than is typical of Chili or Conotton soils. In some vertical banks severely eroded soils are exposed.

Most areas of these Chili and Conotton soils are in permanent pasture or trees. Some areas are a potential source of gravel for commercial purposes.

These soils are too steep for cultivation. They are suitable for improved pasture and woodland. Slope is a limitation to most nonfarm uses. Capability unit VIIe-2; woodland suitability group 3f2.

Condit Series

The Condit series consists of nearly level, poorly drained soils that formed in glacial till. These soils are in depressions and low, level areas on till plains in the northern part of the county.

A representative profile of this series, in a cultivated field, has a dark grayish-brown silt loam plow layer 9 inches thick. The subsoil is firm silty clay loam and is 41 inches thick. The upper 21 inches of the subsoil is dark gray mottled with yellowish brown. The lower part is grayish brown mottled with yellowish brown. The substratum, between depths of 50 and 60 inches, is mottled yellowish-brown and grayish-brown clay loam glacial till. A few pebbles are throughout the profile.

Permeability is slow, and available moisture capacity is high. Runoff is slow, and many areas are ponded for

extended periods in winter and in spring. Artificial drainage is needed for most crops.

Condit soils have poor tilth and are poorly suited to crops, even if drained. The areas are used for crops, pasture, and trees.

Representative profile of Condit silt loam in a cultivated field in the SW1/4SW1/4 sec. 6, T. 22 N., R. 18 W. (Franklin Township):

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

B21tg—9 to 19 inches, dark-gray (10YR 4/1) heavy silty clay loam; common, coarse, distinct mottles of yellowish brown (10YR 5/6) and common, fine, prominent mottles of dark brown (7.5YR 4/4); weak, coarse, prismatic structure that parts to moderate, fine, subangular blocky structure; firm; very dark gray (10YR 3/1) organic clay coatings on ped faces; few fine pebbles; medium acid; clear, wavy boundary.

B22tg—19 to 30 inches, dark-gray (10YR 4/1) heavy silty clay loam; many, medium and coarse, prominent mottles of yellowish brown (10YR 5/6); weak, medium, prismatic structure that parts to weak, medium, angular blocky structure; firm; thick, continuous, gray (10YR 5/1) clay films on ped surfaces; few fine pebbles; medium acid; gradual boundary.

B23tg—30 to 50 inches, grayish-brown (10YR 5/2) silty clay loam; many, coarse, faint and distinct, mottles of yellowish brown (10YR 5/4 and 5/6); weak, coarse, prismatic structure that parts to weak, medium, subangular blocky structure; firm; thick, discontinuous, dark-gray (5Y 4/1) clay films on prisms; 5 percent pebbles; neutral; gradual boundary.

C—50 to 60 inches; mottled yellowish-brown (10YR 5/4) and grayish-brown (10YR 5/2) clay loam; massive; firm; 5 percent pebbles; weakly calcareous; mildly alkaline.

The Ap horizon is dark grayish brown (10YR 4/2) or dark gray (10YR 4/1). In uncultivated areas, an A1 horizon is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2) and is 2 to 5 inches thick. Texture of the A1 or Ap horizon is silt loam or silty clay loam. In some profiles a 2-inch to 6-inch A2g horizon is present. It is dark gray (10YR 4/1) or gray (10YR 5/1) and has mottles of a high chroma.

The B2t horizon is 30 to 44 inches thick and has a texture of heavy silty clay loam, clay loam, or light silty clay. In the part of the B2t horizon above a depth of 30 inches, the color of ped interiors has a hue of 5Y to 10YR, a value of 4 or 5, and a chroma of 1 or 2. In some areas the color of some parts of the B2t horizon below a depth of 30 inches has a chroma of 3 or 4. Ped surfaces are coated with a mixture of organic material and clay films. The color of these coatings has a hue of 5Y to 10YR, a value of 3 to 5, and a chroma of 1 or 2.

In some areas there is a B3 horizon that is leached of carbonates and shows structure development.

The calcareous C horizon is at a depth of 40 to 54 inches. It is firm clay loam or silty clay loam till.

Reaction is medium acid to strongly acid in the upper part of the B horizon and grades to neutral or slightly acid at the bottom of the B2t or B3 horizon.

Condit soils are similar to Bennington soils in texture but are more poorly drained and have a higher proportion of gray color in their subsoil. They are also similar to Pewamo soils in texture but have a lighter colored surface layer. Condit soils are similar to Sebring and Frenchtown soils in color, but they have a more clayey subsoil than Frenchtown soils and are more clayey, less silty, and more pebbly than Sebring soils.

Condit silt loam (Cr).—This soil is on flats and in depressions and along minor natural drainageways on till plains.

Included with this soil in mapping are small areas of dark-colored Pewamo soils, mostly in closed depressions, and small areas of somewhat poorly drained Bennington soils, mostly on knolls. Also included are some areas of soils that have pockets of silt or gravel below a depth of 3 feet. In Sandusky, Springfield, and Sharon Townships some large areas of included soils have a very dark grayish-brown silty clay loam surface layer. This soil has a higher content of organic matter and slightly better tilth than is typical of the series.

Most of the small areas of this soil are cultivated along with surrounding Bennington soils. The large areas are in permanent pasture or crops, and some undrained areas are in trees.

If this soil is farmed, the wetness is a severe limitation. Wetness and slow permeability are limitations to many nonfarm uses. Capability unit IIIw-3; woodland suitability group 2wl.

Conotton Series

The Conotton series consists of gently sloping to very steep, well-drained soils that formed in gravelly outwash deposited by swiftly moving water during and after glacial times. These soils are mainly on terraces along the sides of the major valleys in the southern part of the county.

A representative profile of this series, in a cultivated field, has a dark-brown gravelly loam plow layer about 8 inches thick. The subsoil extends to a depth of 44 inches. The upper part is yellowish-brown gravelly loam that extends to a depth of about 16 inches. The next part is brown very gravelly loam that extends to a depth of 38 inches. The next lower part is yellowish-brown very gravelly sandy loam that extends to a depth of 44 inches. The substratum is yellowish-brown gravel between depths of 44 and 60 inches. The surface layer is about 25 percent gravel; the subsoil, 35 to 70 percent; and the substratum, more than 70 percent.

Available moisture capacity is low, and permeability is rapid. Runoff is slow to moderate. Crops are affected by a lack of moisture during dry periods and when rainfall is average. The root zone is generally shallow and strongly acid. Many areas of Conotton soils contain gravel of commercial value.

Most areas of Conotton soils are small and are cropped or used for permanent pastures along with surrounding soils of greater extent.

Representative profile of Conotton gravelly loam, 2 to 12 percent slopes, in a cultivated field, in the NW1/4 SW1/4 sec. 14, T. 19 N., R. 18 W. (Jefferson Township):

Ap—0 to 8 inches, dark-brown (10YR 4/3) gravelly loam; weak, fine, granular structure; friable; 25 percent gravel; slightly acid; abrupt, smooth boundary.

B1—8 to 16 inches, yellowish-brown (10YR 5/4) gravelly loam; weak, medium, subangular blocky structure; friable; 35 percent gravel; strongly acid; clear, wavy boundary.

B21t—16 to 38 inches, brown (7.5YR 4/4) very gravelly loam; massive; very friable; pebbles coated and bridged with clay; 60 percent gravel; strongly acid; clear, smooth boundary.

B22t—28 to 44 inches, yellowish-brown (10YR 5/4) very

gravelly sandy loam; massive; very friable; pebbles coated and bridged with clay; 70 percent gravel; strongly acid; clear, smooth boundary.

C—44 to 60 inches, yellowish-brown (10YR 5/4) gravel; single grain; loose; 70 percent gravel; fines are sandy loam; medium acid.

The Ap horizon is dark brown (10YR 4/3) or dark grayish brown (10YR 4/2). In uncultivated areas the A1 horizon is very dark grayish-brown (10YR 3/2) or very dark brown (10YR 2/2) gravelly loam or gravelly sandy loam. An A2 horizon, 2 to 5 inches thick, is present in some profiles. It is brown (10YR 5/3) or pale-brown (10YR 6/3) gravelly loam or gravelly sandy loam.

The B1 horizon is 6 to 10 inches thick. It is brown or yellowish brown and is 20 to 35 percent gravel. The B2t horizon starts at a depth of 12 to 20 inches and extends to a depth of 40 to 54 inches. Its color has a hue of 10YR or 7.5YR, a value of 4 or 5, and a chroma of 4 to 6. It is very gravelly loam or very gravelly sandy loam. The B2t horizon is 50 to 75 percent gravel.

The C horizon commonly is gravel or very gravelly sand and is more than 70 percent gravel. Some stratification is commonly present. Strata differ in size and in content of gravel. Strata of gravelly loam or gravelly sandy loam are present in the C horizon in some areas. Most of the coarse fraction is rounded sandstone fragments less than 3 inches in diameter. The C horizon is commonly brown or yellowish brown, but it varies considerably.

The solum is medium acid to very strongly acid, and the C horizon is medium acid to neutral. No carbonates are present within a depth of 60 inches.

Conotton soils have a more gravelly subsoil than Chili or Belmore soils and are more acid than Belmore soils. Conotton and Chili soils having slopes steeper than 12 percent are not separated in mapping. Conotton soils have more gravel in their subsoil and have better natural drainage than Bogart soils. The coarse fragments in Conotton soils are mostly rounded gravel, but those in Berks soils are angular sandstone.

Conotton gravelly loam, 2 to 12 percent slopes (CtC).—This soil is on terraces. It has the profile described as representative of the series. Most areas of this soil are small and consist of narrow strips between areas of less sloping Chili or Wheeling soils. The surface layer is 15 to 50 percent gravel.

Included with this soil in mapping are a few areas of eroded soils that have a light-brown surface layer. Also included are small areas of less gravelly Chili soils.

If this soil is farmed, the hazard of erosion is very severe. Slope is a limitation to many nonfarm uses. Capability unit IVe-2; woodland suitability group 3f1.

Cut and Fill Land

Cut and fill land (Cz) is made up of areas where the natural soil has been altered by cutting or filling. Examples of such areas are highway rights of way, borrow pits, landfills, athletic fields, playgrounds, school yards, airport runways, and industrial areas. In most of these areas, less than 30 percent of the acreage is under buildings or pavement.

In areas where soil material has been removed, this land type generally consists of the remaining substratum. In fills or disposal areas, the soil material varies because it commonly consists of varying kinds and amounts of hauled-in materials, including the subsoil and substratum of nearby soils.

The soil material in this land type generally is poor for plant growth. Available moisture capacity and the content of organic matter are low. Most areas are susceptible to erosion if not protected. Instability of the soil material causes gullying and siltation.

Where a vegetative cover is to be established, the root zone can be improved by resurfacing areas of this land type with good soil material. Grasses and trees that tolerate the adverse characteristics of this soil material should be used to provide cover. Capability unit and woodland suitability group not assigned.

Digby Series

The Digby series consists of nearly level to gently sloping, somewhat poorly drained soils that formed in a mixture of loamy, sandy, and gravelly soil material deposited by water. These soils are gently undulating. They are on outwash plains in the northwestern part of the county.

A representative profile of this series, in a cultivated field, has a dark grayish-brown loam plow layer 12 inches thick. This layer is underlain by 2 inches of brown sandy loam mottled with yellowish brown. The subsoil is 18 inches thick and consists of yellowish-brown loam mottled with grayish brown. The substratum, between depths of 32 and 50 inches, consists of stratified yellowish-brown and grayish-brown loam, sandy loam, and thin bands of loamy sand and clay loam. Between depths of 50 and 60 inches, it consists of yellowish-brown coarse sand mottled with gray and thin bands of sandy loam mottled with gray and yellowish brown.

Permeability is moderate, and available moisture capacity is medium. Runoff is slow. The root zone is deep, and it is slightly acid or neutral in reaction. Artificial drainage is needed for most crops.

These soils are well suited to crops if they are drained. Most areas are used for crops, mainly corn, soybeans, small grain, and hay.

Representative profile of Digby loam, 1 to 4 percent slopes, in a cultivated field, in the SW1/4SW1/4 sec. 1, T. 22 N., R. 20 W. (Plymouth Township):

Ap—0 to 12 inches, dark grayish-brown (10YR 4/2) loam; weak, fine, crumb structure; friable; neutral; abrupt, smooth boundary.

A2—12 to 14 inches, brown (10YR 5/3) sandy loam; common, fine, faint mottles of grayish brown (10YR 5/2) and common, medium, distinct mottles of yellowish brown (10YR 5/6); moderate, thick, platy structure that parts to weak, fine, subangular blocky structure; friable; slightly acid; clear, wavy boundary.

B21t—14 to 22 inches, yellowish-brown (10YR 5/4) loam; common, coarse, distinct mottles of grayish brown (10YR 5/2) and yellowish brown (10YR 5/6); moderate, medium, subangular, blocky structure; friable; very patchy, light brownish-gray (10YR 6/2) silty coatings and grayish-brown (10YR 5/2) clay films on ped faces; 10 percent gravel; slightly acid; clear, wavy boundary.

B22t—22 to 32 inches, yellowish-brown (10YR 5/4) loam; common, medium, distinct mottles of grayish brown (10YR 5/2) and yellowish brown (10YR 5/6); moderate, medium, subangular blocky structure; friable; continuous ped coatings consist of silty coatings and clay films and are dominantly grayish brown (10YR 5/2) with patches of yellowish brown (10YR 5/4 and 5/6); 10 percent gravel; slightly acid; clear, smooth boundary.

C1—32 to 50 inches, yellowish-brown (10YR 5/4 and 5/6) and grayish-brown (10YR 5/2) stratified loam and sandy loam and thin bands of loamy sand and clay loam; massive; friable to loose; 10 percent gravel; neutral; clear, smooth boundary.

C2—50 to 60 inches, yellowish-brown (10YR 5/4) coarse sand and thin bands of sandy loam; common, fine, distinct mottles of gray (10YR 5/1) and yellowish brown (10YR 5/6), in sandy loam bands; single grain; loose; 10 percent gravel; neutral.

The Ap horizon is dark grayish brown (10YR 4/2) or brown (10YR 4/3). In uncultivated areas, an A1 horizon is 2 to 5 inches thick and is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). The A2 horizon is absent in some cultivated areas. Where present, its color has a hue of 10YR, a value of 5 or 6, and a chroma of 2 or 3, and mottles of higher chroma.

A thin B1 horizon is present in some areas. The texture of the B2t horizon is loam, gravelly loam, or gravelly sandy clay loam. The gravel content ranges from almost none to 25 percent. The base color of ped interiors has a hue of 10YR, a value of 4 or 5, and a chroma of 3 or 4. The color of coatings on ped faces has a hue of 10YR or 2.5Y, a value of 4 or 5, and a chroma of 1 or 2. These coatings consist of clay films and silty degradational material. Clay bridging is evident between coarse fragments in the more gravelly profiles.

The C horizon is stratified gravelly sandy loam, gravelly loam, sand, and gravelly sand. It contains thin layers of clean gravel in some areas. The gravel content of the C horizon ranges from 5 to 30 percent. The color varies, but is dominantly brown or yellowish brown, with some mottling.

Reaction is medium acid to neutral in the solum and neutral to moderately alkaline in the C horizon. Depth to carbonates ranges from 36 inches to more than 60 inches.

Digby soils are similar to Haney soils in texture, but they have poorer natural drainage and grayer coatings on peds in the subsoil. Digby soils are more gravelly and less silty than Fitchville soils and are more gravelly and less clayey than Bennington soils.

Digby loam, 1 to 4 percent slopes (DmB).—This soil is on knolls and ridges.

Included with this soil in mapping are many small areas of soils that have a gravelly loam surface layer, a few spots of soils that have a silt loam surface layer, and a few areas of soils that have no gravel within a depth of 2 to 3 feet. Also included are a few areas of soils that are underlain by clay loam glacial till at a depth of 3 to 5 feet and some poorly drained, dark-colored soils in depressions and along minor natural drainageways. Spots of moderately well drained Haney soils on the top of some of the higher knolls and ridges are included.

Most areas of this soil are drained and are used for crops or improved pasture.

If this soil is farmed, wetness is a moderate limitation. Seasonal wetness is a limitation to some nonfarm uses. Capability unit IIw-3; woodland suitability group 2w2.

Fitchville Series

The Fitchville series consists of nearly level to gently sloping, somewhat poorly drained, soils that formed in silty lacustrine deposits. The areas are in all parts of the county.

A representative profile of this series, in a cultivated field, has a dark grayish-brown silt loam plow layer 6 inches thick. This is underlain by 3 inches of brown silt loam mottled with grayish brown and yellowish brown. Beginning at a depth of 9 inches, the subsoil extends to a depth of 42 inches. Between depths of 9 and 13 inches, it is yellowish-brown silt loam mottled with grayish brown; between depths of 13 and 30 inches, it is yellowish-brown, firm silty clay loam mottled with light brownish gray; and between depths of 30 and 42 inches, it is yellowish-brown, firm silty clay loam mottled with grayish brown. The substratum, between depths of 42 and 46 inches, is yellowish-brown fine sandy loam mottled with grayish brown and, between depths of 46 and 60 inches, is yellowish-brown silt loam mottled with gray. The profile is free of stones and pebbles in the upper 4 feet but in some areas pebbly or gravelly layers are below this depth.

Permeability is moderately slow, and available moisture capacity is high. Runoff is slow. Artificial drainage is needed for most crops. Tilth is good, and the root zone is deep. Reaction in the root zone ranges from strongly acid in the upper part to slightly acid or neutral in the lower part.

If these soils are drained, they are well suited to crops. Most areas are used for crops. The crops grown depend on location in the county and the use of surrounding soils, but crops commonly include corn, soybeans, and small grain.

Representative profile of Fitchville silt loam, 0 to 2 percent slopes, in a cultivated field in the SW1/4NW1/4 sec. 8, T. 23 N., R. 18 W. (Blooming Grove Township):

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

A2—6 to 9 inches, brown (10YR 5/3) silt loam; many, medium, faint, grayish-brown (10YR 5/2) mottles and many, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, thin, platy structure; friable; strongly acid; clear, irregular boundary.

B1—9 to 13 inches, yellowish-brown (10YR 5/4) silt loam; many, coarse, faint, grayish-brown (10YR 5/2) and yellowish-brown (10YR 5/6) mottles; weak, coarse, subangular blocky structure; friable; few brown (10YR 5/3) degradational silt coatings; strongly acid; clear, wavy boundary.

B21t—13 to 30 inches, yellowish-brown (10YR 5/4) silty clay loam; many, fine, distinct, light brownish-gray (10YR 6/2) mottles and many, fine, faint, yellowish-brown (10YR 5/6) mottles; weak, coarse, prismatic structure that parts to strong, medium, angular blocky structure; firm; continuous, light brownish-gray (2.5Y 6/2) ped coatings that include thin, patchy clay films; few, pale-brown (10YR 6/3) degradational silt coatings on ped faces; strongly acid; gradual boundary.

B22t—30 to 42 inches, yellowish-brown (10YR 5/4) silty clay loam; many, medium, faint, grayish-brown (10YR 5/2) and yellowish-brown (10YR 5/6) mottles; weak, medium, prismatic structure that parts to moderate, medium, subangular blocky structure; firm; continuous, grayish-brown (2.5Y 5/2) ped coatings that include patchy clay films of moderate thickness; medium acid; abrupt, smooth boundary.

C1—42 to 46 inches, yellowish-brown (10YR 5/4) fine sandy loam; few, coarse, faint, grayish-brown (10YR 5/2) and yellowish-brown (10YR 5/6) mottles; massive; friable; slightly acid; clear, wavy boundary.

C2—46 to 60 inches, yellowish-brown (10YR 5/4) silt loam; many, coarse, distinct, light-gray (10YR 7/2) mottles and few, medium, faint, yellowish-brown (10YR 5/6) mottles; massive; mildly alkaline; calcareous.

In uncultivated areas an A1 horizon is 3 to 5 inches thick and is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). The A2 horizon is as much as 8 inches thick in some uncultivated areas and is absent in some cultivated areas. It is grayish brown (10YR 5/2) or brown (10YR 5/3) and is mottled.

The B1 horizon is 3 to 8 inches thick. The B2t horizon is 16 to 32 inches thick and is heavy silt loam or light silty clay loam. The dominant color of ped interiors generally has a hue of 10YR or 2.5Y, a value of 4 or 5, and a chroma of 3 to 5. Mottles of low chroma are present. The dominant color of ped exteriors has a hue of 10YR or 2.5Y, a value of 4 to 6, and a chroma of 1 or 2. There is a B3 horizon that shows structure development in some Fitchville soils.

The C horizon is stratified. Texture generally is silt loam and silty clay loam, but thin strata of loam or fine sandy loam are commonly present. Adjacent strata commonly differ slightly in color but are dominantly yellowish brown or brown.

Reaction is medium acid to strongly acid in the B1 horizon and in the upper part of the B2t horizon and becomes medium acid to neutral in the lower part of the B2t horizon or the B3 horizon. Depth to carbonates is more than 40 inches. Reaction is slightly acid to mildly alkaline at a depth of 60 inches, where no carbonates are present. The profile is essentially free of coarse fragments in the upper 4 feet, but a few pebbles and thin gravelly layers are present below a depth of 4 feet in some areas.

Fitchville soils are similar to Glenford and Sebring soils in texture but differ from them in color and natural drainage. They are mottled at a shallower depth than Glenford soils, and they are grayer in the subsoil and are poorer in natural drainage. They have more brown and less gray in their subsoil than Sebring soils and have better natural drainage. Fitchville soils have a lighter colored surface layer than Luray soils. They are siltier and less gravelly than Digby soils. In the upper parts of their profiles, the Fitchville soils and the Fitchville soils, gravelly subsoil variant, are similar, but the Fitchville soils are silty to a greater depth. Fitchville soils are siltier and less gravelly than Bennington, Ravenna, and Wadsworth soils, and they lack the dense fragipan layer that is present in Ravenna and Wadsworth soils. Fitchville soils are silty to a greater depth than Tiro soils.

Fitchville silt loam, 0 to 2 percent slopes (FcA).—This soil is on flats and in shallow depressions. It has the profile described as representative of the series. A few large areas of this soil are in the northwestern part of the county, but most of the areas are small and scattered.

Included with this soil in mapping are a few areas of soils that have a loam surface layer, a few areas of soils that have a black or very dark gray surface layer, and a few small areas of soils that are underlain by glacial till within a depth of 3 feet. Also included are a few areas of soils that have sandy or gravelly loam below a depth of 3 feet and spots of poorly drained, dark-colored Luray soils and poorly drained, light-colored Sebring soils in depressions and along minor drainageways.

The limitation of wetness is moderate if this soil is farmed (fig. 5). Seasonal wetness is a limitation to many nonfarm uses. Capability unit IIw-3; Woodland suitability group 2w2.

Fitchville silt loam, 2 to 6 percent slopes (FcB).—This soil is on low knolls and ridges and on the sides of minor natural drainageways.

Included with this soil in mapping are a few areas of soils that have a black or very dark gray loam surface layer; many small spots of soils that are underlain by firm glacial till within a depth of 3 feet; and a few small areas of soils, in the southern part of the county that have broken rock or gravelly loam at a depth of 3 to 5 feet. Also included are spots of poorly drained Sebring soils in depressions and along natural drainageways and a few spots of moderately well drained Glenford soils on some of the higher knolls.

If this soil is farmed, wetness is a moderate limitation. Seasonal wetness is a limitation to many nonfarm uses. Capability unit IIw-3; woodland suitability group 2w2.

Fitchville-Bennington silt loams, 0 to 2 percent slopes (FdA).—This complex is on lake plains, where a combination of ice action and water action has produced extremely variable soils.

About 50 percent of the complex is Fitchville soils, and 30 percent is Bennington soils. About 10 percent is Tiro and Digby soils and 10 percent is poorly drained Sebring soils and very poorly drained Luray soils in shallow depressions.

Fitchville and Bennington soils have a profile similar to the one described as representative of their respective series. Fitchville soils, however, contain more coarse sand and gravel than is typical of the Fitchville series, and most of the sandy and gravelly layers are below a depth of 3 feet. Some areas of the Bennington soils are more sandy or gravelly below a depth of 3 feet than is typical of the Bennington series. Irregularly shaped lenses and pockets of sandy loam and gravelly loam are at a depth of 3 to 6 feet throughout this complex, and their occurrence is unpredictable.

Artificial drainage is needed for most crops. If the soils are adequately drained, they are well suited to crops.

Wetness is a moderate limitation if these soils are farmed. Seasonal wetness and moderately slow permeability are limitations to many nonfarm uses. Capability unit IIw-3; woodland suitability group 2w2.

Fitchville Series, Gravelly Subsoil Variant

The Fitchville series, gravelly subsoil variant, consists of nearly level to gently sloping, somewhat poorly

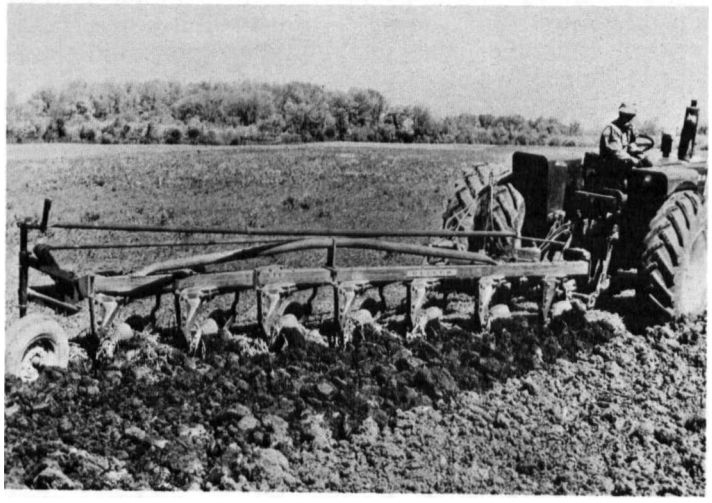

Figure 5.—**If Fitchville silt loam, 0 to 2 percent slopes, is drained, it is suited to farming.**

drained soils that formed in lacustrine material. These soils are generally silty in the upper part and sandy or gravelly in the lower part. They are on stream terraces in the central and southern parts of the county.

A representative profile of this series, in a cultivated field, has a dark grayish-brown silt loam plow layer 11 inches thick. This layer is underlain by 2 inches of grayish-brown silt loam mottled with yellowish brown. Beginning at a depth of 13 inches, the subsoil extends to a depth of 36 inches. Between depths of 13 and 16 inches, it is grayish-brown, light silty clay loam mottled with yellowish brown. Between depths of 16 and 24 inches, it is yellowish-brown, silty clay loam mottled with grayish brown and yellowish brown. Between depths of 24 and 30 inches, it is yellowish-brown, light silty clay loam mottled with grayish brown. Between depths of 30 and 36 inches, it is gravelly sandy clay loam that has a mixture of grayish-brown and yellowish-brown colors. This lower part of the subsoil contains considerably more sand and gravel than the upper part. The substratum, to a depth of 60 inches, consists of many thin layers of sandy and gravelly materials that vary in color, consistence, and gravel content. A few pebbles are in the upper part of the profile.

Permeability is moderately slow in the upper part of the profile and rapid in the lower part. Available moisture capacity is medium, and runoff is slow. Artificial drainage is needed for most crops. Tilth is generally good.

If these soils are drained, they are well suited to crops. Most areas are small and are cropped along with surrounding soils of greater extent. Corn, soybeans, small grain, and hay are the main crops.

Representative profile of Fitchville silt loam, gravelly subsoil variant, 0 to 2 percent slopes, in a cultivated field, in the SW1/4NW1/4 sec. 36, T. 19 N., R. 20 W. (Sandusky Township):

Ap—0 to 11 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine, granular structure; friable; slightly acid; abrupt, smooth boundary.

A2—11 to 13 inches, grayish-brown (10YR 5/2) silt loam; many, fine, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium, subangular blocky structure; friable; medium acid; clear, irregular boundary.

B1—13 to 16 inches, grayish-brown (10YR 5/2) light silty clay loam; common, coarse, distinct, yellowish-brown (10YR 5/6) mottles; moderate, fine, subangular blocky structure; friable; grayish-brown (10YR 5/2), degradational silt coatings on ped surfaces; medium acid; gradual, smooth boundary.

B21t—16 to 24 inches, yellowish-brown (10YR 5/6) silty clay loam; many, coarse, distinct, grayish-brown (10YR 5/2) mottles and common, fine, faint yellowish-brown (10YR 5/8) mottles; moderate, fine, angular blocky structure; firm; continuous, grayish-brown (10YR 5/2) coatings that include thin, patchy clay films on ped surfaces; strongly acid; clear, wavy boundary.

B22t—24 to 30 inches, yellowish-brown (10YR 5/6) light silty clay loam; many, coarse, distinct, grayish-brown (10YR 5/2) mottles; weak, coarse, prismatic structure that breaks to moderate, fine, subangular blocky structure; firm; continuous, grayish-brown (10YR 5/2) clay films on ped surfaces; strongly acid; abrupt, smooth boundary.

IIB3—30 to 36 inches, mottled, yellowish-brown (10YR 5/4 and 5/6) and grayish-brown (10YR 5/2) gravelly sandy clay loam; weak, coarse, subangular, blocky structure; friable; few clay films; 20 percent gravel; medium acid; abrupt, smooth boundary.

IIC1—36 to 54 inches, mottled, light brownish-gay (10YR 6/2), brown (10YR 5/3), and yellowish-brown (10YR 5/8), stratified gravelly loam, sandy loam, and loam; massive; very friable; medium acid; abrupt, smooth boundary.

IIC2—54 to 60 inches, dark-brown (10YR 4/3) stratified sandy loam and gravelly loam; thin strata of sand and gravel; single grain; loose; slightly acid.

Depth to the sandy loam or gravelly loam ranges from 24 to 40 inches. In uncultivated areas, the A1 horizon is very dark grayish brown (10YR 3/2) or very dark gray (10YR 3/1) and is 2 to 5 inches thick. The A2 horizon is as much as 7 inches thick and is absent in some cultivated areas. It is grayish brown (10YR 5/2), gray (10YR 5/1), or light brownish gray (10YR 6/2) and has mottles of higher chroma.

The B1 horizon is 2 to 6 inches thick. It is grayish brown or yellowish brown and is mottled. It shows a varying amount of degradation.

The B2t horizon is 12 to 26 inches thick. The base color of the ped interiors has a hue of 10YR or 2.5Y, a value of 4 or 5, and a chroma of 4 to 6. Mottles of lower chroma are present. The dominant color of ped exteriors and coatings has a hue of 10YR or 2.5Y, a value of 4 to 6, and a chroma of 1 or 2. The texture of the B2t horizon is heavy silt loam or light silty clay loam. The lower boundary of the B2t horizon commonly coincides with the contact between the two types of soil materials. In a few areas it is above the contact, and a silt loam B3 horizon is present. In a few other areas, the upper 4 to 8 inches of the gravelly loam material is part of the B2t horizon.

The C horizon is stratified. The material is sandy or gravelly, but individual strata differ greatly in gravel content and amount of fines. Texture commonly is gravelly loam, gravelly sandy loam, gravelly loamy sand, gravelly sand, sand, and gravel. The color of strata varies, but yellowish brown, brown, and grayish brown are dominant. Mottles are evident in the more consolidated strata. The gravel of the C horizon consists primarily of rounded and angular sandstone fragments.

Reaction in the A2 and B horizons is medium acid to strongly acid. The C horizon is medium acid to mildly alkaline. Depth to carbonates is more than 60 inches.

Fitchville soils, gravelly subsoil variant, are similar to Bogart silt loams in texture but have poorer natural drainage and grayer coatings on peds in their subsoil. They are siltier and less gravelly in the upper part of the profile than Digby soils and are more acid. They are sandy or gravelly at a depth of 24 to 40 inches, whereas typical Fitchville soils are silty to a depth of 4 feet or more.

Fitchville silt loam, gravelly subsoil variant, 0 to 2 percent slopes (FgA).—This soil is in depressions, low spots, and seep areas on terraces along the sides of stream valleys. It has the profile described as representative of the series.

Included with this soil in mapping are many spots of soils where the depth to gravel is more than 40 inches. Also included are small, low areas of soils that have a grayer subsoil than the soil and a few areas of soils that have gravelly loam above a depth of 24 inches.

This soil has a moderate limitation of wetness if farmed. Seasonal wetness is a limitation to many nonfarm uses. Capability unit IIw-3; woodland suitability group 2w2.

Fitchville silt loam, gravelly subsoil variant, 2 to 6 percent slopes (FgB).—This soil is on knolls and ridges and in natural drainageways on terraces.

Included with this soil in mapping are small areas of very poorly drained Luray soils in some low spots and

moderately well drained Bogart soils in some high spots. Also included are spots of soils that are gravelly in the surface layer and in the upper part of the subsoil.

Most areas of this soil are small, and their use is determined by use of surrounding soils. The wetness of this soil is caused mainly by seepage, and is not easily corrected in some areas.

Wetness is a moderate limitation if this soil is farmed. Seasonal wetness is a limitation to many nonfarm uses. Capability unit IIw-3; woodland suitability group 2w2.

Frenchtown Series

The Frenchtown series consists of nearly level, poorly drained soils that formed in glacial till. Some areas are in closed depressions. Frenchtown soils are in the central and southern parts of the county.

A representative profile of this series, in a wooded area, has a silt loam surface layer about 5 inches thick that is dark grayish brown mottled with brown. The subsurface layer is silt loam, and it extends to a depth of 12 inches. It is dark gray mottled with yellowish red. The upper part of the subsoil, between depths of 12 and 22 inches, is firm silty clay loam that is gray mottled with brown. The lower part of the subsoil, or fragipan, begins at a depth of 22 inches and extends to a depth of 40 inches. It is very firm silt loam that has a mixture of gray, grayish-brown, and yellowish-brown colors. Through it are vertical streaks of gray soil that intersect to form blocks. The interiors of the blocks are very dense and are not easily penetrated by roots or water. Below the fragipan, between depths of 40 and 60 inches, is yellowish-brown, firm loam glacial till. This till grades from slightly acid to neutral with depth. A few small, sharp pebbles are in all parts of the profile.

Permeability is very slow. Runoff is slow, and some areas are ponded in winter and early in spring. The root zone is moderately deep, available moisture capacity is medium, and reaction ranges from slightly acid to strongly acid. Artificial drainage is needed for most crops.

Frenchtown soils are generally poorly suited to crops. Most areas of these soils are small and are used along with surrounding soils for crops and pasture.

Representative profile of Frenchtown silt loam, in a wooded area, in the NE1/4SW1/4, sec. 19, T. 21 N., R. 18 W. (Madison Township):

A1—0 to 5 inches, dark grayish-brown (10YR 4/2) silt loam; common, fine, distinct, strong-brown (7.5YR 5/8) mottles; weak, coarse, granular structure; friable; few, angular, coarse fragments; slightly acid; clear, irregular boundary.

A2g—5 to 12 inches, dark-gray (10YR 4/1) silt loam; many, medium and fine, prominent, yellowish-red (5YR 4/6) mottles; moderate, fine, subangular blocky structure; friable; very dark grayish-brown (10YR 3/2) fillings in old root channels; few, angular, coarse fragments; slightly acid; clear, wavy boundary.

B2tg—12 to 22 inches, gray (10YR 5/1) light silty clay loam; many, medium, prominent, strong-brown (7.5YR 5/6) mottles; moderate, fine, subangular blocky structure; firm; patchy dark-gray (10YR 4/1) clay films on ped faces; common, very dark grayish-brown (10YR 3/2) manganese concretions; few, angular, coarse fragments; medium acid; clear, wavy boundary.

Bx1—22 to 32 inches, gray (10YR 5/1) and grayish-brown (10YR 5/2) heavy silt loam; many, medium, prominent, yellowish-brown (10YR 5/6) mottles; weak, very coarse, prismatic structure that parts to weak, coarse, subangular blocky structure; firm; slightly brittle; prism faces coated with gray (10YR 5/1) clay films and a network of yellowish-red (5YR 5/8) root channel fillings; few manganese concretions; few, angular, coarse fragments; strongly acid; clear, smooth boundary.

Bx2—32 to 40 inches, grayish-brown (10YR 5/2) heavy silt loam; many, coarse, distinct, yellowish-brown (10YR 5/6 and 5/4) mottles; moderate, coarse, prismatic structure that parts to moderate, medium, subangular blocky structure; very firm, brittle; gray (10YR 5/1) clay films on peds; few, angular, coarse fragments; strongly acid; diffuse, irregular boundary.

B31—40 to 50 inches, yellowish-brown (10YR 5/6) heavy loam; common, coarse, faint, yellowish-brown (10YR 5/4) and brown (10YR 5/3) mottles, and common, coarse, distinct, grayish-brown (10YR 5/2) mottles; massive; firm; few vertical partings with grayish-brown (10YR 5/2) coatings; common, angular, coarse fragments; slightly acid; gradual boundary.

B32—50 to 60 inches, yellowish-brown (10YR 5/4) heavy loam; many, coarse, distinct, gray (10YR 5/1) mottles; massive; firm; few vertical partings with dark-gray (10YR 4/1) coatings; common, angular, coarse fragments; neutral.

The A1 horizon is very dark gray (10YR 3/1), very dark grayish brown (10YR 3/2), or dark grayish brown (10YR 4/2). It is less than 6 inches thick and is not mottled in all areas. In cultivated areas the plow layer is dark grayish brown (10YR 4/2) or dark gray (10YR 4/1) and is not mottled. A thin A2 horizon is present in many uncultivated areas and in a few cultivated areas. It is typically silt loam that has a gray or grayish-brown base color and distinct mottles of higher chroma. The A2g horizon is 3 to 8 inches thick. Its dominant color has a chroma of 1 or 2, and the mottles have a higher chroma.

The B horizon above the fragipan is as much as 12 inches thick. It has a hue of 10YR or 2.5Y, a value of 4 or 5, and a chroma of 1 or 2. Mottles of higher chroma are present in the ped interiors. The texture of this part of the B horizon is fine loam, silt loam, light clay loam, or silty clay loam. Clay films are on ped surfaces.

The fragipan begins at a depth of 13 to 24 inches and is 16 to 30 inches thick. Its texture is similar to that of the horizon above. The structure is prismatic or polygonal that parts to platy or subangular blocky structure. Ped surfaces are coated with clay films of gray or grayish brown. Silty films are also present in some areas. Ped interiors have a mixture of gray or grayish-brown and brown or yellowish-brown colors. Leaching and clay movement are evident to a depth of 6 to 18 inches below the bottom of the fragipan.

The B3 horizon is loam or clay loam in texture. Reaction in and above the fragipan is medium or strongly acid. Reaction becomes less acid with depth below the fragipan. The depth to carbonates is more than 50 inches. Reaction at a depth of 60 inches, where no carbonates are present, is slightly acid to mildly alkaline.

Frenchtown soils are similar to Wadsworth and Ravenna soils in texture but have a grayer subsoil and poorer natural drainage than those soils, and are generally in lower positions. They have more pebbles than Sebring soils and have a firmer, denser subsoil. Frenchtown soils are similar to Condit soils in color but have a firmer, less clayey subsoil and are acid to a greater depth. They have a lighter colored surface layer than Pewamo soils.

Frenchtown silt loam (Fr).—This soil is in shallow depressions and in drainageways.

Included with this soil in mapping are small areas of soils where the original surface layer is covered by

light-colored soil material washed from higher, nearby areas. Also included are a few areas of soils that are underlain by gravel or rock at a depth of 3 to 5 feet.

Most areas of this soil are less than 10 acres in size. The few larger areas are wooded or are in permanent pasture, but some small areas are cropped along with surrounding soils of greater extent.

The limitation of wetness is severe if this soil is farmed. Seasonal wetness and very slow permeability are limitations to many nonfarm uses. Capability unit IIIw-3; woodland suitability group 2w1.

Glenford Series

The Glenford series consists of nearly level to sloping, moderately well drained, soils. These soils formed in lacustrine sediment that is high in content of silt. They are in all parts of the county.

A representative profile of this series, in a cultivated field, has a dark grayish-brown silt loam plow layer 10 inches thick. The upper 6 inches of the subsoil consists of yellowish-brown silt loam. The lower part, between depths of 16 and 40 inches, is yellowish-brown, firm silty clay loam mottled with grayish brown. The substratum, between depths of 40 and 54 inches, is yellowish-brown, friable, stratified silt loam and loam mottled with grayish brown. This layer becomes less acid with increasing depth. The substratum, between depths of 54 and 60 inches, is brown silt loam mottled with grayish brown and yellowish brown.

Permeability is moderately slow, and available moisture capacity is high. Runoff is slow to moderate. Sloping areas are subject to erosion if not protected. Tilth is good. The root zone is deep, and it is medium acid or strongly acid. Natural drainage is generally adequate for most purposes, although the soils are occasionally wet for brief periods.

Most areas of Glenford soils are used for crops. The main crops grown depend upon location in the county but commonly include corn, soybeans, and small grain.

Representative profile of Glenford silt loam, 2 to 6 percent slopes, in a cultivated field, in the SE1/4SE1/4 sec. 24, T. 22 N., R. 20 W. (Plymouth Township):

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

B1—10 to 16 inches, yellowish-brown (10YR 5/4) silt loam; weak, medium, subangular blocky structure; friable; few pale-brown (10YR 6/3) silt coatings; medium acid; clear, wavy boundary.

B21t—16 to 26 inches, yellowish-brown (10YR 5/6) silty clay loam; common, fine, faint, grayish-brown (10YR 5/2) mottles; moderate, fine, subangular blocky structure; firm; discontinuous, brown (10YR 5/3) clay films on ped faces; medium acid; gradual, smooth boundary.

B22t—26 to 40 inches, yellowish-brown (10YR 5/4) light silty clay loam; common, medium, faint, grayish-brown (10YR 5/2) mottles; moderate, medium, subangular blocky structure; firm; patchy, brown (10YR 5/3) clay films on ped faces; medium acid; gradual boundary.

C1—40 to 54 inches, yellowish-brown (10YR 5/4 and 5/6) stratified silt loam and loam mottled with grayish brown (10YR 5/2); massive; friable; thin lenses of fine sandy loam and silty clay loam; slightly acid; gradual boundary.

C2—54 to 60 inches; brown (10YR 5/3) silt loam; common, medium, faint, grayish-brown (10YR 5/2) mottles and common, fine, distinct, yellowish-brown (10YR 5/6) mottles; massive; friable; slightly acid.

In uncultivated areas, the A1 horizon is 2 to 4 inches thick, and is very dark grayish brown (10YR 3/2). An A2 horizon 2 to 6 inches thick is present in most uncultivated areas and in some cultivated areas. It is brown (10YR 5/3) or pale-brown (10YR 6/3) silt loam that has weak, platy or subangular blocky structure.

The B1 horizon is 4 to 8 inches thick. Its color is yellowish brown (10YR 5/4) or dark yellowish brown (10YR 4/4). It exhibits varying amounts of degradational silt coatings.

The B2t horizon has a total thickness of 20 to 32 inches. It has a texture of heavy silt loam or light silty clay loam. The base color of the B2t horizon has a hue of 10YR or 7.5YR, a value of 4 or 5, and a chroma of 4 to 6. A B3 horizon that shows evidence of structure development is present below the B2t horizon in some pedons.

The C horizon is stratified. Silt loam and silty clay loam textures predominate, but strata of loam, fine sandy loam, and light silty clay are present in many areas. Individual strata differ in color. Yellowish brown and grayish brown predominate. Reaction in the B1 and upper B2t horizons is medium acid to strongly acid. In the B3 and C horizons, reaction becomes less acid with increasing depth and is slightly acid to mildly alkaline at a depth of 60 inches.

Glenford soils are similar to Mentor soils and Fitchville soils in texture, but their natural drainage is poorer than that of Mentor soils, and they are mottled at a shallower depth. They have better natural drainage than Fitchville soils and a browner, less gray subsoil. The upper part of the Glenford silt loam is similar to the upper part of the Bogart silt loam, but Bogart silt loam has sandy or gravelly material at a depth of 20 to 40 inches, whereas Glenford silt loam has silty material to a depth of 4 feet or more. Glenford soils have a siltier, less pebbly subsoil than Canfield, Rittman, and Cardington soils. In addition, they lack the fragipan that is present in Canfield and Rittman soils, and they are lower in clay content than Cardington soils. Glenford soils are siltier and contain less rounded gravel than Bogart or Haney soils.

Glenford silt loam, 0 to 2 percent slopes (GfA).—This soil is on ridgetops, terraces, and low knolls on lake plains.

Included with this soil in mapping are small areas of somewhat poorly drained Fitchville soils in depressions and along minor natural drainageways. Also included are areas of soils, in the northwestern part of the county, that have layers of firm, pebbly clay loam in the profile and a few areas of soils, in the southern part of the county, that have broken rock below a depth of 4 feet. A few spots of soils that have gravel on the surface are included.

Most areas of this soil are small and are used for crops. Random tile drains are beneficial in the wetter spots. Occasional wetness is a limitation to some nonfarm uses. Capability unit I-1; woodland suitability group 1o1.

Glenford silt loam, 2 to 6 percent slopes (GfB).—In the northern part of the country, this soil is on the highest part of low knolls and ridges on lake plains. In the southern part of the county this soil is along the sides of major valleys and in the upper watershed of minor drainageways. In these areas it is generally below steeper soils. This soil has the profile described as representative of the series.

Included with this soil in mapping, in the northern part of the county are areas of soils that have layers of firm, pebbly clay loam in their profile. Included in the southern part of the county are spots of soils that are underlain by gravel, glacial till, or broken rock at

a depth of 40 to 60 inches. Also included are spots of somewhat poorly drained Fitchville soils and poorly drained Pewamo soils in depressions and along minor natural drainageways. Other inclusions are some spots of soils that have a sandy gravelly surface layer.

Most areas of this soil are used for crops or for improved pasture, depending on the use of surrounding soils. Areas surrounded by wetter soils are generally tiled. The hazard of erosion is moderate if this soil is farmed. Erosion-control practices are difficult to apply where this soil occurs on irregularly shaped knolls and ridges. Occasional wetness is a limitation to some nonfarm uses. Capability unit IIe-2; woodland suitability group 1ol.

Glenford silt loam, 6 to 12 percent slopes (GfC).—This soil is on the sides of low ridges and along the sides of stream valleys.

Included with this soil in mapping are small areas of soils that are underlain by glacial till, gravel, or shattered bedrock, the latter being most common in the southern part of the county. Also included are areas of well-drained Mentor soils that occupy some of the higher positions and narrow strips of poorly drained Pewamo soils along some minor natural drainageways.

Most areas of this soil are used for pasture or for crops. The hazard of erosion is severe, and erosion can be expected on unprotected areas. Slope and occasional wetness are limitations to many nonfarm uses. Capability unit IIIe-6; woodland suitability group 1ol.

Gravel Pits

Gravel pits (Gp) consists of excavations from which the underlying gravelly material has been removed. Gravel pits are in gravelly outwash areas, commonly near Chili and Conotton soils, which were in these areas prior to the removal of sand and gravel.

The soil material in gravel pits varies within short distances. Organic-matter content and available moisture capacity are low. A lack of plant cover and instability of the soil material commonly result in erosion and siltation.

Areas of this land type that are no longer mined should be treated so that plants can be established to help control erosion. Grasses and trees that can tolerate the unfavorable soil properties are suitable for seeding and planting. Ponded areas are potentially suitable for recreation or wildlife. Capability unit and woodland suitability group not assigned.

Gresham Series

The Gresham series consists of gently sloping, somewhat poorly drained soils that formed in old glacial till that has been leached of natural lime. These soils have a dense fragipan that restricts the growth of roots and the movement of water. They are in draws, most of which contain springs. These soils are in the southeastern part of the county.

A representative profile of this series, in a pasture, has a 4-inch surface layer of dark grayish-brown silt loam. Below this is a 6-inch subsurface layer of grayish-brown silt loam mottled with dark brown, brown, and yellowish brown. The upper part of the subsoil consists of 6 inches of brown silt loam mottled with grayish brown and yellowish brown and 7 inches of firm silt loam that has a mixture of grayish-brown and yellowish-brown colors. The lower part of the subsoil contains the fragipan. It is very firm, dense silt loam that also has a mixture of grayish-brown and yellowish-brown colors. This layer extends to a depth of 52 inches. Between depths of 52 and 60 inches, the subsoil is friable, brown loam mottled with grayish brown and yellowish brown.

Permeability is slow, and available moisture capacity is medium. The root zone is moderately deep, and it is strongly acid. Artificial drainage is needed for most crops.

Representative profile of Gresham silt loam, 2 to 6 percent slopes, in a pasture, in the NE1/4NE1/4 sec. 12, T. 19 N., R. 18 W. (Jefferson Township):

A1—0 to 4 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, crumb structure; friable; medium acid; clear, wavy boundary.

A2—4 to 10 inches, grayish-brown (10YR 5/2) silt loam; common, fine, faint, dark-brown (7.5YR 4/4) mottles and common, medium, faint, brown (10YR 5/3) and yellowish-brown (10YR 5/4 and 5/6) mottles; moderate, medium, platy structure; friable; strongly acid; clear, wavy boundary.

B1—10 to 16 inches; brown (10YR 5/3) silt loam; common, medium, faint, grayish-brown (10YR 5/2) mottles and few, fine, prominent, yellowish-brown (10YR 5/8) mottles; weak, medium, subangular blocky structure; friable; few, pale-brown (10YR 6/3) silty coatings; 5 percent pebbles; strongly acid; clear, irregular boundary.

B2t—16 to 23 inches, grayish-brown (10YR 5/2) heavy silt loam; many, coarse, prominent, yellowish-brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure; firm; grayish-brown (10YR 5/2) clay films and a few, light brownish-gray (10YR 6/2) silt coatings on ped faces; 5 percent coarse fragments; strongly acid; clear, smooth boundary.

Bx1—23 to 34 inches; grayish-brown (10YR 5/2) heavy silt loam; common, coarse, prominent yellowish-brown (10YR 5/8) mottles; weak, coarse, prismatic structure that parts to moderate, medium, subangular blocky structure; very firm, brittle; grayish-brown (10YR 5/2) clay films on prisms and blocks; patchy, light brownish-gray (10YR 6/2) silt coatings on upper parts of prisms; 5 percent coarse fragments; strongly acid; gradual, smooth boundary.

Bx2—34 to 52 inches; grayish-brown (10YR 5/2) heavy silt loam; common, coarse, prominent yellowish-brown (10YR 5/8) mottles; weak, coarse, prismatic structure that breaks to moderate, medium, subangular blocky structure; very firm, brittle; grayish-brown (10YR 5/2) clay films on prism faces; 5 percent very dark brown (10YR 2/2) manganese concretions; 10 percent coarse fragments; strongly acid; clear, wavy boundary.

B3—52 to 60 inches; brown (10YR 5/3) loam; common, coarse, faint, grayish-brown (10YR 5/2) mottles and common, medium, distinct yellowish-brown (10YR 5/6) mottles; weak, medium subangular blocky structure; friable; 10 percent coarse fragments; strongly acid.

In cultivated areas the Ap horizon is dark grayish brown (10YR 4/2). The A2 horizon is absent in some cultivated areas, and it is as much as 8 inches thick in some uncultivated areas. Its color has a hue of 10YR, a value of 4 or 5, and a chroma of 1 or 2. The mottles have a higher chroma.

The B1 horizon is 2 to 8 inches thick. It has a base color of grayish brown (10YR 5/2) or brown (10YR 5/3) and

mottles of a higher chroma. It has some degradational silt coatings. The B2t horizon above the fragipan is 5 to 12 inches thick and is loam or silt loam. The base color of ped interiors has a hue of 10YR, a value of 4 or 5, and a chroma of 2 to 4.

The fragipan begins at a depth of 18 to 26 inches and is 26 to 40 inches thick. It is heavy loam or silt loam. The base color of ped interiors has a hue of 10YR, a value of 4 or 5, and a chroma of 2 to 4. The mottles have a contrasting color. The ped coatings have a chroma of 1 or 2. The structure is prismatic or polygonal, and the peds are 2 to 4 inches in diameter.

The B3 horizon below the fragipan is as much as 50 percent rock fragments. Reaction is medium acid to strongly acid throughout the profile.

Gresham soils are similar to Titusville soils in texture, but they are wetter and have a grayer subsoil than those soils and they are mottled at a shallower depth. They are similar to Ravenna soils in color and texture but are acid to a greater depth. Gresham soils have a less gray subsoil than Frenchtown soils and are more acid. They are more pebbly and less silty than Fitchville soils, and they contain a fragipan.

Gresham silt loam, 2 to 6 percent slopes (GrB).—This soil is mainly in draws, most of which are fed by springs and have intermittent streams. It also is on the lower part of till-covered hills underlain by rock. These areas are wet because of seepage through the rock.

Included with this soil in mapping are spots of soils on the bottom of some draws and around springs. The subsoil of these soils is almost solid gray. Also included are areas of soils that have broken rock within a depth of 60 inches and a few areas that have broken rock at a depth of only 3 feet.

Wetness is a moderate limitation if this soil is farmed. Wetness and slow permeability are limitations to many nonfarm uses. Capability unit IIw-4; woodland suitability group 2w2.

Haney Series

The Haney series consists of nearly level to gently sloping moderately well drained, soils that formed in loamy to gravelly outwash deposits. They are on outwash plains in the northern part of the county.

A representative profile of this series, in a cultivated field, has a dark-brown loam plow layer 10 inches thick. The subsoil, between depths of 10 and 16 inches, is yellowish-brown loam; between depths of 16 and 29 inches, it is firm dark yellowish-brown gravelly clay loam mottled with grayish brown; and between depths of 29 and 40 inches, it is yellowish-brown gravelly sandy clay loam mottled with grayish brown. The substratum, between depths of 40 and 46 inches, is dark yellowish-brown gravelly sandy loam and, between depths of 46 and 60 inches, it is dark yellowish-brown gravelly loamy coarse sand.

Permeability is moderate in the subsoil and rapid in the underlying coarse material. Runoff is slow, and available moisture capacity is medium. Natural drainage is generally adequate for crops. Tilth is generally good. The root zone is deep, and it ranges from medium acid to neutral.

Most areas of Haney soils are used for crops, mainly corn, soybeans, small grain, and hay.

Representative profile of Haney loam, 2 to 6 percent slopes, in a cultivated field, in the SW1/4SW1/4 sec. 1, R. 20 W., T. 22 N. (Plymouth Township):

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

B21t—10 to 16 inches, yellowish-brown (10YR 5/4) loam, moderate, medium, subangular blocky structure; friable; patches of dark yellowish-brown (10YR 4/4) clay films on ped faces; 10 percent fine gravel; slightly acid; clear, smooth boundary.

B22t—16 to 29 inches, dark yellowish-brown (10YR 4/4) gravelly clay loam; few, fine, distinct, grayish-brown (10YR 5/2) mottles; firm, sticky; gravel and sand grains coated and bridged with clay; 20 percent gravel; medium acid; clear, smooth boundary.

B23t—29 to 40 inches, yellowish-brown (10YR 5/4) gravelly sandy clay loam; few, fine, faint grayish-brown (10YR 5/2) mottles; massive; friable; slightly sticky; some coarse fragments and sand grains coated and bridged with clay; 20 percent gravel; slightly acid; gradual, smooth boundary.

C1—40 to 46 inches, dark yellowish-brown (10YR 4/4) gravelly sandy loam; massive; very friable; 20 percent gravel; neutral; clear, smooth boundary.

IIC2—46 to 60 inches, dark yellowish-brown (10YR 4/4) gravelly loamy coarse sand; single grain; loose, 25 percent gravel; neutral.

In uncultivated areas, the A1 horizon is very dark grayish brown (10YR 3/2) and is 2 to 4 inches thick. An A2 horizon is present in some areas. It is brown (10YR 5/3) or pale-brown (10YR 6/3) loam that is free of mottling.

A B1 horizon is present in some areas. It is typically yellowish brown and has pale-brown degradational silt coatings. The B2t horizon has a total thickness of 20 to 32 inches. The texture of layers in this horizon is loam, gravelly loam, gravelly clay loam, and sandy clay loam. The gravel content ranges from almost none to 25 percent. The base color of the B2t horizon has a hue of 10YR, a value of 4 or 5, and a chroma of 3 or 4.

The C horizon is highly stratified. The texture of the individual strata is gravelly sandy loam, very gravelly loam, and loamy sand. The gravel content ranges from 10 to 30 percent.

Reaction in the A and B horizons is medium acid to neutral. The C horizon is neutral to moderately alkaline, and it is calcareous. Carbonates are at a depth of 40 to 72 inches.

Haney soils are similar to Belmore and Digby soils in texture. They are a little wetter than Belmore soils and are mottled at a shallower depth. They have better natural drainage than Digby soils and have dark yellowish-brown clay films, rather than a grayish-brown, on ped faces in the subsoil. Haney soils are less acid than Bogart soils, but they are otherwise similar. They are more gravelly and less silty than Glenford soils and are less clayey and more gravelly than Cardington soils.

Haney loam, 2 to 6 percent slopes (HaB).—This soil is on outwash plains. Included in mapping are a few areas of soils that are underlain by glacial till at a depth of 3 to 5 feet; many spots of gravelly soils; and a few, small, low areas of somewhat poorly drained Digby soils. Also included are a few areas of soils that are almost free of gravel in the upper 1 foot to 3 feet; a few small areas of soils that have slope of more than 6 percent; and a few large areas of soils that have slopes of less than 2 percent.

The hazard of erosion is moderate, especially in areas on high knolls. The slopes are generally too short and irregular for special erosion-control practices. Slope and occasional periods of wetness are limitations to some nonfarm uses. Capability unit IIe-1; woodland suitability group 2o1.

Hanover Series

The Hanover series consists of gently sloping to steep, well-drained, soils. These soils formed in old glacial till that is low in lime. They have a dense fragipan in the subsoil that restricts the movement of water and the penetration of roots. They are in the southern part of the county.

A representative profile of this series, in a cultivated field, has a dark-brown silt loam plow layer 7 inches thick. The subsoil has a total thickness of 69 inches. The top part consists of a 3-inch layer of yellowish-brown silt loam underlain by a 12-inch layer of yellowish-brown, firm loam. Below this is the fragipan that is 50 inches thick. It consists of very firm, dense, yellowish-brown loam that breaks into large blocks, the interiors of which are very dense and not easily penetrated by roots or water. The fragipan is underlain by 4 inches of yellowish-brown loam. Small pebbles and a few stones are in all parts of the profile, and stones are numerous below a depth of 4 feet in some areas.

Permeability is moderately slow, and available moisture capacity is medium. Runoff is moderate to rapid. Natural drainage is adequate for most uses. The root zone is moderately deep, and it ranges from strongly acid to slightly acid. Uneroded areas have good tilth, but eroded areas have poorer tilth, lower available moisture capacity, and less rooting depth.

The less strongly sloping Hanover soils are used for crops or for improved pasture. The steeper areas are in permanent pasture or trees. Most trees grow well on these soils.

Representative profile of Hanover silt loam, 2 to 6 percent slopes, in a cultivated field, in the NE1/4 NW1/4 sec. 2, T. 19 N. R. 18 W. (Jefferson Township) (laboratory data sample RC-18):

Ap—0 to 7 inches, dark-brown (10YR 4/3) silt loam; weak, fine, crumb structure; friable; medium acid; abrupt, smooth boundary.

B1—7 to 10 inches, yellowish-brown (10YR 5/4) silt loam; weak, medium, subangular blocky structure; friable; 5 percent pebbles, mostly less than one-half inch in diameter; slightly acid; clear, wavy boundary.

B2t—10 to 22 inches, yellowish-brown (10YR 5/6) heavy loam; moderate, medium, subangular, blocky structure; firm; medium acid; prism faces have patchy, brown (10YR 5/3), yellowish-brown (10YR 5/4) and dark yellowish-brown (10YR 4/4) clay films; 2 percent very dark gray (10YR 3/1) manganese concretions; 5 percent coarse fragments, mostly less than 1 inch in diameter; slightly acid; clear, smooth boundary.

Bx1—22 to 34 inches, yellowish-brown (10YR 5/6) heavy loam; few, fine, distinct, strong-brown (7.5YR 5/6 and 5/8) stains; weak, coarse, prismatic structure, massive within prisms; very firm, brittle; prisms have light yellowish-brown (10YR 6/4) silt coatings and patchy, grayish-brown (10YR 5/2) clay films; 5 percent very dark gray (10YR 3/1) manganese concretions that are not distributed uniformly in depth; 5 percent coarse fragments less than 1 inch in diameter; medium acid; diffuse, wavy boundary.

Bx2—34 to 48 inches, yellowish-brown (10YR 5/6) heavy loam; moderate, very coarse, prismatic structure; very firm, brittle; discontinuous grayish-brown (10YR 5/2) clay films on ped faces; 5 percent very dark gray (10YR 3/1) manganese concretions that are not uniformly distributed; 5 percent coarse fragments, mostly less than 1 inch in diameter but a few sandstone fragments are 2 to 3 inches in diameter; very strongly acid; clear, wavy boundary.

Bx3—48 to 60 inches; yellowish-brown (10YR 5/4) loam; few, medium, faint, yellowish-brown (10YR 5/6) mottles and few, fine, distinct, gray (10YR 5/1) mottles; weak, very coarse, prismatic structure that parts to weak, thick, platy structure; very firm, brittle; yellowish-brown (10YR 5/4) and light-gray (10YR 6/1) coatings on prism face; horizontal ped faces 10 percent covered with very dark gray (10YR 3/1) manganese concretions; 5 percent pebbles; very strongly acid; clear, wavy boundary.

Bx4—60 to 72 inches, yellowish-brown (10YR 5/4) loam; few, coarse, distinct, yellowish-brown (10YR 5/8) mottles; weak, very coarse, prismatic structure that parts to weak, medium, platy structure; very firm, brittle; ped faces mostly yellowish-brown (10YR 5/4) with patches of grayish-brown (10YR 5/2); 5 percent manganese concretions; 5 percent pebbles; very strongly acid; clear, smooth boundary.

B3—72 to 76 inches, yellowish-brown (10YR 5/4) loam; weak, medium, subangular blocky structure; firm; patchy, brown (10YR 4/3) clay films on ped surfaces; 5 percent pebbles; 5 percent manganese concretions; very strongly acid.

The Ap horizon is dark grayish brown (10YR 4/2) to brown or dark brown (10YR 4/3). In uncultivated areas the A1 horizon is 1 to 4 inches thick and is very dark grayish brown (10YR 3/2). A brown (10YR 5/3) A2 horizon, as much as 7 inches thick, is present in some uncultivated areas.

The B1 horizon is as much as 6 inches thick and shows a varying amount of degradational silt coatings. The B2t horizon, which is above the fragipan, is 10 to 16 inches thick. Its color has a hue of 10YR or 7.5YR, a value of 4 or 5, and a chroma of 4 to 6. It has degradational silt coatings in some areas.

The fragipan begins at a depth of 20 to 28 inches and is 30 to 54 inches thick. It is loam or light clay loam. The base color is yellowish brown or brown and has a hue of 10YR or 7.5YR. Yellowish brown (10YR 5/4 or 5/6) is the dominant color. Dark-colored manganese stains and concretions are prominent and coat as much as 80 percent of the horizontal ped surfaces. In some areas the upper part of the fragipan is degraded and has an abundance of grainy silt coatings, and there is an absence of prismatic or polygonal structure.

The B3 horizon is similar to the fragipan in color and texture but lacks the firmness and brittleness of the fragipan. In some areas there is no B3 horizon.

Many pebbles and a few stones are in all parts of the profile. Partly weathered sandstone fragments are below a depth of 3 feet, and in some areas a high percentage of weathered sandstone is below a depth of 4 feet.

Hanover soils are similar to Titusville soils in texture but have better natural drainage and are deeper to mottling. They are deeper over bedrock than Loudonville soils, but in the upper part of the profile they are similar to those soils in texture. Hanover soils are more pebbly and less silty than Mentor soils, and they contain less rounded gravel than Chili soils. In addition, they have a fragipan, which Mentor and Chili soils do not have. Hanover soils are similar to Wooster soils but formed in older glacial till that is acid to a greater depth.

Hanover silt loam, 2 to 6 percent slopes (HfB).—This soil is on hilltops and in valleys between hills that are underlain by rock. It has the profile described as representative of the series.

Included with this soil in mapping are small, low areas of moderately well drained Titusville soils. Also included around a few springs, in wet spots, and along minor natural drainageways are soils that are grayer and more mottled than this soil. Spots of soils that have

broken rock within a depth of 40 inches and a few small areas of stony soils are also included.

The hazard of erosion is moderate if this soil is farmed. The moderately slow permeability is a limitation to some nonfarm uses. Capability unit IIe-5; woodland suitability group 1ol.

Hanover silt loam, 6 to 12 percent slopes (HfC).—This soil is on hillsides and in valleys between hills that are underlain by rock. Included in mapping are small areas of moderately well drained Titusville soils on the lower part of some hilsides. Also included around some seeps and springs are soils that are wetter and grayer than this soil. Many spots of Loudonville soils that have bedrock within a depth of 40 inches, and a few spots of more gravelly Chili soils are included.

The hazard of erosion is severe if this soil is farmed. Slope and moderately slow permeability are limitations to most nonfarm uses. Capability unit IIIe-4; woodland suitability group 1ol.

Hanover silt loam, 6 to 12 percent slopes, moderately eroded (HfC2).—This soil is on hillsides. Erosion has removed a part of the surface layer, and the plow layer is a mixture of the material originally in the surface layer and that from the subsoil. The color of the surface layer ranges from brown or yellowish brown where erosion is greater to dark grayish brown in the least eroded spots. Below the plow layer, the profile is similar to that described as representative of the series, but in the more eroded spots, the fragipan is closer to the surface.

Included with this soil in mapping are small areas of moderately well drained Titusville soils on the lower part of some hillsides. Also included are a few small areas of soils that have bedrock within a depth of 40 inches and small spots of soils that are stony or gravelly.

Most areas of this soil are cultivated or were formerly cultivated. This soil has poorer tilth, faster runoff, and lower available moisture capacity than uneroded Hanover soils, and it is slightly less well suited to crops.

The hazard of further erosion is severe if this soil is farmed. Slope and moderately slow permeability are limitations to most nonfarm uses. Capability unit IIIe-4; woodland suitability group 1ol.

Hanover silt loam, 6 to 12 percent slopes, severely eroded (HfC3).—This soil is on hillsides. Erosion has removed most of the original surface layer, and the present plow layer consists mainly of yellowish-brown material originally in the subsoil. Below the plow layer, the profile is similar to that described as representative for the series, but the fragipan is closer to the surface.

Included with this soil in mapping are a few small areas of uneroded soils that have a darker colored plow layer than this soil. Also included are small areas of the more mottled Titusville soils on some of the lower slopes. In a few small areas, bedrock is within a depth of 40 inches.

Most areas of this soil are cultivated or were formerly cultivated. This soil has poorer tilth, lower available water capacity, and faster runoff than less eroded Hanover soils, and it is not so well suited to crops. Additions of organic matter are especially beneficial.

The hazard of further erosion is very severe if this soil is farmed. Slope and moderately slow permeability are limitations to most nonfarm uses. Capability unit IVe-3; woodland suitability group 1ol.

Hanover silt loam, 12 to 18 percent slopes (HfD).—This soil is on hillsides. Most areas are long and narrow.

Included with this soil in mapping are a few areas of eroded soils that have a light brownish-gray surface layer, a few spots of stony or gravelly soils, and many spots of soils that are underlain by broken rock at a depth of 3 to 4 feet. Also included are small areas of moderately well drained Titusville soils on the lower part of some hillsides, and areas of gray and mottled soils around some springs and seeps and along natural drainageways. Most areas of this soil are in permanent pasture or in trees.

The hazard of erosion is very severe if this soil is farmed. Slope is a limitation to many nonfarm uses. Capability unit IVe-1; woodland suitability group 1rl.

Hanover silt loam, 12 to 18 percent slopes, moderately eroded (HfD2).—This soil is on hillsides. Erosion has removed a part of the surface layer, and the plow layer is a mixture of the material originally in the surface layer and that from the subsoil. The plow layer ranges from dark grayish brown in the least eroded spots to brown or yellowish brown where erosion is greater. Below the surface layer the profile is similar to that described as representative of the series, but the restricting fragipan in this soil is at a slightly shallower depth where erosion is greater.

Included with this soil in mapping are small areas of gravelly or stony soils and small areas of soils that have rock within a depth of 40 inches. Also included around seeps and springs are soils that are gray and mottled.

Most areas of this soil are cultivated or were formerly cultivated. Further erosion can be expected if a vegetative cover is not maintained. This soil has poorer tilth, faster runoff, and lower available moisture capacity than uneroded Hanover soils that have the same gradient of slope.

The hazard of erosion is very severe if this soil is farmed. Slope is a limitation to most nonfarm uses. Capability unit IVe-1; woodland suitability group 1rl.

Hanover silt loam, 18 to 25 percent slopes (HfE).—This soil is on the sides of narrow stream valleys. It is in long, narrow areas.

Included with this soil in mapping are many small areas of soils that have stones and boulders on the surface and soils that have solid or broken rock at a depth of 3 to 5 feet. Also included are small areas of eroded soils that have a brown surface layer, a few areas of more gravelly Chili soils, and some areas of gray and mottled soils around seeps and springs. A few areas of soils, on very narrow stream bottoms, that are similar to Holly or Shoals soils; and small areas of soils that have slopes of more than 25 percent are included. A few shallow gullies are in some areas. If these gullies are not controlled, they extend into the more nearly level areas.

Most areas of this soil are wooded. This soil is too steep for cultivation, but it responds to most woodland improvement practices. Slope is a limitation to most nonfarm uses. Capability unit VIe-1; woodland suitability group 1rl.

Holly Series

The Holly series consists of nearly level, poorly drained soils that formed in alluvial material deposited by flooding streams. These soils are in depressions, abandoned stream channels, and other low areas on the flood plains of streams throughout the county.

A representative profile of this series, in a wooded area, has a dark-gray silt loam surface layer 3 inches thick. The subsoil extends a depth of 32 inches. It is dark-gray silt loam mottled with strong brown and dark grayish brown. The substratum, between depths of 32 and 40 inches, is dark grayish-brown loam mottled with dark gray and gray. Between depths of 40 and 60 inches, it consists of dark-gray silt loam and thin strata of fine sandy loam.

Permeability is moderate, and available moisture capacity is high. Runoff is very slow. These soils are subject to flooding, and some areas remain under water for a considerable period after floods or heavy rains. Artificial drainage is needed if these soils are farmed, but many areas are difficult to drain because of their size and location. For this reason, few areas of Holly soils are cultivated. Most areas are in trees, brush, or permanent pasture.

Representative profile of Holly silt loam, in a wooded area east of OH-95, in the NW1/4 sec. 2, T. 21 N., R. 17 W. (Worthington Township):

A1—0 to 3 inches, dark-gray (10YR 4/1) silt loam; few, coarse, faint, dark grayish-brown (10YR 4/2) mottles and many, coarse, distinct, strong-brown (7.5YR 5/6) mottles; weak, medium, subangular blocky structure; friable; few dark concretions; neutral; gradual boundary.

Bg1—3 to 14 inches, dark-gray (10YR 4/1) silt loam; few, coarse, faint, dark grayish-brown (10YR 4/2) mottles and many, coarse, distinct, strong-brown (7.5YR 5/6) mottles; weak, medium, subangular blocky structure; friable; neutral; gradual boundary.

Bg2—14 to 32 inches, dark-gray (10YR 4/1) silt loam; common, coarse, faint, dark grayish-brown (10YR 4/2) mottles and many, fine, distinct, strong-brown (7.5YR 5/6) mottles; weak, fine, subangular blocky structure; friable; few dark concretions; neutral; gradual boundary.

C1g—32 to 40 inches, dark grayish-brown (10YR 4/2) loam; common, coarse, faint, dark-gray (10YR 4/1) and gray (10YR 5/1) mottles; massive; friable; slightly stratified; neutral; gradual boundary.

C2g—40 to 60 inches, dark-gray (5Y 4/1) silt loam; common, fine, prominent, strong-brown (7.5YR 5/8) mottles; massive; friable; several thin strata of fine sandy loam; neutral.

The A1 horizon has a texture of loam or silt loam and is 3 to 8 inches thick. Its color has a hue of 10YR, a value of 3 or 4, and a chroma of 1 or 2. The Ap horizon in cultivated areas has a similar range of color.

The B horizon has a hue of 10YR to 2.5Y, a value of 4 or 5, and a chroma of 0 to 2. The texture of the B and C1 horizons is silt loam, loam, silty clay loam, or fine sandy loam. The substratum, below a depth of 40 inches, varies even more in texture and contains sandy, gravelly, and stony strata. These coarser textured strata are most common in the valleys of the smaller, swifter streams. In some areas the profile has one or more thin, buried surface layers. Reaction generally is neutral throughout the profile, but it ranges to slightly acid.

Holly soils have poorer natural drainage than Shoals soils and are grayer below the surface layer. They do not have the thick, dark-colored buried surface layer that Algiers soils have. Holly soils generally have a lighter colored surface layer than Sloan soils, but in some areas they have a thinner, dark-colored surface layer. They have a less definite subsoil than Sebring soils and are subject to flooding.

Holly silt loam (Ho).—This soil is on flood plains. It covers the entire flood plain of many narrow valleys and is in depressions and in old abandoned stream channels in the wider valleys. Slopes are dominantly less than 2 percent, but some are as much as 4 percent in narrow valleys. Some areas are cut by old stream channels and have nearly vertical banks.

Included with this soil in mapping are small areas of soils that have a silty clay loam, loam, or gravelly loam surface layer; a few areas of soils, in the southern part of the county, that have rock at a depth of 3 to 5 feet; and many areas of soils that have sandy or gravelly loam below a depth of 3 feet. Also included are a few areas of soils that are gravelly at a shallower depth than this soil, a few areas of soils that are stony on the surface, and some small areas of somewhat poorly drained Shoals soils on knolls.

A few areas of this soil are cultivated along with nearby soils, but most areas are in pasture or in trees. Wetness is a severe limitation if this soil is farmed. Some rather large areas in the Black Fork Valley are ponded for extended periods after flooding. Flooding and seasonal wetness are limitations to most nonfarm uses. Capability unit IIIw-5; woodland suitability group 2wl.

Landes Series

The Landes series consists of nearly level, well-drained, dark-colored soils that formed in sandy loam and loamy sand alluvial deposits. These soils are on the flood plains of Clear Fork and Cedar Fork.

A representative profile of this series, in a cultivated field, has a very dark grayish-brown fine sandy loam plow layer 13 inches thick. This layer is underlain by brown, friable fine sandy loam to a depth of 27 inches. Below this, to a depth of 60 inches or more, is yellowish-brown fine sandy loam and loamy fine sand. There is some gravel in the layers below a depth of 40 inches.

Permeability is moderately rapid, and available moisture capacity is low. Runoff is slow. The root zone is deep, and it ranges from slightly acid to mildly alkaline. Tilth is good. These soils are subject to occasional flooding, but they are not flooded every year, and natural drainage is adequate for farming.

Landes soils are well suited to crops and are commonly used for corn, soybeans, and small grain. There is, however, a continuing hazard of flooding.

Representative profile of Landes fine sandy loam, in a cultivated field, in the NW1/4NE1/4 sec. 15, T. 19 N., R. 18 W. (Jefferson Township):

Ap—0 to 13 inches, very dark grayish-brown (10YR 3/2) (rubbed) fine sandy loam; weak, fine, crumb structure; friable; neutral; abrupt, smooth boundary.

C1—13 to 27 inches, brown (10YR 4/3) fine sandy loam; massive; friable; neutral; abrupt, smooth boundary.

IIC2—27 to 40 inches, yellowish-brown (10YR 5/4) loamy fine sand; massive; loose, neutral; clear, smooth boundary.

IIC3—40 to 60 inches +, yellowish-brown (10YR 5/4) and brown (10YR 5/3) stratified loamy sand and fine sandy loam; massive; very friable to loose; lenses of clean sand and fine gravel become more numerous with depth; neutral.

The Ap or A1 horizons are very dark grayish brown (10YR 3/2) or very dark brown (10YR 2/2) fine sandy loam. They extend to a depth of at least 10 inches.

The substratum, between depths of 13 and 40 inches, has a hue of 10YR or 7.5YR, a value of 4 to 6, and a chroma of 3 to 6. This part of the substratum is loamy sand or fine sandy loam that has thin strata of silt loam. It is as much as 5 percent coarse fragments. A thin, dark, buried surface layer is in some areas. The substratum below a depth of 40 inches is loamy sand or sandy loam, and it contains lenses of clean sand. The gravel content increases with depth and is as high as 30 percent at a depth of 60 inches. Reaction throughout the profile ranges from slightly acid to mildly alkaline, but it is predominantly neutral. The lower part of the C horizon is weakly calcareous in some areas.

Landes soils are darker colored and less acid than Lobdell soils, and they are sandier below the surface layer. They are darker colored, less acid, and sandier than Mentor soils.

Landes fine sandy loam (La).—This soil is on flood plains. Some areas are cut by old stream channels that have almost vertical banks. Included in mapping are Sloan, Shoals, and other wetter soils in old abandoned channels. Also included are spots of soils that have a dark surface layer less than 10 inches thick.

Areas of this soil are used for crops or for improved pasture. Wetness is a moderate limitation if this soil is farmed. Flooding is a limitation to many nonfarm uses. Capability unit IIw-6; woodland suitability group 2ol.

Latham Series

The Latham series consists of gently sloping and sloping, moderately well drained soils that formed in material weathered from siltstone and shale. These soils are underlain by soft rock at a depth of 20 to 40 inches. They are on hilltops and hillsides in the east-central and southeastern parts of the county.

A representative profile of this series, in a cultivated field, has a dark grayish-brown silt loam plow layer 7 inches thick. The subsoil begins at a depth of 7 inches and extends to a depth of 28 inches. Between depths of 7 and 10 inches, it is mottled yellowish-brown and strong-brown heavy silty clay loam; between depths of 10 and 14 inches, it is strong-brown, very firm silty clay mottled with dark brown and gray; between depths of 14 and 24 inches, it is mottled brown, yellowish-brown, and grayish-brown, firm silty clay loam; and between depths of 24 and 28 inches, it is pale-brown, firm silty clay loam mottled with yellowish brown and grayish brown. The substratum, between depths of 28 and 32 inches, is light yellowish-brown silty clay loam mottled with grayish brown and yellowish red. Below a depth of 32 inches, it is gray shale or siltstone.

Permeability is slow, and available moisture capacity is medium. Runoff is rapid. Natural drainage is generally adequate, although these soils are excessively wet for brief periods. The root zone is moderately deep, and it is generally very strongly acid.

Latham soils are poorly suited to crops. They are very strongly acid; Consequently they have a very high lime requirement. Tilth is poor in most cultivated areas. Most areas of these soils are in trees or pasture or are idle.

Representative profile of Latham silt loam, 6 to 12 percent slopes, in a cultivated field, in the NW1/4SE1/4 sec. 35, T. 21 N., R. 17 W. (Worthington Township):

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine, granular structure; friable; very strongly acid; abrupt, smooth boundary.

B1—7 to 10 inches, yellowish-brown (10YR 5/4) and strong-brown (7.5YR 5/6) heavy silty clay loam; moderate, medium, subangular blocky structure; firm; light yellowish-brown (10YR 6/4) ped coatings; 3 percent coarse fragments; extremely acid; clear, wavy boundary.

B21t—10 to 14 inches, strong-brown (7.5YR 5/6) silty clay; common, medium, faint, dark-brown (7.5YR 4/4) mottles and common, medium, prominent, gray (10YR 6/1) mottles; weak, medium, prismatic structure that parts to moderate, medium, subangular blocky structure; very firm; light yellowish-brown (10YR 6/4) clay films on ped faces and ped interiors; few sandstone fragments; very strongly acid; clear, smooth boundary.

B22t—14 to 24 inches, mottled, brown (10YR 5/3) yellowish-brown (10YR 5/4), and grayish-brown (10YR 5/2) heavy silty clay loam; moderate, medium, subangular blocky structure; firm; thin, patchy, brown (10YR 5/3) clay films on ped faces; few sandstone fragments; very strongly acid; clear, irregular boundary.

B3—24 to 28 inches, pale-brown (10YR 6/3) silty clay loam; many, fine, distinct, yellowish-brown (10YR 5/4) and grayish-brown (10YR 5/2) mottles; weak, medium, subangular blocky structure; firm; few sandstone and shale fragments; very strongly acid; clear, smooth boundary.

C1—28 to 32 inches, light yellowish-brown (10YR 6/4) silty clay loam; many, coarse, distinct, grayish-brown (10YR 5/2) mottles and common, fine, prominent, yellowish-red (5YR 5/6) mottles; weak, medium, platy structure; firm; 10 percent fine sandstone and shale fragments; very strongly acid; abrupt, wavy boundary.

C2—32 inches +, gray (10YR 5/1) shale or siltstone; common, coarse, prominent, yellowish-red (5YR 5/6) stains; paralithic.

Depth to shale or siltstone ranges from 20 to 40 inches. The solum is 20 to 36 inches thick. An A2 horizon is present in some areas. It is generally pale-brown (10YR 6/3) silt loam or light silty clay loam.

The B1 horizon is not present in all areas. The B2t horizon is 8 to 20 inches thick. It has a hue of 10YR or 7.5YR, a value of 5 or 6, and a chroma of 3 to 6. The B3 and C1 horizons have a hue of 10YR or 2.5Y, a value of 5 or 6, and a chroma of 3 or 4.

The underlying rock is soft enough to be dug through to a depth of at least 48 inches. Reaction in the solum is strongly acid to extremely acid.

Latham soils have a more clayey subsoil than Lordstown, Loudonville, or Berks soils. They are shallower to rock and have a more clayey subsoil than Hanover or Titusville soils.

Latham silt loam, 2 to 6 percent slopes (LfB).—This soil is on hilltops. Included in mapping are a few areas of soils that have a thin covering of glacial till over weathered shale and some small areas of soils around wet spots. These soils are generally gray in the upper part of the subsoil. A few small areas of soils that have solid rock within a depth of 40 inches are also included.

Most areas of this soil were formerly used for crops, but they are now idle. The hazard of erosion is moderate if this soil is farmed. Shallowness to bedrock and slow permeability are limitations to many nonfarm uses. Capability unit IIe-6; woodland suitability group 4wl.

Latham silt loam, 6 to 12 percent slopes (LfC).—This

soil is on hillsides and hilltops. It has the profile described as representative of the series.

Included with this soil in mapping are many small areas of eroded soils that have a brown silty clay loam surface layer and soils around seeps and springs that have a grayer, more mottled subsoil than this soil. Also included are some areas of soils that have glacial stones and thin deposits of glacial till on the surface and a few small areas of soils that have solid rock within a depth of 40 inches. A few small areas of soils that have slopes of less than 6 percent and a few large areas that have slopes of 12 to 18 percent are also included.

Most of the large areas of this soil are wooded or are idle. The hazard of erosion is severe if this soil is farmed. Steepness of slope and shale bedrock within a depth of 40 inches are limitations to many nonfarm uses. Capability unit IIIe-3; woodland suitability group 4wl.

Linwood Series

The Linwood series consists of nearly level, dark-colored, very poorly drained soils that formed in muck underlain by loam or silt loam at a depth of 20 to 50 inches. These soils formed under a brush and marsh-grass vegetation. They are in low areas, mostly in the northern part of the county.

A representative profile of this series has 24 inches of black muck overlying gray silt loam between depths of 24 and 40 inches and grayish-brown loam between depths of 40 and 60 inches.

Linwood soils are very wet. The water table is at or near the surface for extended periods, and some areas are ponded. Artificial drainage is needed if these soils are cultivated. If the soils are drained, they are suited to a variety of field and vegetable crops. They have a deep root zone, moderate permeability, and high available moisture capacity. These soils have good tilth. They are subject to soil blowing and fire damage if not protected.

Representative profile of Linwood muck, in a cultivated field, just west of the intersection of Fackler and Shatzer Roads, in the NE1/4 sec. 26, T. 23 N., R. 19 W. (Cass Township):

Oap—0 to 6 inches, black (10YR 2/1) sapric material, no color change when rubbed; about 15 percent fiber, 5 percent when rubbed; moderate, very fine, subangular, blocky structure; friable; 10 percent mineral; neutral; abrupt, smooth boundary.

Oa1—6 to 18 inches, black (10YR 2/1) sapric material; same color when rubbed; about 15 percent fiber, 5 percent when rubbed; moderate, fine, subangular, blocky structure; friable; 5 percent mineral; neutral; diffuse, wavy boundary.

Oa2—18 to 24 inches, black (10YR 2/1) sapric material; same color when rubbed; 20 percent fiber, 5 percent when rubbed; weak, medium, subangular, blocky structure; friable; neutral; abrupt, wavy boundary.

IIC1—24 to 40 inches, gray (5Y 5/1) silt loam; many, medium, prominent, strong-brown (7.5YR 5/8) mottles; massive; friable; neutral; clear, wavy boundary.

IIC2—40 to 60 inches, grayish-brown (10YR 5/2) loam; many, medium, faint, yellowish-brown (10YR 5/4) mottles; massive; friable; 5 percent pebbles; mildly alkaline; weakly calcareous.

The organic material ranges from 20 to 50 inches in thickness. The organic horizons have a hue of 10YR, a value of 2, and a chroma less than 2. The value and chroma increase by not more than one unit when the material is rubbed. More than 75 percent of the organic deposit is sapric (highly decomposed) material. The fiber content of unrubbed material is less than 25 percent and decreases to less than 10 percent of rubbed material. The mineral horizons are a loam or silt loam. These horizons are highly stratified where the muck is of alluvial origin. Reaction in the organic part of the profile is slightly acid to neutral. In the mineral part, the reaction is neutral to moderately alkaline. In some areas the mineral part is calcareous.

Linwood soils differ from most other soils in the county in having a muck surface layer. They formed in thinner organic deposits than Carlisle soils and they do not have the mineral surface layer that Wallkill soils have.

Linwood muck (Lk).—This soil occurs as moderately deep muck pockets.

Included with this soil in mapping are areas of soils in which muck is less than 20 inches thick and other areas in which it is more than 50 inches thick. Generally, the muck is thicker in the center of the pocket and thinner toward the edges. Also included are small areas of dark-colored Pewamo, Sloan, and Luray soils, which do not have a muck surface layer. Small areas of soils in which the organic material is peat rather than muck are included.

The degree of wetness varies greatly. Some undrained areas are almost permanently wet; others are as dry as or drier than adjacent mineral soils. Some drained areas of this soil are used for crops. Some of the wetter areas are marshland. Some areas in and adjoining Black Fork Valley are subject to flooding. Wetness is a limitation to most nonfarm uses. Capability unit IIw-7; woodland suitability group 5wl.

Lobdell Series

The Lobdell series consists of nearly level, moderately well drained soils that formed in alluvial sediment deposited by flowing streams. These soils are on flood plains of streams in all parts of the county.

A representative profile of this series, in a wooded area, has a dark grayish-brown silt loam surface layer 6 inches thick. The upper part of the subsoil, between depths of 6 and 20 inches, is yellowish-brown loam. The lower part, between depths of 20 and 28 inches, is yellowish-brown silt loam mottled with grayish brown. The substratum, between depths of 28 and 60 inches, consists of alternate layers of silt loam, loam, and fine sandy loam, which are yellowish brown, brown, or grayish brown.

Permeability is moderate, and available moisture capacity is high. Tilth is generally good. The root zone is deep, and is commonly neutral in reaction. These soils are subject to occasional flooding. They are generally on the highest part of the flood plain. Natural drainage is generally adequate for farming. These soils are used for crops. Corn, soybeans, small grain, and hay crops are commonly grown.

Representative profile of Lobdell silt loam, in a wooded area, in the NE1/4SW1/4 sec. 17, R. 19 W., T. 21 N. (Sharon Township):

A1—0 to 6 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, crumb structure; friable; neutral; clear, wavy boundary.

B21—6 to 20 inches, yellowish-brown (10YR 5/4) loam; weak, medium, subangular blocky structure; friable; neutral; clear, wavy boundary.

B22—20 to 28 inches, yellowish-brown (10YR 5/4) silt loam; common, fine, faint grayish-brown (10YR 5/2) mottles weak, fine, subangular blocky structure; friable; neutral; clear, smooth boundary.

C1—28 to 42 inches, yellowish-brown (10YR 5/4) silt loam; common, fine, faint, grayish-brown (10YR 5/2) mottles and common, fine, distinct, strong-brown (7.5YR 5/6) mottles; massive; friable; neutral; gradual boundary.

C2—42 to 60 inches, brown (10YR 5/3) stratified silt loam, loam, and fine sandy loam; common, medium, faint, grayish-brown (10YR 5/2) and yellowish-brown (10YR 5/4 and 5/6) mottles; massive; friable; few strata of loamy sand; neutral.

The A1 horizon is very dark grayish brown (10YR 3/2) in some areas. In cultivated areas the Ap horizon is dark grayish brown (10YR 4/2).

The B horizon has a hue of 10YR, a value of 4 or 5, and a chroma of 3 or 4. The texture is loam or silt loam. A few pebbles are generally present.

The C horizon is stratified. It is generally silt loam, loam, and sandy loam. Strata of sand or gravel are below a depth of 3 feet in many areas. Reaction in the upper 40 inches is slightly acid to neutral.

Lobdell soils have a brighter color, fewer mottles, and better natural drainage than Shoals soils. They have a less well defined subsoil than Glenford soils and are subject to flooding. They have a lighter colored surface layer and a less sandy subsoil than Landes soils.

Lobdell silt loam (Lo).—This soil is on the higher part of flood plains in broad valleys and in narrow, sloping valleys in uplands.

Included with this soil in mapping are many areas of soils that have a surface layer of a different texture because of the variation in water speed during flooding. Also included are many areas of soils that contain gravel and a few areas of soils that have rock below a depth of 3 feet. Large stones and boulders are on the surface of soils in some of the narrow valleys. Other inclusions are small areas of somewhat poorly drained Shoals soils and poorly drained Holly soils in depressions and abandoned stream channels. Small areas of the darker colored Landes soils are included in valleys of Clear Fork and Cedar Fork. The slope of these soils generally is less than 2 percent but in many small areas, especially in the narrow valleys, it is more than 2 percent. Some areas of these soils are cut by old stream channels that have nearly vertical side slopes.

Most of the broader areas of this soil are used for crops. The narrower areas are in pasture or trees. This soil is well suited to crops, but it is subject to flooding. Some areas are too dissected by old stream channels to be farmed. Susceptibility to flooding is a limitation to many nonfarm uses. Capability unit IIw-6; woodland suitability group 1ol.

Lordstown Series

The Lordstown series consists of gently sloping to very steep, well-drained soils that are underlain by sandstone or siltstone bedrock at a depth of 20 to 40 inches. These soils formed in soil material weathered from rock. They are on ridgetops and hillsides, mainly in the southern part of the county.

A representative profile of this series, in a wooded area, has a very dark gray silt loam surface layer 2 inches thick. The subsoil is 22 inches thick. It is yellowish-brown silt loam and contains some sandstone fragments. The substratum begins at a depth of 24 inches and extends to a depth of 36 inches. It is a mixture of rock and yellowish-brown loam, the amount of rock increasing with depth. The substratum is underlain by solid bedrock.

Permeability is moderate, and available moisture capacity is medium. Runoff is moderate to very rapid. Some crops are damaged because of a lack of available moisture during extended dry periods. The root zone is moderately deep. Roots penetrate the cracked upper layer of the rock. Reaction in the root zone is medium acid to strongly acid. Tilth is generally good. Sloping areas are subject to erosion.

The less strongly sloping areas of these soils are suited to crops and improved pasture. The steeper areas are used for trees or permanent pasture.

Representative profile of Lordstown silt loam, 6 to 12 percent slopes, in a wooded area in the SE1/4 sec. T. 21 N., R. 17 W. (Worthington Township): (laboratory data sample RC-13):

A1—0 to 2 inches, very dark gray (10YR 3/1) silt loam; moderate, very fine, granular structure; very friable; resists wetting; 5 percent channers and pebbles; extremely acid; clear, wavy boundary.

B21—2 to 12 inches, yellowish-brown (10YR 5/6) silt loam; weak, thick, platy structure that parts to weak, fine, subangular blocky structure; friable; many pale-brown (10YR 6/3) silt coatings; 5 percent pebbles and channers; very strongly acid; diffuse, wavy boundary.

B22—12 to 24 inches, yellowish-brown (10YR 5/4) silt loam; weak, thick, platy structure that parts to moderate, fine, subangular blocky structure; friable; patchy, pale-brown (10YR 6/3) silt coatings; few, strong-brown (7.5YR 5/8) iron stains; 15 percent channers; very strongly acid; clear, wavy boundary.

C—24 to 36 inches, yellowish-brown (10YR 5/6) channery loam; massive; friable; 35 percent channers in the upper part and 70 percent in the lower part; channers 1 inch thick and 1 to 4 inches in diameter; some gravel-size fragments also present; very strongly acid; clear, irregular boundary.

R—36 inches +, fine-grained, fractured sandstone and siltstone bedrock, 1 to 2 inches thick; base color, strong brown (7.5YR 5/8); very dark grayish-brown (10YR 3/2) stains on some cleavage faces.

The solum ranges from 20 to 30 inches in thickness, and depth to rock ranges from 20 to 40 inches. In cultivated areas the Ap horizon is dark grayish brown (10YR 4/2). The content of coarse fragments is less than 15 percent in the A horizon and in the upper part of the B2 horizon and 10 to 35 percent in the lower part of the B2 horizon. The B2 horizon has a hue of 10YR or 7.5YR, a value of 4 to 5, and a chroma of 4 to 6. Silt coatings are present in some areas, but not in others. The texture of the B2 horizon is silt loam or loam.

In some shallow areas, there is no C horizon. Reaction is generally medium acid to very strongly acid throughout the profile, except where the effects of liming are evident.

Lordstown soils have a less stony subsoil than Berks soils. In Lordstown soils the subsoil is less than 35 percent sandstone fragments, and in Berks soils it is 50 percent or more. Lordstown soils are similar to Loudonville soils in color and depth to rock, but the upper part of Lordstown soils formed mainly in material weathered from fine-grained sandstone; the upper part of Loudonville soils formed in glacial till. The areas of Lordstown and Loudonville soils that have slopes steeper than 18 percent are mapped together. The

subsoil of Lordstown soils contains more silt and clay and less coarse sand than that of Schaffenaker soils.

Lordstown silt loam, 2 to 6 percent slopes (LrB).—This soil is on hilltops and ridgetops.

Included with this soil in mapping are spots of soils that have no solid rock within a depth of 40 inches, but within this depth broken rock makes up more than 90 percent of the soil volume. Most areas of this soil are bounded by steeper hilltops and the depth to rock is usually less toward these areas. Also included are small areas of more stony Berks soils and a few wet spots of soils that are grayer and more mottled than this soil. Areas of soils that have slopes of more than 6 percent are included. The steeper areas are generally between gently sloping soils on hilltops and steeper soils on hillsides.

Most of the acreage of this soil is used for crops and improved pasture. The hazard of erosion is moderate if this soil is cultivated. Shallowness to rock is a limitation to some nonfarm uses. Capability unit IIe-4; woodland suitability group 3ol.

Lordstown silt loam, 6 to 12 percent slopes (LrC).—This soil is on hilltops. It is underlain by sandstone and has the profile described as representative of the series.

Included with this soil in mapping are many spots of soils that have no solid rock within a depth of 40 inches, but within this depth broken rock makes up more than 90 percent of the soil volume. Also included are a few areas of soils that have solid rock within a depth of 20 inches; small areas of the stonier Berks soils and, in cultivated fields, a few spots of eroded soils that have a light grayish-brown surface layer. These eroded soils are also stony on the surface. The severely eroded spots are indicated by a special symbol on the soil map. Included around a few springs and seeps are soils that are grayer and more mottled than this soil.

This soil is used for crops, for trees, and for pasture. The hazard of erosion is severe if this soil is cultivated. Slope and shallowness to rock are limitations to some nonfarm uses. Capability unit IIIe-5; woodland suitability group 3ol.

Lordstown silt loam, 12 to 18 percent slopes (LrD).—This soil is on hillsides in the southern part of the county. It is underlain by sandstone.

Included with this soil in mapping are spots of soils that have no solid rock within a depth of 40 inches, but within this depth broken rock makes up more than 90 percent of the soil volume. Also included are a few areas of soils that have solid rock within a depth of 20 inches and many small areas of Berks soils that are more stony than this soil. On the lower part of some hillsides, areas of soils around springs and seeps are included. The soils in these areas are grayer and more mottled than this soil, and in places they are more clayey. Small natural drainageways start in some of the springs and extend down the slope. Along these drainageways are a few spots of eroded soils that have a brown or yellowish-brown surface layer. The severely eroded soils are shown by a special symbol on the soil map.

Most areas of this soil are in trees or permanent pasture. A few areas are used for crops. Cleared areas are subject to severe erosion. Slope is a limitation to many nonfarm uses. Capability unit IVe-5; woodland suitability group 2rl.

Lordstown and Loudonville silt loams, 18 to 25 percent slopes (LtE).—These soils are on hillsides. The Lordstown soils are the major soils in some areas, and the Loudonville soils in others, but there is no set pattern where they occur in the same area.

Included with these soils in most of the mapped areas is a small acreage of the stonier Berks soils and small areas of the gravelly Chili and Conotton soils bordering the wider valleys. Also included are some spots of soils where depth to solid rock is more than 40 inches, and a few spots where depth to bedrock is less than 20 inches. Also included are areas of soils that have stones, gravel, and boulders on the surface. Included around springs and seeps are soils that are grayer than Lordstown and Loudonville soils. Natural drainageways begin in some of these wet areas. Some of the longer slopes have an overall gradient of 18 to 25 percent but break into shorter slopes that have a gradient of 15 to 50 percent.

Most areas of Lordstown and Loudonville soils are long and narrow and are used for permanent pasture or trees. These soils are generally too steep for cultivation, but they are suitable for pasture and woodland improvement and logging operations. They are too steep for most nonfarm uses. Capability unit IVe-5; woodland suitability group 2rl.

Lordstown and Loudonville silt loams, 25 to 40 percent slopes (LtF).—This mapping unit is on long hillsides that form the sides of wide valleys. It is also on the sides of narrow valleys that cut into rock. Lordstown soils are the major soils in some areas of this mapping unit, and Loudonville soils in others. Where the soils are in the same area, they occur in no set pattern.

Included with these soils in most of the mapped areas are small acreages of the stonier Berks soils and, adjoining the larger valleys, the gravelly Chili and Conotton soils. Also included on long hillsides along many springs and seeps are soils that are grayer and more mottled than Loudonville and Lordstown soils. Small natural drainageways start in some of these areas and extend down the slope. Included along these drainageways are some areas of soils that have a few large stones on the surface and a few very small rock outcrop. Many of the longer slopes have an overall gradient of 25 to 40 percent but break into short slopes that have a gradient of 15 to 50 percent.

Where this group of soils occurs on the sides of narrow valleys cut into rock, the side slopes and the valley bottom are included in mapping. The valley bottoms have a gradient of 1 to 6 percent. The soils on these narrow bottoms are like the Lobdell and Shoals soils. The depth to rock is less than 20 inches in many spots, but on the upper part of slopes the depth exceeds 40 inches in many spots. There are also small rock outcrops.

Most areas of this mapping unit are in trees, but a few are in permanent pasture. Tree growth is generally fair to good. It is poorer in the narrow valleys. Pasture growth is fair. The soils of this mapping unit are too steep for some pasture and woodland improvement practices. They are too steep for most nonfarm

uses. Capability unit VIe-2; woodland suitability group 2rl.

Loudonville Series

The Loudonville series consists of gently sloping to moderately steep, well-drained soils that formed in glacial till underlain by sandstone bedrock at a depth of 20 to 40 inches. These soils are mostly in the southern part of the county.

A representative profile of this series, in a wooded area, has a very dark grayish-brown silt loam surface layer 3 inches thick. It is underlain by 4 inches of brown silt loam. The upper part of the subsoil, between depths of 7 and 14 inches, is yellowish-brown, firm silt loam. The lower part, between depths of 14 and 26 inches, is yellowish-brown, firm clay loam. The substratum, between depths of 26 and 31 inches, is yellowish-brown fine sandy loam. Between depths of 31 and 38 inches, the substratum is a mixture of sandstone fragments and yellowish-brown loamy fine sand. Sandstone bedrock is at a depth of 38 inches.

Permeability is moderate. Available moisture capacity is low to medium, depending on the depth to rock. Some of the shallower areas are droughty. Runoff is moderate to very rapid. Roots generally can penetrate to the rock, but in some areas, extend into cracks in the rock. Tilth is generally good, and natural drainage is adequate for crops.

The less strongly sloping Loudonville soils are used for crops or improved pasture. The steeper soils are used for permanent pasture or trees.

Representative profile of Loudonville silt loam, 2 to 6 percent slopes, in a wooded area, in the NE1/4NE1/4 sec. 5, T. 20 N., R. 19 W. (Troy Township) (laboratory data sample RC-12):

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

A2—3 to 7 inches, brown (10YR 4/3) silt loam; weak, thick, platy structure that parts to weak, fine, subangular blocky structure; friable; many roots; very strongly acid; clear, irregular boundary.

B21t—7 to 14 inches, yellowish-brown (10YR 5/4) silt loam; weak, coarse, subangular blocky structure that parts to moderate, fine, subangular blocky structure; friable; thin, patchy, brown (10YR 5/3) clay films on horizontal and vertical ped faces; few pebbles; strongly acid; diffuse, irregular boundary.

B22t—14 to 26 inches, yellowish-brown (10YR 5/4) light clay loam; moderate, fine, subangular blocky structure; firm; moderately thick, patchy, yellowish-brown (10YR 5/4) clay films on vertical and horizontal ped faces; few pebbles; strongly acid; abrupt, wavy boundary.

IIC1—26 to 31 inches, yellowish-brown (10YR 5/4) fine sandy loam; weak, medium, subangular, blocky structure; friable; 20 percent subangular sandstone fragments, 1 to 4 inches in diameter and 1 to 2 inches in thickness, easily crushed; few larger rock fragments; very strongly acid; clear, wavy boundary.

IIC2—31 to 38 inches, 60 percent sandstone fragments, 4 to 12 inches in diameter and 1 to 3 inches in thickness; 40 percent yellowish-brown (10YR 5/8) loamy fine sand; single grain; loose; very strongly acid; clear, irregular boundary.

R—38 inches +, brownish-yellow (10YR 6/6) sandstone bedrock.

In cultivated areas the Ap horizon is dark grayish brown (10YR 4/2). The A2 horizon is very thin or is absent in some cultivated areas.

The B2t horizon has a total thickness of 10 to 30 inches. It has a hue of 7.5YR or 10YR, a value of 4 or 5, and a chroma of 4 to 6. In some areas the mottles have a chroma of 2 or less in the lower part of the B2t horizon. Clay films are patchy to continuous on ped faces.

Reaction in the entire profile is medium acid to very strongly acid where not influenced by liming. Depth to rock ranges from 20 to 40 inches. The till extends to the solid rock in some areas, but in most areas there is a IIC horizon of weathered rock material. The texture of this horizon is loam, sandy loam, or loamy sand, depending on the grain size in the underlying rock. In most areas roots can penetrate the cracks in the upper few inches of rock.

Loudonville soils are similar to Lordstown soils in color, natural drainage, and depth to rock, but the upper part of Lordstown soils formed in weathered sandstone. Loudonville and Lordstown soils that have slopes steeper than 18 percent are mapped together in undifferentiated units. Loudonville soils contain less sandstone fragments in their subsoil than Berks soils, and their subsoil is less sandy than that of Schaffenaker soils. Loudonville soils are similar to Wooster and Hanover soils in color and texture, but they are underlain by sandstone at a depth of 20 to 40 inches.

Loudonville silt loam, 2 to 6 percent slopes (LvB).—This soil is on hilltops and on the lower part of hills. It has the profile described as representative of the series.

Included with this soil in mapping are some small wet areas, mostly below the steeper hilltop, of soils that are grayer and more mottled than this soil. Also included are spots of soils that are stony or gravelly on the surface and a few areas of soils in which the entire profile above the rock is quite gravelly. Many spots of soils in which the depth to solid rock is more than 40 inches and a few areas of wetter soils that have a layer of gray, mottled silty clay below the subsoil are included.

Most of the large areas of this soil are used for crops or improved pasture. Small areas are in trees or permanent pasture. The hazard of erosion is less severe on this soil than on steeper Loudonville soils. Wetness caused by seepage and springs is a limitation in places.

The hazard of erosion is moderate if this soil is farmed. Shallowness to bedrock is a limitation to some nonfarm uses. Capability unit IIe-4; woodland suitability group 2ol.

Loudonville silt loam, 6 to 12 percent slopes (LvC).—This soil is on hills.

Included with this soil in mapping around a few springs and seeps are soils that are grayer and more mottled than this soil. Also included are many small spots of soils in which the depth to rock is more than 40 inches, and a few in which it is less than 20 inches. Included in a few areas, are soils that are gravelly or stony above the bedrock. In cultivated fields a few spots of eroded soils that have a brown surface layer are included.

This soil is used for crops, pasture, or trees. Seeps and springs create local wetness.

The hazard of erosion is severe if this soil is farmed. Slope and shallowness to bedrock are limitations to many nonfarm uses. Capability unit IIIe-5; woodland suitability group 2ol.

Loudonville silt loam, 12 to 18 percent slopes (LvD).—Some areas of this soil are on entire hillsides. Other areas are below steeper hillsides, commonly in the upper end of small valleys.

Included with this soil in mapping on the lower part of hillsides around many wet spots and springs are soils that are grayer and more mottled than this soil. Some of the springs and seeps that drain down the slopes have formed channels that are cut to rock and have very steep sides. Also included are many spots of soils where depth to solid rock is more than 40 inches, and a few small spots where it is less than 20 inches. Among inclusions are some areas of soils that contain many broken rocks and some areas of soils that have enough stones on the surface to make clearing and cultivation difficult. A few small areas of eroded soils, in cultivated fields, that have a brown surface layer are included.

Most of the larger areas of this soil are in trees or permanent pasture. Some small areas are used for crops, and a few are in orchards.

The hazard of erosion is very severe if this soil is farmed. Steepness of slope is a limitation to most nonfarm uses. Capability unit IVe-5; woodland suitability group 2rl.

Luray Series

The Luray series consists of nearly level, very poorly drained, dark-colored soils that formed in lacustrine sediment high in content of silt. They formed under lowland hardwood trees and swamp grass vegetation. These soils are in all parts of the county but are most extensive in the northwestern part, where they occur in areas that were shallow lakes during the postglacial era.

A representative profile of this series, in a cultivated field, has a very dark grayish-brown silty clay loam plow layer 11 inches thick. Beginning at a depth of 11 inches, the subsoil extends to a depth of 42 inches. Between depths of 11 and 17 inches, it is dark grayish-brown silty clay loam mottled with yellowish brown and brown; between depths of 17 and 30 inches, it is grayish-brown silty clay loam mottled with yellowish brown and yellowish red; and between depths of 30 and 42 inches, it is mottled grayish-brown and yellowish-brown, stratified silty clay loam and silt loam. The substratum, between depths of 42 and 60 inches, is yellowish-brown silt loam mottled with gray. The upper 4 feet of the profile is essentially free of stones and pebbles.

Permeability is moderately slow, and available moisture capacity is high. Runoff is slow, and some areas are ponded in winter and early in spring. Artificial drainage is needed for most crops. The root zone is deep, and it is generally medium acid. The content of organic matter is high, and tilth is good.

Most drained areas of these soils are used for crops. Undrained areas are in trees or permanent pasture.

Representative profile of Luray silty clay loam, in a cultivated field, in the SE1/4NE1/4 sec. 25, T. 20 N., R. 20 W. (Sandusky Township):

Ap—0 to 11 inches, very dark grayish-brown (10YR 3/2) silty clay loam; moderate, fine, granular structure; firm; very dark gray (10YR 3/1) organic coatings; slightly acid; abrupt, smooth boundary.

B21tg—11 to 17 inches, dark grayish-brown (10YR 4/2) silty clay loam; many, coarse, distinct, brown (10YR 5/3) and prominent, yellowish-brown (10YR 5/6) mottles; moderate, fine, subangular blocky structure; firm; thick, dark-gray (10YR 4/1), organic clay coatings on peds; medium acid; gradual boundary.

B22tg—17 to 30 inches, grayish-brown (10YR 5/2) silty clay loam; many coarse, distinct, yellowish-brown (10YR 5/6) mottles and common, medium, prominent, yellowish-red (5YR 5/6) mottles; moderate, medium, angular blocky structure; firm; thin, patchy, gray (10YR 5/1) clay films on ped faces; streaks of dark-gray (10YR 4/1) organic staining on clay films; medium acid; gradual boundary.

B3g—30 to 42 inches, mottled, grayish-brown (10YR 5/2) and yellowish-brown (10YR 5/4 and 5/6), stratified silty clay loam and silt loam; weak, coarse, subangular blocky structure; firm, few vertical faces that have gray (10YR 5/1) coatings; medium acid; clear, smooth boundary.

C—42 to 60 inches; yellowish-brown (10YR 5/4) silt loam; many, coarse, distinct, gray (10YR 5/1) mottles and few, medium, distinct, strong-brown (7.5YR 5/8) mottles; massive; friable; contains thin strata of loam and sandy loam; neutral.

Colors of black (10YR 2/1), very dark gray (10YR 3/1), and very dark grayish brown (10YR 3/2) extend to a depth of 10 to 16 inches. These colors are in the A1 or Ap horizon, and in some areas extend into a B1 horizon or the upper few inches of the B2t horizon. The A1 or Ap horizon has a texture of silty clay loam or silt loam. In some areas an A12 horizon is below the Ap horizon. This A12 horizon is generally the most clayey layer in the profile and has a texture of heavy silty clay loam or silty clay.

The B2tg horizon has a total thickness of 18 to 27 inches. It has a hue of 10YR to 5Y, a value of 4 or 5, and a chroma of 1 or 2, and the mottles are of higher chroma. The texture is heavy silt loam or silty clay loam. The clay films on peds in the B2t horizon have a value of 3 to 5 and a chroma of 0 to 1 where the color is not obscured by organic stains.

The B3 and C horizons are stratified. Silty clay loam and silt loam are the dominant textures. Thin strata of loam, fine sandy loam, or sandy loam are common. The color ranges from gray to yellowish brown and differs in adjacent strata. Most strata are mottled. Reaction in the solum is medium acid or slightly acid and, in the C horizon it is slightly acid to moderately alkaline. Depth to carbonates ranges from 48 inches to more than 60 inches.

Luray soils resemble Pewamo soils in color, but Luray soils formed in silty, water-laid material that is almost free of pebbles, and Pewamo soils formed in glacial till that is less silty and that contains more pebbles. Luray soils have a darker surface layer than Sebring and Fitchville soils and a grayer subsoil than Fitchville soils. Luray soils have more distinct subsoil layers than Sloan soils.

Luray silty clay loam (Ly).—This soil is on flats and in depressions.

Included with this soil in mapping are a few areas of soils that have a silt loam or silty clay surface layer. In a few small included areas, are soils that have dark colors to a depth of 2 feet; thin, pebbly or gravelly layers are below a depth of 2 feet in some areas. These layers are thicker in areas along Marsh Run in Plymouth Township. Ponding is also extensive along Marsh Run. Also included in mapping are a few areas of soils that have firm glacial till at a depth of 3 to 5 feet. Other areas of soils have stony or gravelly loam at a depth of 3 to 5 feet. These areas are generally in long, narrow valleys, such as the valley between Pavonia and the County Home and the valley north of Alta.

Some of the larger areas of this soil are artificially drained and used for crops. Other areas could be drained

if tile outlets were available. This soil is well suited to crops if it is drained. Undrained areas are poorly suited to crops and are generally in pasture or trees. Wetness is a limitation to most nonfarm uses. Capability unit IIw-5; woodland suitability group 2wl.

Mentor Series

The Mentor series consists of gently sloping to moderately steep, well-drained soils that formed in lacustrine sediment high in content of silt. These soils are in all parts of the county but are more extensive along the sides of major valleys in the southern part.

A representative profile of this series, in a cultivated field, has a dark grayish-brown silt loam plow layer 10 inches thick. The upper part of the subsoil, between depths of 18 and 24 inches, is dark yellowish-brown silt loam. Between depths of 24 and 36 inches, the subsoil is yellowish-brown silt loam. The lower part, between depths of 36 and 43 inches, is dark yellowish-brown silt loam that contains lenses of very fine sandy loam. The substratum, between depths of 43 and 50 inches, is yellowish-brown very fine sandy loam and, between depths of 50 and 60 inches, is yellowish-brown gravelly sandy loam. The profile is essentially free of pebbles and stones in the upper 4 feet.

Permeability is moderate, and available moisture capacity is high. Runoff is moderate to rapid. Natural drainage is adequate for crops. Erosion is a hazard if it is not controlled. Tilth is generally good. The root zone is deep, and it generally is strongly acid or very strongly acid.

Mentor soils are well suited to crops, but controlling erosion is a major management need. The areas of these soils are used about equally for crops, pasture, and trees.

Representative profile of Mentor silt loam, 2 to 6 percent slopes, in a cultivated field, in the SW1/4NE1/4 sec. 6, T. 21 N., R. 17 W. (Worthington Township):

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

B1—10 to 14 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, fine and medium, subangular blocky structure; friable; strongly acid; gradual boundary.

B21t—14 to 24 inches, dark yellowish-brown (10YR 4/4) silt loam; moderate, fine and medium, subangular blocky structure; friable; few manganese concretions; patchy, thin, dark-brown (7.5YR 4/4) clay films on peds; very strongly acid; gradual boundary.

B22t—24 to 30 inches, yellowish-brown (10YR 5/4) silt loam; moderate, medium and fine, subangular blocky structure; friable; thin, patchy, dark-brown (7.5YR 4/4) clay films on peds; very strongly acid; gradual boundary.

B23t—30 to 36 inches, yellowish-brown (10YR 5/4) heavy silt loam; moderate, medium, subangular blocky structure; friable; thin, patchy, dark-brown (7.5YR 4/4) clay films on peds; very strongly acid; clear, wavy boundary.

B3—36 to 43 inches, dark yellowish-brown (10YR 4/4) light silt loam and lenses of very fine sandy loam; weak, coarse, subangular blocky structure; friable; strongly acid; clear, smooth boundary.

IIC1—43 to 50 inches, yellowish-brown (10YR 5/4) very fine sandy loam; massive; very friable; strongly acid; abrupt, wavy boundary.

IIIC2—50 to 60 inches; yellowish-brown (10YR 5/4) gravelly sandy loam; massive; very friable; 20 percent angular gravel; medium acid.

In uncultivated areas the A1 horizon is very dark grayish brown (10YR 3/2) and is 2 to 4 inches thick. An A2 horizon is present in most uncultivated areas. It is brown (10YR 5/3) or pale-brown (10YR 6/3) silt loam and is free of mottling. A thin remnant of an A2 horizon is below the Ap horizon in some cultivated areas.

The B1 horizon is yellowish brown (10YR 5/4 or 5/6) or dark yellowish brown (10YR 4/4). It is generally silt loam but ranges to light silty clay loam. It is unmottled but contains degradational silt coatings in some areas. The B2t horizon is 20 to 30 inches thick. It has a hue of 10YR or 7.5YR, a value of 4 or 5, and a chroma of 4 to 6. The texture ranges from silt loam to light silty clay loam.

The C horizon is dominantly silt loam that has strata of very fine sandy loam, sandy loam, gravelly sandy loam, and loam in places. Individual strata vary slightly in color; yellowish brown and brown predominate. A gravelly layer is at a depth of 50 inches or more in some areas.

Reaction is medium acid to very strongly acid in the B1 horizon and in the upper part of the B2t horizon and strongly acid to slightly acid in the B3 and C horizons. Carbonates are below a depth of 54 inches in some areas.

Mentor soils are similar to Glenford soils in texture, but they are deeper to mottling and have better natural drainage. They contain more silt and less coarse sand and gravel than Chili and Belmore soils. Mentor soils have a less pebbly, more silty subsoil than Wooster, Rittman, and Hanover soils, and they do not have a fragipan. Depth to gravel is greater in Mentor soils than in Wheeling soils. Mentor and Wheeling soils are similar in the upper part of their profile, and areas of Mentor and Wheeling soils that have slopes of more than 12 percent are mapped together as undifferentiated units.

Mentor silt loam, 2 to 6 percent slopes (MeB).—This soil is on terraces, on the sides of valleys, and along natural drainageways. Most areas are long and narrow. This soil has the profile described as representative of the series.

Included with this soil in mapping are spots of moderately well drained Glenford soils on the lower part of some hillsides. Also included are a few small areas of moderately eroded soils that have a light grayish-brown or brown surface layer. Gravel is within a depth of 3 feet in some small areas. A few areas of included soils are underlain by glacial till or broken rock at a depth of 3 to 5 feet.

Most areas of this soil are used for crops or for improved pasture. The hazard of erosion is moderate if this soil is farmed. This soil is suitable for many nonfarm uses. Capability unit IIe-2; woodland suitability group 1ol.

Mentor silt loam, 6 to 12 percent slopes (MeC).—This soil is on terraces and the sides of valleys and natural drainageways. Most areas are long and narrow.

Included with this soil in mapping are small areas of the moderately well drained Glenford soils on the lower part of some hillsides and areas of Holly or Sebring soils on the bottoms of some narrow natural drainageways. A few seeps occur in some areas. A few small areas of included soils are underlain by gravel, broken rock, or glacial till at a depth of 3 to 5 feet.

Most areas of this soil are used for crops or for improved pasture. Some areas are wooded. The hazard of erosion is moderate if this soil is farmed. Slope is a limitation to some nonfarm uses. Capability unit IIIe-6; woodland suitability group 1ol.

Orrville Series, Moderately Shallow Variant

This moderately shallow variant of the Orrville series consists of nearly level, somewhat poorly drained soils that are underlain by rock at a depth of 20 to 40 inches. These soils formed in alluvial sediment deposited in valleys, mostly in the northern part of the county.

A representative profile of this series, in a pasture, has a dark grayish-brown loam surface layer 5 inches thick. The subsoil, between depths of 5 and 14 inches, is friable, brown loam mottled with grayish brown. Between depths of 14 and 21 inches, the subsoil is grayish-brown very gravelly loam that is at least 50 percent rock fragments. The substratum, about 17 inches thick, is grayish-brown very gravelly loam mottled with yellowish brown. Bedrock is at a depth of 38 inches.

Permeability is rapid, and available moisture capacity is low. The soils have a seasonal high water table and are subject to periodic flooding.

The areas of these soils are not well suited to crops. Most areas are in pasture.

Representative profile of Orrville loam, moderately shallow variant, in a pasture in the NE1/4NE1/4 sec. 29 T. 23 N., R. 18 W. (Blooming Grove Township):

A1—0 to 5 inches, dark grayish-brown (10YR 4/2) loam; moderate, medium, granular structure; friable; dark-brown (10YR 3/3) organic coatings; medium acid; clear, smooth boundary.

B1—5 to 14 inches, brown (10YR 5/3) loam; common, medium, faint, grayish-brown (10YR 5/2) mottles; weak, fine, subangular blocky structure; friable; 15 percent rock fragments; medium acid; clear, smooth boundary.

B2—14 to 21 inches, grayish-brown (2.5Y 5/2) very gravelly loam; weak, very fine, subangular blocky structure; friable; 50 to 60 percent rock fragments about 1 inch in size; slightly acid; clear, irregular boundary.

C—21 to 38 inches, grayish-brown (2.5Y 5/2) heavy very gravelly loam; few yellowish-brown (10YR 5/6) mottles; massive; friable; 50 to 60 percent fine-grained sandstone rock fragments; medium acid, abrupt, wavy boundary.

IIR—38 inches +, olive-gray (5Y 5/2), bedded hard shale and fine-grained sandstone; most beds about 1 inch thick; yellowish-brown (10YR 5/6) stains on horizontal cleavage faces.

Depth to rock ranges from 20 to 40 inches. The Ap horizon, in cultivated areas, is dark grayish brown (10YR 4/2). In some uncultivated areas, the A1 horizon is very dark grayish brown (10YR 3/2) and is less than 6 inches thick. The A1 or Ap horizon is loam or silt loam in texture and is as much as 15 percent coarse fragments.

The B horizon has a hue of 10YR or 2.5Y, a value of 4 or 5, and a chroma of 1 to 3. A chroma of 2 is dominant in most subhorizons. The B horizon is gravelly or very gravelly loam that is 15 to 60 percent coarse fragments. These fragments are of gravel size, but most are angular rather than rounded.

The C horizon is loam, sandy loam, or silt loam, that is 50 to 60 percent gravelly or channery coarse fragments. Reaction is medium acid to neutral throughout the profile. The underlying rock is shale, siltstone, or fine-grained sandstone.

The moderately shallow Orrville variants differ from the Shoals soils and the coarse subsoil Shoals variants in having rock within a depth of 40 inches. These soils are wetter than Loudonville soils.

Orrville loam, moderately shallow variant (Or).—This soil is on flood plains of streams where the valley has been cut down close to the underlying bedrock. In areas of this soil, the stream generally flows directly on solid rock. Slopes are 1 to 4 percent and are generally short and irregular.

Included with this soil in mapping are some spots of better drained soils that are less gray than this soil. Depth to rock is more than 40 inches in a few spots.

This soil is too wet during wet periods and too droughty during dry periods for most crops. Most areas are in pasture. The hazard of flooding is a limitation to many nonfarm uses. Capability unit IIw-1; woodland suitability group 2wl.

Pewamo Series

The Pewamo series consists of dark-colored, nearly level soils that are very poorly drained. These soils formed in glacial till that was originally limy. They are on broad flats, in closed depressions, and along minor natural drainageways, mainly in the northern part of the county.

A representative profile of this series, in a pasture, has a very dark gray silty clay loam surface layer 11 inches thick. The subsoil, between depths of 11 and 14 inches, is very dark gray silty clay loam; between depths of 14 and 26 inches, it is dark-gray silty clay loam mottled with yellowish brown; and between depths of 26 and 52 inches, it is gray silty clay loam mottled with yellowish brown. The substratum, between depths of 52 and 64 inches, is gray silty clay loam mottled with yellowish brown; and between depths of 64 and 78 inches, it is yellowish-brown clay loam mottled with gray and brown.

Permeability is moderately slow, and available moisture capacity is high. Runoff is slow. Some areas, especially those in closed depressions, are ponded late in winter and early in spring. Tilth is generally good, but some of the more clayey areas are cloddy if plowed too wet. The root zone is deep, and reaction is generally neutral.

These soils are well suited to crops if they are drained. Most of the larger areas are drained and used for corn, soybeans, and small grain. Undrained areas are in permanent pasture or trees.

Representative profile of Pewamo silty clay loam, in a pasture, in the NE1/4SW1/4 sec. 20, T. 25 N., R 17 W. (Butler Township):

A1—0 to 11 inches, very dark gray (10YR 3/1) silty clay loam; strong, medium, granular structure; friable; 1 percent pebbles; neutral; clear, irregular boundary.

B21tg—11 to 14 inches, very dark gray (10YR 3/1) heavy silty clay loam strong, fine and medium, angular blocky structure; firm; few clay films on ped faces; 2 percent pebbles; neutral; clear, smooth boundary.

B22tg—14 to 26 inches, dark-gray (10YR 4/1) heavy silty clay loam; common, fine, distinct, yellowish-brown (10YR 5/6) mottles in ped interiors; strong, medium, angular blocky structure; firm; thin, patchy clay films on ped faces; 2 percent pebbles; neutral; clear, wavy boundary.

B23tg—26 to 41 inches, gray (10YR 5/1) light silty clay; many, medium, prominent, yellowish-brown (10YR 5/6) mottles; weak, coarse, angular blocky structure that parts to moderate, medium, subangular blocky structure; very firm; dark-gray (5Y 4/1) clay films on ped faces; 4 percent pebbles; mildly alkaline; clear, wavy boundary.

B3g—41 to 52 inches, gray (10YR 5/1) silty clay loam; many, coarse, prominent, yellowish-brown (10YR 5/6) mottles and common, medium, prominent, yellowish-brown (10YR 5/4) mottles; yellowish brown (10YR 5/6) dominant in some irregularly shaped parts of the horizon; weak, coarse, subangular blocky structure; firm; 6 percent pebbles; mildly alkaline; clear, smooth boundary.

C1g—52 to 64 inches, gray (10YR 5/1) silty clay loam; many, coarse, distinct, yellowish-brown (10YR 5/6) mottles and common, medium, prominent, dark-brown (7.5YR 4/4) mottles; weak, medium, angular blocky structure; firm; 8 percent pebbles; mildly alkaline, calcareous; gradual boundary.

C2g—64 to 78 inches, yellowish-brown (10YR 5/4) clay loam; many, coarse, distinct, gray (10YR 5/1) mottles and common, medium, faint, brown (10YR 5/3) and yellowish-brown (10YR 5/6) mottles; massive; firm; 8 percent pebbles; mildly alkaline; calcareous.

The surface layer ranges from 10 to 14 inches in thickness and is silty clay loam or silt loam in texture. It is black (10YR 2/1), very dark gray (10YR 3/1), or very dark grayish brown (10YR 3/2). Distinct or prominent mottles are in the lower part of the A1 horizon in some areas.

In some areas a B1g horizon, 2 to 6 inches thick, is below the A horizon. The B2tg horizon has a total thickness of 18 to 36 inches and a texture of heavy clay loam, silty clay loam, and light silty clay. The ped surfaces have a hue of 10YR, 2.5Y or 5Y, a value of 3 to 5, and a chroma of 0 to 2.

The C horizon is clay loam and silty clay loam in texture. A part of the C horizon is leached of carbonates in some areas.

The B2tg horizon is medium acid to neutral in reaction and grades to mildly alkaline at the base of the horizon. The C horizon is mildly alkaline. This horizon is not always calcareous in the upper part. Depth to carbonates is 36 to 54 inches.

Pewamo soils are similar to Bennington and Condit soils in texture, but they have a thicker, darker colored surface layer. Also, they are more poorly drained than Bennington soils and they have a grayer subsoil. Pewamo soils are more pebbly and less silty in and below the subsoil than Luray soils, although they are similar to those soils in color.

Pewamo silt loam (Pa).—This soil is in depressions and along natural drainageways. Its profile differs from that described as representative of the series in having a surface layer of silt loam instead of silty clay loam. This texture is the result of deposits of soil washed from nearby higher areas. The silt loam is 10 to 22 inches thick. Below it the profile is like that described as representative of the series.

Included with this soil in mapping are areas of soils in which the dark-colored surface layer extends to a depth of as much as 24 inches. Also included are areas of soils that have a lighter colored surface layer than this soil. They are the Condit soils, the somewhat poorly drained Bennington soils on knolls and ridges, and some areas of soils at the base of eroded areas and along natural drainageways that are overwashed by lighter colored soil material.

If this soil is drained, it is well suited to crops. It has good tilth and a high content of organic matter. Most of the larger areas are drained artificially and used for crops. Narrow strips of this soil are used along with surrounding soils of greater extent. Undrained areas are in pasture. Wetness is a limitation to many nonfarm uses. Capability unit IIw-5; woodland suitability group 2wl.

Pewamo silt loam, overwash (Pc).—This soil is in upland draws and closed depressions on till plains. Its profile differs from the one described as representative of the series in having light-colored soil deposits over the dark-colored, original surface layer. This light-colored soil material has been removed from adjacent hillsides by erosion and deposited in the draws and depressions. Depth to a buried dark surface layer is 12 to 30 inches. Wetness is generally less where the light-colored surface deposit is thick. This soil is generally on the lowest part of the landscape and is subject to overwashing after heavy rains. Overwashing can damage or kill seedlings. The soil material deposited is unconsolidated and very erodible.

Included with this soil in mapping are spots of soils that have a surface layer of loam or sandy loam. Also included are spots of soils that have slopes of as much as 4 percent. These more strongly sloping soils are generally toward the edges of areas of this soil.

Wetness and susceptibility to overwashing are limitations to farm and nonfarm uses. Capability unit IIw-1; woodland suitability group 2wl

Pewamo silty clay loam (Pm)—This soil is on flats and in closed depressions on till plains. Slopes are dominantly less than 2 percent. A few small areas on the sides of natural drainageways, however, have slopes of as much as 4 percent. This soil has the profile described as representative of the series.

Included with this soil in mapping are areas of soils in which the surface layer is dominantly silt loam and a few small areas in which it is silty clay. Also included are areas of soils that have a lighter colored surface layer than this soil. They are the Condit soils, the somewhat poorly drained Bennington soils on knolls and ridges, and some areas of soils at the base of eroded areas where light-colored soil material has been deposited over the original dark-colored surface layer. The latter areas are more common where narrow strips of Pewamo soils are along drainageways near areas of Cardington and Alexandria soils. There are spots of these soils in which the dark-colored surface layer is as much as 2 feet thick and many spots of soils in which the dark color extends only to the depth of plowing.

The use of this soil depends on the extent to which it is drained. Open ditches, as well as tile, are needed to drain some of the larger areas. Drained areas are used for crops. Undrained areas are in trees or in pasture. Maintaining good tilth is difficult in some of the more clayey areas of this soil. Plowing and preparing of a seedbed must be done at the right moisture content. Wetness is a severe limitation to many nonfarm uses. Capability unit IIw-5; woodland suitability group 2wl.

Ravenna Series

The Ravenna series consists of nearly level to gently sloping, somewhat poorly drained soils. These soils have a fragipan in the subsoil that restricts the movement of water and the growth of roots. They formed in glacial till that is low in content of lime. They are in the southwestern and central parts of the county.

A representative profile of this series, in a cultivated field, has a dark grayish-brown silt loam plow layer 8 inches thick. This is underlain by a 2-inch subsurface layer of brown silt loam mottled with yellowish brown. The upper part of the subsoil, between depths of 10 and

23 inches, is yellowish-brown silt loam mottled with grayish brown. Below this is a fragipan, which extends to a depth of 50 inches. It is very firm, yellowish-brown loam mottled with grayish brown. Through the fragipan are vertical streaks of gray and dark-gray clay that intersect to form blocks. The interiors of these blocks are very dense and are not easily penetrated by roots or water. The lower layer of the subsoil, between depths of 50 and 56 inches, is friable, yellowish-brown loam glacial till. The substratum, between depths of 56 and 60 inches, is also yellowish-brown loam glacial till but lacks structure. Small pebbles and a few stones are in all parts of the profile.

Permeability is slow and available moisture capacity is medium. Runoff is slow to moderate. The root zone is moderately deep, and reaction is generally strongly acid. Artificial drainage is generally needed for most crops.

Most areas of Ravenna soils are too small to be farmed separately and are used along with surrounding soils, mostly for crops or permanent pasture.

Representative profile of Ravenna silt loam, 0 to 2 percent slopes, in a cultivated field, in the SE1/4SE1/4 sec. 1, T. 20 N., R. 19 W. (Troy Township):

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

A2—8 to 10 inches, brown (10YR 5/3) silt loam; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, thin, platy structure; friable; strongly acid; clear, wavy boundary.

B1—10 to 16 inches, yellowish-brown (10YR 5/4) silt loam; many, coarse, faint, grayish-brown (10YR 5/2) mottles; weak, medium, subangular blocky structure; friable; strongly acid; clear, wavy boundary.

B2t—16 to 23 inches, yellowish-brown (10YR 5/4) heavy silt loam; common, coarse, faint, yellowish-brown (10YR 5/6) and grayish-brown (10YR 5/2) mottles; moderate, medium, subangular blocky structure; firm; continuous, gray (10YR 5/1) clay films on ped faces; strongly acid; clear, wavy boundary.

Bx1—23 to 40 inches, yellowish-brown (10YR 5/4) heavy loam; many, coarse, faint, grayish-brown (10YR 5/2) mottles; weak, very coarse, prismatic structure that parts to weak, medium, subangular blocky structure; very firm, brittle; thick, continuous, gray (10YR 5/1) and dark-gray (10YR 4/1) coatings and clay films on prism faces; common, fine, distinct, dark grayish-brown (10YR 3/2) manganese concretions; strongly acid; gradual boundary.

Bx2—40 to 50 inches, yellowish-brown (10YR 5/4) loam; many, coarse, faint, yellowish-brown (10YR 5/6) and grayish-brown (10YR 5/2) mottles; weak, coarse, prismatic structure that parts to weak, fine, subangular blocky structure; very firm, slightly brittle; dark-gray (10YR 4/1) clay films on ped faces; few, very dark grayish-brown (10YR 3/2) manganese concretions; strongly acid; clear, wavy boundary.

B3—50 to 56 inches yellowish-brown (10YR 5/4) loam; many, coarse, faint, yellowish-brown (10YR 5/6) and grayish-brown (10YR 5/2) mottles; weak, fine, subangular, blocky structure; friable; a few dark-gray (10YR 4/1) coatings on vertical faces; medium acid; gradual boundary.

C—56 to 60 inches; yellowish-brown (10YR 5/4) loam; many, coarse, faint, grayish-brown (10YR 5/2) mottles; massive; friable; slightly acid.

The A horizon has a total thickness of 7 to 12 inches and is generally silt loam in texture. In unplowed areas a very dark gray (10YR 3/1) A1 horizon is 2 to 4 inches thick. The A2 horizon is absent in some cultivated areas and is as much as 6 inches thick in some uncultivated areas. It has a hue of 10YR, a value of 5 or 6, and a chroma of 2 to 4, and it is mottled with color of a higher chroma.

The B1 horizon is 3 to 8 inches thick. The B2t horizon above the fragipan is 5 to 10 inches thick. It is heavy loam or silt loam. Silt coatings are on the ped faces in some areas. The ped interiors have a hue of 10YR or 2.5Y, a value of 4 or 5, and a chroma of 3 or 4, and mottles of a lower chroma.

The fragipan begins at a depth of 18 to 24 inches and is 24 to 36 inches thick. The prisms in this layer have gray or grayish-brown coatings that consist mostly of clay, but some silt is in the upper part of the fragipan. The color of ped interiors is a mixture of yellowish brown, grayish brown and light olive brown in a hue of 10YR or 2.5Y and a dominant chroma of 3 or 4. The texture of the fragipan is loam or silt loam.

Reaction in and above the fragipan is medium acid to very strongly acid. Reaction below the fragipan becomes less acid with depth and is slightly acid to neutral at a depth of 60 inches. The underlying till is loam. The content of coarse fragments is generally 2 to 5 percent in all horizons.

Ravenna soils are similar to Canfield soils in texture, but they are more poorly drained than those soils and generally occupy lower positions on the landscape. They have a browner subsoil and better natural drainage than Frenchtown soils. Ravenna soils are similar to Wadsworth soils in color but are less clayey in the subsoil. Ravenna soils are more pebbly than Fitchville soils and have a firmer, denser subsoil.

Ravenna silt loam, 0 to 2 percent slopes (ReA).—This soil is generally in shallow depressions on till plains. It has the profile described as representative of the series. Individual areas of this soil are small and some appear as wet spots in fields of surrounding soils that have adequate natural drainage.

Included with this soil in mapping are small areas of the poorly drained Frenchtown soils in some low spots. Also included are small areas of soils in which the dark grayish-brown surface layer is as much as 2 feet thick. These areas are more common at the base of steep areas.

Most areas of this soil are used along with surrounding soils for crops. A seasonal high water table is a limitation to many nonfarm uses. Capability unit IIw-4; woodland suitability group 2w2.

Ravenna silt loam, 2 to 6 percent slopes (ReB).—This soil is in low areas, most of which are surrounded by steeper, better drained Wooster and Canfield soils. Most areas are less than 5 acres in size, but a few large areas are in places.

Included with this soil in mapping are small areas of the better drained Canfield soils on some high spots and the poorly drained Frenchtown soils in some low spots. Also included are some spots of gravelly and stony soils, especially along natural drainageways. In a few of these areas, mostly in the southern part of the county, rock, is at a depth of 5 feet. At the base of eroded areas are some soils that have a very thick surface layer.

The use of this soil depends on the slope and nature of surrounding soils. Most of the cultivated areas are artificially drained. Wetness is a moderate limitation if this soil is farmed. A seasonal high water table is a limitation to many nonfarm uses. Capability unit IIw-4; woodland suitability group 2w2.

Rittman Series

The Rittman series consists of gently sloping to moderately steep, moderately well drained soils. These

soils have a very dense fragipan in the subsoil that restricts the downward movement of water. Rittman soils formed in glacial till that is low in content of lime. They are in an area that extends across the central part of the county and includes the rapidly urbanizing Ontario and Lincoln Heights communities.

A representative profile of this series, in a cultivated field, has a dark grayish-brown silt loam plow layer 7 inches thick. The subsoil is yellowish-brown silt loam between depths of 7 and 13 inches, and brown, firm, silty clay loam mottled with yellowish brown and gray between depths of 13 and 18 inches. The plow layer and the upper part of the subsoil are very strongly acid. Between depths of 18 and 42 inches is the fragipan, which is very firm, dark-brown silty clay loam mottled with brown and grayish brown. Through it are vertical streaks of gray clay that intersect to form blocks 5 to 10 inches across. The interiors of these blocks are very dense and are not easily penetrated by roots or water. The fragipan is very strongly acid, grading to medium acid with depth. The subsoil below the fragipan is brown, firm clay loam glacial till to a depth of 50 inches. It becomes less acid with depth and is calcareous in the lower part. The substratum, between depths of 50 and 60 inches, is brown light clay loam mottled with yellowish brown and grayish brown. There are small pebbles and a few stones throughout the profile.

Permeability is slow in the fragipan, and moderately slow below it. Available moisture capacity is medium. The root zone is moderately deep. Runoff is moderate to rapid. Natural drainage is generally adequate for crops, but this soil is excessively wet for brief periods.

In general, the suitability of these soils for crops decreases as slope and the degree of erosion increase. Most areas are used for crops, but a large acreage is used for residential development and for other nonfarm uses.

Representative profile of Rittman silt loam, 2 to 6 percent slopes, in a cultivated field, in the NE1/4SE1/4 sec. 36, T. 20 N., R. 20 W. (Sandusky Township):

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; friable; very strongly acid; abrupt, smooth boundary.

B1—7 to 13 inches, yellowish-brown (10YR 5/4) heavy silt loam; moderate, medium, subangular blocky structure; friable; thin, continuous, brown (10YR 5/3) silt coatings; very strongly acid; clear, wavy boundary.

B2t—13 to 18 inches, brown (7.5YR 4/4) silty clay loam; common, fine, distinct, yellowish-brown (10YR 5/6) mottles and common, medium, distinct, gray (10YR 5/1) mottles; moderate, medium, prismatic structure that parts to moderate, medium and coarse, subangular blocky structure; firm; thin, brown (10YR 4/3) clay films on blocks; few fine pebbles; very strongly acid; clear, wavy boundary.

Bx—18 to 42 inches, dark-brown (7.5YR 4/4) light silty clay loam; many, medium, faint, brown (10YR 4/3) mottles and common, fine, distinct, grayish-brown (10YR 5/2) mottles; prisms, 5 to 10 inches across, break to weak, thick, platy structure and weak, coarse, angular blocky structure; very firm, brittle; continuous, thick, gray (5Y 5/1) clay films on prism faces; few fine pebbles; very strongly acid, becoming medium acid with depth; clear, wavy boundary.

B3—42 to 50 inches, brown (10YR 4/3) light, clay loam; common, fine, distinct, grayish-brown (10YR 5/2) mottles; weak, coarse, subangular, blocky structure; firm; 5 percent pebbles; neutral; clear, wavy boundary.

C—50 to 60 inches, brown (10YR 4/3) light clay loam; common, medium, distinct, grayish-brown (10YR 5/2) and yellowish-brown (10YR 5/6) mottles; massive; firm, 5 percent pebbles; mildly alkaline; calcareous.

In unplowed areas the A1 horizon, 1 to 3 inches thick, is very dark grayish-brown (10YR 3/2) silt loam. Below this is an A2 horizon of yellowish-brown (10YR 5/4) silt loam that is 2 to 5 inches thick. This horizon is absent in most cultivated areas.

In the B1 and B2t horizons of most profiles, the silty coatings indicate degradation. The B2t horizon above the fragipan is generally 4 to 12 inches thick, but it is thinner in eroded areas. It is clay loam or silty clay loam in texture. It has a hue of 7.5YR or 10YR, a value of 4 or 5, and a chroma of 4 to 6.

Depth to the fragipan ranges from 12 to 24 inches, the shallower depth being in severely eroded areas. The thickness of the fragipan ranges from 14 to 30 inches. The texture is heavy silt loam, loam, light clay loam, or silty clay loam. The base color has a hue of 7.5YR, 10YR, or 2.5Y, a value of 4 or 5, and a chroma of 3 or 4. Dark-colored manganese concretions are present in many areas. The prism faces are coated with clay films that range from dark brown (10YR 4/3) to dark gray (N4/0). Reaction is strongly acid or very strongly acid above the fragipan, medium acid to very strongly acid in the upper part of the fragipan, and medium acid or slightly acid in the lower part of the fragipan. Depth to the C horizon, which consists of calcareous glacial till, ranges from 42 to 60 inches.

Rittman soils are similar to Wadsworth soils in texture, but they have better natural drainage and are slightly deeper to mottling. They resemble Canfield soils but are higher in content of clay, especially in the upper part of the subsoil. Rittman soils are more acid than Cardington soils, and they have a denser and less clayey subsoil.

Rittman silt loam, 2 to 6 percent slopes (RsB).—This soil is on hillsides and hilltops. Some areas have short, undulating slopes, and others have longer, more uniform slopes. This soil has the profile described as representative of the series.

Included with this soil in mapping are a few spots of somewhat poorly drained Wadsworth soils, which have a grayer subsoil than Rittman soils. These soils are in low areas and on the lower part of hillsides. A few of the soils on high knolls are eroded and have a lighter colored surface layer than this Rittman soil. Also included along narrow natural drainageways are soils that are very gray. A few spots of soils that are underlain by rock or gravel at a depth of 4 to 5 feet are also included.

This soil is used for crops, pasture, trees and urban development. The hazard of erosion is moderate if this soil is farmed. Slow permeability and seasonal wetness are limitations to some nonfarm uses. Capability unit IIe-6; woodland suitability group 2w2.

Rittman silt loam, 2 to 6 percent slopes, moderately eroded (RsB2).—Some areas of this soil have short, undulating slopes, others have longer, more uniform slopes. Erosion has removed a part of the surface layer, and the plow layer consists of a mixture of material originally in the surface layer and from the subsoil. The degree of erosion varies within small areas, and there are a variety of colors in the surface layer. The darkest spots are the least eroded. Below the surface layer, the profile of this soil is similar to that described as representative of the series.

Included with this soil in mapping are a few spots of

the somewhat poorly drained Wadsworth soils in depressions and in low spots. Also included are a few, small areas of soils that have a stony surface layer.

This soil has slightly faster runoff, poorer tilth, and lower available moisture capacity than uneroded Rittman soils. Most areas are either in crops or are idle. If this soil is farmed, the hazard of further erosion is moderate. Slow permeability and seasonal wetness are limitations to some nonfarm uses. Capability unit IIe-6; woodland suitability group 2w2.

Rittman silt loam, 6 to 12 percent slopes (RsC).—This soil is on hillsides and on the sides of minor natural drainageways. Most areas are small.

Included with this soil in mapping are a few areas of soils that have a gravelly or stony surface layer. Also included are soils on the narrow bottoms of drainageways that are similar to the Frenchtown, Shoals, or Holly soils. Included around a few springs and seeps, are soils that are grayer than this soil.

The hazard of erosion is severe if this soil is cultivated. Slope and occasional wetness are limitations to nonfarm uses. Capability unit IIIe-3; woodland suitability group 2w2.

Rittman silt loam, 6 to 12 percent slopes, moderately eroded (RsC2).—Most areas of this soil are on the sides of small natural drainageways. A few areas are on longer hillsides. Erosion has removed a part of the surface layer, and the plow layer is a mixture of material originally in the surface layer and the subsoil; it is light brownish gray. The degree of the erosion varies within small areas. Many dark spots are only slightly eroded and some light spots are severely eroded. Below the plow layer, the profile of this soil is similar to that described as representative of the series.

Included with this soil in mapping are soils on the bottom of a few, narrow natural drainageways that are similar to the Frenchtown, Shoals, and Holly soils. Around a few seeps and springs are soils that are grayer and more mottled than this soil. Soils that have a stony surface layer are included in a few spots.

Most areas of this soil are cultivated along with surrounding soils of greater extent. This soil has a slightly faster runoff, somewhat poorer tilth, shallower rooting depth, and lower available moisture capacity than uneroded Rittman soils. The hazard of further erosion is severe if this soil is cultivated. Slope and occasional wetness are limitations to nonfarm uses. Capability unit IIIe-3; woodland suitability group 2w2.

Rittman silt loam, 12 to 18 percent slopes (RsD).—This soil is on the sides of natural drainageways and valleys. Except for a few gray mottles in the upper part of the subsoil, its profile is similar to that described as representative of the series.

Included with this soil in mapping are a few spots of soils that are stony on the surface and a few spots of soils underlain by rock at a depth of 40 to 60 inches. Also included around a few seeps and springs are soils that are grayer and more mottled than this soil. Included on the bottom of some narrow valleys and natural drainageways, are soils that are similar to Frenchtown, Shoals, and Holly soils.

Most areas of this soil are small and are used for trees or permanent pasture. The hazard of erosion is very severe if this soil is cultivated. Most of the wetness is caused by seepage. Slope is a limitation to many nonfarm uses. Capability unit IVe-4; woodland suitability group 2w3.

Rittman silt loam, 12 to 18 percent slopes, moderately eroded (RsD2).—This soil is on the sides of valleys and natural drainageways. Erosion has removed a part of the surface layer, and the present plow layer is a mixture of material originally in the surface layer and the subsoil. The color of the surface layer ranges from dark grayish brown in the least eroded spots to brown or yellowish brown in the most eroded spots. Except for a few gray mottles in the upper part of the subsoil, the profile of this soil is similar to that described as representative of the series.

Included with this soil in mapping around a few springs and seeps are soils that are grayer and more mottled than this soil. Also included on the bottom of some narrow natural drainageways are soils that are similar to Pewamo, Shoals, and Frenchtown soils. Rock is at a depth of 4 to 5 feet in a few small areas of included soils.

Most areas of this soil are in permanent pasture or crops. The hazard of further erosion is greater on this soil than on less strongly sloping Rittman soils. Also, runoff is slightly faster, tilth is somewhat poorer, available moisture capacity is lower, and the rooting depth is shallower. The hazard of erosion is very severe. Slope is a limitation to many nonfarm uses. Capability unit IVe-4; woodland suitability group 2w3.

Rittman silty clay loam, 6 to 12 percent slopes, severely eroded (RtC3).—Most areas of this soil are on the sides of small natural drainageways. A few areas are on long hillsides. Most areas are small. Erosion has removed most of the original surface layer, and the present plow layer consists mainly of material from the subsoil. The plow layer is brown or yellowish brown, and its texture is light silty clay loam. The profile of this soil is a few inches shallower to the slowly permeable fragipan than the profile described as representative of the series.

Included with this soil in mapping are a few small areas of soils that are less eroded than this soil, and they have a darker surface layer that is silt loam in texture. Also included are soils on the bottom of a few narrow natural drainageways that are similar to Frenchtown, Shoals, and Holly soils. Included around a few seeps and springs are soils that are grayer and more mottled than this soil. A few spots of soils that have a stony surface layer are included.

Most areas of this soil are cultivated along with surrounding soils of greater extent. This soil has faster runoff, poorer tilth, and lower available moisture capacity than less eroded Rittman soils. The hazard of further erosion is very severe if this soil is farmed. Slope, occasional wetness, and slow permeability are limitations to many nonfarm uses. Capability unit IVe-4; woodland suitability group 2w2.

Rittman silty clay loam, 12 to 18 percent slopes, severely eroded (RtD3).—This soil is on the sides of valleys and natural drainageways. Erosion has removed most of the original surface layer, and the plow layer consists mainly of material from the subsoil. The

plow layer is brown to yellowish brown and has a higher clay content than the original surface layer. Depth to the restricting fragipan is shallower than in the profile described as representative of the series.

Included with this soil in mapping are a few spots of less eroded soils that have a darker surface layer than this soil, and they are silt loam in texture. Also included around a few springs and seeps are soils that are grayer and more mottled than this soil. Included on the bottom of some narrow natural drainageways are soils that are similar to Pewamo, Shoals, and Frenchtown soils. A few small areas of soils that have rock at a depth of 4 to 5 feet are included.

Most areas of this soil are in permanent pasture or crops. The hazard of further erosion is very severe. This soil has faster runoff, poorer tilth, and lower available moisture capacity than the less eroded Rittman soils that have the same gradient of slope. Slope is a limitation to many nonfarm uses. Capability unit VIe-1; woodland suitability group 2w2.

Schaffenaker Series

The Schaffenaker series consists of gently sloping to very steep, well-drained, soils that are underlain by sandstone bedrock at a depth of 20 to 40 inches. These soils formed in sand weathered from coarse-grained sandstone. They are most common in the southern and central parts of the county.

A representative profile of this series, in a wooded area, has a very dark gray loamy sand surface layer 4 inches thick. This layer is underlain by pale-brown sand and brown loamy sand about 6 inches thick. The subsoil is yellowish-brown sand between depths of 10 to 20 inches and light yellowish-brown sand and rock fragments between depths of 20 and 28 inches. Solid rock is at a depth of 28 inches or more.

Permeability is rapid, and available moisture capacity is very low. Runoff is slow, even on the steep areas. In many places shallow-rooted plants are affected by a lack of moisture. The root zone is moderately deep, and reaction is generally very strongly acid.

Most areas of these soils are in trees. In general, these soils are poorly suited to crops and to pasture.

Representative profile of Schaffenaker loamy sand, 18 to 40 percent slopes, in a wooded area, in the NW1/4 SW1/4 sec. 34, T. 23 N., R. 17 W. (Mifflin Township) (laboratory data sample RC-14):

A1—0 to 4 inches, very dark gray (10YR 3/1) loamy sand; very weak, fine, crumb structure; loose; about 25 percent of sand grains are clean and uncoated; many fine roots; 2 percent coarse fragments; extremely acid; clear, wavy boundary.

A2&B1—4 to 10 inches, A2 material (60 percent): pale-brown (10YR 6/3) sand; very weak, fine, crumb structure; loose; many fine roots; resists wetting, very strongly acid; abrupt, very irregular boundary, material mixed with that from the B1 horizon. B1 material (40 percent): brown (7.5YR 4/4) loamy sand; very weak, fine, crumb structure; loose; many fine roots; easily wetted; very strongly acid; abrupt, irregular boundary, material from A2 horizon mixed with that from the underlying B2 horizon.

B2—10 to 20 inches, yellowish-brown (10YR 5/4) sand; single grain; loose; few, fine roots; 10 percent rounded, weathered sandstone fragments; very strongly acid; clear, irregular boundary.

B3—20 to 28 inches, light yellowish-brown (10YR 6/4) sand; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; single grain; loose; 15 to 20 percent sandstone fragments 1 to 4 inches in diameter; 5 to 10 percent highly weathered, easily crushed sandstone fragments; very strongly acid; abrupt, irregular boundary.

R—28 inches +; massive Black Hand Sandstone in which there are conglomeritic zones; dominantly medium to coarse sand, but largely quartzitic pebbles imbedded in comglomerate parts.

Depth to bedrock is 20 to 40 inches. Texture above the bedrock is sand or loamy sand, medium and coarse sand predominating. In cultivated areas the Ap horizon is dark brown (10YR 4/3) to yellowish brown (10YR 5/4). The A1 horizon is 2 to 6 inches thick. It is very dark gray (10YR 3/1) or dark gray (10YR 4/1). The A2 and B1 horizons are generally intermingled, but they exist one above the other in some areas. The A2 horizon is brown (10YR 5/3) or pale brown (10YR 6/3) and generally resists wetting. The B1 horizon has a hue of 7.5YR or 10YR, a value of 4 or 5, and a chroma of 4 or 6. The B2 horizon has a hue of 10YR or 7.5YR, a value of 4 to 6, and a chroma of 3 to 6. The B3 horizon is 5 to 30 percent sandstone fragments, some of which are easily crushed. Reaction throughout the profile is strongly acid to extremely acid.

Schaffenaker soils are sandier than Lordstown, Berks, and Loudonville soils, although these soils also are underlain by rock at a depth of 20 to 40 inches. Schaffenaker soils differ from Chili and Conotton soils in being underlain by rock at a depth of 20 to 40 inches and in having a sandier, less clayey subsoil.

Schaffenaker loamy sand, 2 to 12 percent slopes (SaC).—This soil is on the top of hills underlain by sandstone.

Included with this soil in mapping are many spots of soils in which broken rock is within a depth of 40 inches. Also included are small areas of soils in which solid rock is within a depth of 20 inches. Cultivated areas of these soils generally have a dark-brown plow layer, but in eroded spots the plow layer is yellowish brown.

Most areas of this soil are in trees or are idle. A few areas are in cultivated fields or in pasture. Slope and the presence of rock at a depth of 20 to 40 inches are limitations to many nonfarm uses. Capability unit IVs-1; woodland suitability group 4s1.

Schaffenaker loamy sand, 12 to 18 percent slopes (SaD).—This soil is on the top and sides of hills underlain by sandstone.

Included with this soil in mapping are many spots of soils in which broken or soft rock is within a depth of 40 inches. Also included are many small areas of soils in which solid rock is within a depth of 20 inches. Also included are some areas of soils that have a few sandstone channers on the surface. Cultivated areas generally have a dark-brown plow layer, but in eroded spots the plow layer is yellowish brown. A few small areas of soils have slopes greater than 18 percent. These soils are mostly in narrow areas and on ledges on the sides of hills. In the shallow areas, the soil profile has been mixed by tree throw.

Most areas of this soil are in trees. A few are in pasture or crops. Slope and shallowness to rock are limitations to many nonfarm uses. Capability unit IVs 1; woodland suitability group 4s2.

Schaffenaker loamy sand, 18 to 40 percent slopes (SaE).—This soil is on hillsides. Most areas are long and nar-

row and separate two levels of more gently sloping soils. This soil has the profile described as representative of the series.

Included with this soil in mapping are many small spots of soils in which the depth to solid rock is more than 40 inches, and a few in which it is less than 20 inches. Rock outcrop is in some areas. There are a few nearly vertical rock cliffs. Tree throw in some wooded areas has mixed the upper layers of this soil. A few spots of soils that have a gravelly surface layer are included.

Almost all areas of this soil are wooded. Steepness of slope hampers some woodland harvest and improvement operations. Slope is a limitation to most nonfarm uses. Capability unit VIe-2; woodland suitability group 4s2.

Sebring Series

The Sebring series consists of nearly level, poorly drained soils that formed in lacustrine sediment. These soils formed under a lowland hardwood forest. They are on flats and in closed depressions in all parts of the county.

A representative profile of this series, in a cultivated field, has a dark grayish-brown silt loam plow layer 8 inches thick. Beginning at a depth of 8 inches, the subsoil extends to a depth of 37 inches. It is dark grayish-brown silty clay loam between depths of 8 and 12 inches; firm, gray silty clay loam mottled with yellowish brown between depths of 12 and 32 inches; and yellowish-brown silty clay loam mottled with grayish brown between depths of 32 and 37 inches. Between depths of 37 and 60 inches are alternate thin layers of silty clay loam and silt loam and sandy loam. These layers are grayish brown and yellowish brown and are neutral in reaction. The profile is almost free of pebbles in the upper 4 feet, but pebbly or gravelly layers are below this depth in some areas.

Permeability is moderately slow, available moisture capacity is high, and runoff is slow to ponded. Some areas are ponded for extended periods. The water table is within 6 inches of the surface during the wettest time of year. Artificial drainage is needed for most crops. Tilth is fair, and the root zone is deep.

Most areas of Sebring soils are small and are used along with surrounding soils. The larger areas are in permanent pasture or trees.

Representative profile of Sebring silt loam, in a cultivated field, in the SE1/4NW1/4 sec. 25, T. 21 N., R. 20 W. (Sharon Township):

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

B1g—8 to 12 inches, dark grayish-brown (10YR 4/2) silty clay loam; many, medium, prominent, yellowish-brown (10YR 5/6) mottles; weak, fine, subangular blocky structure; firm; medium acid; clear, smooth boundary.

B21tg—12 to 20 inches, gray (10YR 5/1) silty clay loam; many, medium, distinct, yellowish-brown (10YR 5/4) mottles; moderate, medium, subangular blocky structure; firm; dark-gray (10YR 4/1) clay films on ped faces; medium acid; clear, smooth boundary.

B22tg—20 to 32 inches, gray (10YR 5/1) silty clay loam; many, coarse, distinct, yellowish-brown (10YR 5/4 and 5/6) mottles; moderate, fine, subangular blocky structure; firm; patchy, dark-gray (10YR 4/1) clay films on ped faces; slightly acid; clear, smooth boundary.

B3g—32 to 37 inches, yellowish-brown (10YR 5/6) silty clay loam; many, medium and coarse, distinct, grayish-brown (10YR 5/2) mottles; weak, fine, subangular blocky structure; firm; neutral; clear, smooth boundary.

Cg—37 to 60 inches, mottled, yellowish-brown (10YR 5/4 and 5/6) and grayish-brown (10YR 5/2), stratified silty clay loam, silt loam, and sandy loam; massive; friable; neutral.

In uncultivated areas the A1 horizon is 1 to 3 inches thick. It is black (10YR 2/1), very dark gray (10YR 3/1), or very dark grayish brown (10YR 3/2). An A2 horizon, 1 to 6 inches thick, is in uncultivated areas and in some cultivated areas. It has a hue of 10YR, a value of 4 to 6, and a chroma of 1 or 2, and it has distinct or prominent mottles of higher chroma.

The B1g horizon is 3 to 7 inches thick. It has a hue of 10YR or 2.5Y, a value of 4 or 5, and a chroma of 2 or less. Degradational silt coatings are in some areas. The B2tg horizon begins at a depth of 10 to 18 inches and is 18 to 28 inches thick. It is heavy silt loam or silty clay loam in texture. The ped interiors have a hue of 10YR or 2.5Y, a value of 4 to 6, and a chroma of 0 to 2. A few degradational silt coatings are in the upper B2tg horizon in some areas. The B3 horizon is not present in some areas.

The C horizon is stratified. Silt loam and silty clay loam are the dominant textures, but strata of sandy loam, loam, or clay loam are common. The color of the C horizon is a mixture of grayish brown, yellowish brown, brown, and gray. Adjacent strata differ slightly in color.

Reaction is medium acid to strongly acid in the B1 horizon and in the upper part of the B2tg horizon; medium acid to slightly acid in the lower part of the B2tg and B3 horizon; and neutral to moderately alkaline in the C horizon. Depth to carbonates is 40 inches to more than 60 inches. The profile is free of coarse fragments in the upper 4 feet.

Sebring soils are similar to Fitchville and Luray soils in texture, but they have a grayer subsoil and poorer natural drainage than Fitchville soils, and they have a lighter colored surface layer than Luray soils. Sebring soils are similar to Condit and Frenchtown soils in color, but they have a siltier, less pebbly subsoil.

Sebring silt loam (Se).—This soil is on flats, in depressions, and along minor natural drainageways.

Included with this soil in mapping are areas of soils that have a surface layer of silty clay loam and have poorer tilth than this soil. Also included are small areas of the dark-colored, very poorly drained Luray soils in low places. Included along streams and around springs in the northwestern part of Plymouth Township are areas of soils that have a light-brown surface layer when dry. Some small included areas of soils have pebbly or gravelly layers below a depth of 30 inches. Other included areas are soils that have compact glacial till at a depth of 3 to 4 feet, especially in areas within 4 or 5 miles of the west county line.

The use of this soil depends on the size of the areas and the nature and slope of surrounding soils. Some small areas are artificially drained and used for crops. Many large areas are in pasture and trees. Wetness is a severe limitation if this soil is farmed. Seasonal wetness is a limitation to most nonfarm uses. Capability unit IIIw-3; woodland suitability group 2wl.

Shoals Series

The Shoals series consists of nearly level, somewhat poorly drained soils that formed in alluvium deposited

by flowing streams in relatively recent times. These soils formed under a lowland hardwood forest. They are on flood plains of streams throughout the county.

A representative profile of this series, in woodland, has a very dark grayish-brown silt loam surface layer 4 inches thick. Between depths of 4 and 16 inches, the subsoil is dark grayish-brown silt loam mottled with yellowish brown and dark brown, and between depths of 16 to 26 inches, it is grayish-brown silt loam mottled with yellowish brown and dark grayish brown. The substratum, between depths of 26 and 42 inches, is brown, stratified loam and silt loam mottled with dark gray. Between depths of 42 and 60 inches, it is yellowish-brown silt loam mottled with dark gray and containing thin strata of sandy loam and loam. Generally, no carbonates are in the upper 30 inches, but they are below this depth in a few areas. Shoals soils are extremely variable, and the profile can be expected to differ greatly from the representative profile.

Permeability is moderate, and available moisture capacity is high. Runoff is slow. The soils are subject to occasional flooding, and some areas are ponded for brief periods. Artificial drainage is needed for most crops. The root zone is deep, and reaction is commonly slightly acid or neutral.

The use of Shoals soils depends on whether they are protected from flooding and the extent to which they are drained. Some areas in the wide valleys are well suited to crops. Most areas in the narrow valleys are used for permanent pasture or trees because of their inaccessibility and the difficulty of providing adequate drainage.

Representative profile of Shoals silt loam, in a wooded area, along Rocky Fork Creek, in the NE1/4 NW1/4 sec. 9, T. 22 N., R. 17 W. (Monroe Township):

A1—0 to 4 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, fine, granular structure; friable; neutral; clear, wavy boundary.

B1—4 to 16 inches, dark grayish-brown (10YR 4/2) silt loam; common, coarse, faint, dark-brown (10YR 4/3) mottles and few, fine, faint, yellowish-brown (10YR 5/4) mottles; weak, coarse, subangular blocky structure; friable; very dark grayish-brown (10YR 3/2) organic coatings on ped faces; neutral; clear, smooth boundary.

B2—16 to 26 inches, grayish-brown (10YR 5/2) silt loam; common, medium, faint, dark grayish-brown (10YR 4/2) mottles and common, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, coarse, subangular, blocky structure; friable; neutral; clear, smooth boundary.

C1—26 to 42 inches, brown (10YR 5/3), stratified loam and silt loam; many coarse, distinct, dark-gray (10YR 5/1) mottles; massive; friable; neutral; clear, smooth boundary.

C2—42 to 60 inches, yellowish-brown (10YR 5/4) silt loam and thin strata of sandy loam and loam; many coarse, distinct, dark-gray (10YR 4/1) mottles; massive; friable; mildly alkaline.

The Ap horizon is dark grayish brown (10YR 4/2). The A1 horizon, in uncultivated areas, is very dark grayish brown (10YR 3/2) or very dark brown (10YR 2/2). This horizon is less than 6 inches thick.

The B horizon has a hue of 10YR to 2.5Y, a value of 4 or 5, and a chroma of 2 or 3. The dominant texture is silt loam, loam, or silty clay loam. Strata below a depth of 40 inches have a wider textural range that includes sandy, gravelly, or stony textures. The coarser textured strata are most common in the valleys of the small, swift streams; the finer textured strata are common in the large valleys. The profile is slightly acid to neutral in the upper 30 inches and neutral to moderately alkaline below a depth of 30 inches.

Shoals soils have a browner, less gray subsoil and better natural drainage than Holly soils. They have a grayer subsoil, are mottled at a shallower depth, and have poorer natural drainage than Lobdell soils. They are less gravelly than the Shoals coarse subsoil variants. They have a lighter colored surface layer than Sloan soils. Shoals soils differ from Fitchville soils in having a less well defined subsoil and in being subject to flooding.

Shoals silt loam (Sh).—This soil is on flood plains. Included in mapping are small areas of the poorly drained Holly soils in depressions and old stream channels and the moderately well drained Lobdell soils on some knolls and ridges. Also included are a few areas on which there is a fresh deposit of alluvial material; many small areas of soils that have a surface layer of loam, gravelly loam, or gravelly silt loam; a few areas of soils that are underlain by rock at a depth of 4 to 5 feet; some areas where there are a few large stones and boulders on the surface, especially in the narrow valleys. Other inclusions are some areas of soils in which there is a buried surface layer; some soils, on knolls, ridges, and valley bottoms, that have slopes of more than 2 percent; and some areas that are cut by old stream channels that have nearly vertical banks.

The use of this soil depends on the size and shape of the area. Most of the wide areas are used for crops, and the narrow ones are in permanent pasture. Old stream channels prevent cultivation of some areas that would otherwise be suitable for crops. Susceptibility to flooding is a limitation to many nonfarm uses. Capability unit IIw-1; woodland suitability group 2wl.

Shoals Series, Coarse Subsoil Variant

The Shoals series, coarse subsoil variant, consists of nearly level, somewhat poorly drained soils that formed in sandy and gravelly sediment deposited by swiftly flowing streams in relatively recent times. They formed under a lowland hardwood forest. These soils are limy in the surface layer. They are in the valleys of swiftly flowing streams in all parts of the county.

A representative profile of this series, in a pasture, has a dark-brown loam surface layer 5 inches thick. The subsoil is 5 inches thick and consists of grayish-brown loam mottled with dark yellowish brown. The substratum is dark grayish-brown very gravelly sandy loam between depths of 10 and 18 inches and grayish-brown very gravelly or gravelly sand between depths of 18 and 60 inches. The sand is loose and limy and varies greatly in content of gravel within short distances.

Permeability is rapid, runoff is slow, and available moisture capacity is low. Periodic flooding is a hazard. Artificial drainage is needed for most crops. Tilth is good, and the root zone is deep.

The suitability of these soils for crops depends upon the extent to which they are drained and whether they are protected from flooding. Some small areas are cultivated, but a large acreage is in trees or permanent pasture.

Representative profile of Shoals loam, coarse subsoil variant, in a pasture, in the SE1/4NE1/4 sec. 26, T. 22 N., R. 17 W. (Weller Township):

A1—0 to 5 inches, dark-brown (10YR 3/3) (10YR 4/3, rubbed) light loam; moderate, medium, granular structure; friable; 5 percent pebbles less than one-half inch in diameter; mildly alkaline; weakly calcareous; clear, irregular boundary.

B2—5 to 10 inches, dark grayish-brown (2.5Y 4/2) light loam; 30 percent dark yellowish-brown (10YR 3/4) mottles; weak, fine, subangular blocky structure; friable; 5 percent stones, a few larger than 1 inch; mildly alkaline; weakly calcareous; abrupt, irregular boundary.

IIC1—10 to 18 inches, dark grayish-brown (10YR 4/2) very gravelly sandy loam; massive; loose; 60 percent skeletal, mixed, fine and medium sandstone fragments and igneous pebbles; mildly alkaline; weakly calcareous; clear, wavy boundary.

IIC2—18 to 32 inches, grayish-brown (2.5Y 5/2) very gravelly sand; massive; loose; 50 percent skeletal material, 80 percent of which is less than one-half inch in size; mildly alkaline, moderately calcareous; gradual boundary.

IIC3—32 to 40 inches, grayish-brown (2.5Y 5/2) very gravelly sand; common yellowish-brown (10YR 5/4) to dark yellowish-brown (10YR 4/4) mottles; massive; loose; 50 percent skeletal material, 80 percent of which is less than one-half inch in size; mildly alkaline; moderately calcareous; gradual boundary.

IIC4—40 to 60 inches, grayish-brown (2.5Y 5/2) gravelly sand; few, coarse, distinct, yellowish-brown (10YR 5/4) mottles; single grain; loose; 40 percent gravel; moderately alkaline, moderately calcareous.

In cultivated areas the Ap horizon is dark grayish-brown (10YR 4/2) loam or silt loam. The B horizon is 4 to 10 inches thick. It has a hue of 10YR or 2.5Y, a value of 4 or 5, and a chroma of 2. The texture of the B horizon is sandy loam, loam, or light silt loam.

The C horizon is sand or loamy sand and 40 to 70 percent coarse fragments. In most areas thin layers of sandy loam or loam are in this horizon. The C subhorizons vary greatly in color. They also vary in texture but sand or loamy sand is dominant. The soil is calcareous throughout the 10 to 20 inch depth. The A and B horizons that are not calcareous are neutral or mildly alkaline in reaction.

Shoals loam, coarse subsoil variant (Sk).—This soil is on flood plains of swiftly flowing streams. Slopes are dominantly less than 2 percent, but they are steeper on the sides of abandoned stream channels in some areas. Some areas are so cut up by these old channels that they are not easily cultivated.

Included with this soil in mapping are many areas of soils, especially in the southern part of the county, in which the surface layer and subsoil are not calcareous. Also included are large areas of soils in which the texture below the subsoil is gravelly loam, instead of gravelly or very gravelly sand. These soils have a higher moisture-holding capacity than this soil. In some included spots are soils that have a surface layer of sandy loam or gravelly loam. A few included areas of soils are moderately well drained and have a yellowish-brown subsoil mottled with gray.

Most areas of this soil are used for pasture or for trees. The hazard of flooding is a limitation to many nonfarm uses. Capability unit IIw-1; woodland suitability group 2wl.

Sloan Series

The Sloan series consists of dark, nearly level, very poorly drained soils that formed in sediment deposited by flowing streams in relatively recent times. These soils formed under a lowland hardwood forest and swampgrass. They are in depressions in the valleys of major streams.

A representative profile of this series, in a cultivated field, has a very dark brown silty clay loam plow layer 10 inches thick. Below the plow layer is black silty clay loam that extends to a depth of 19 inches. The subsoil is dark-gray and gray silty clay loam mottled with yellowish brown. It extends to a depth of 30 inches. The substratum, between depths of 30 and 45 inches, is gray silt loam mottled with yellowish brown. Between depths of 45 and 79 inches, it is yellowish-brown silt loam mottled with gray and strong brown. Reaction in the profile is neutral to mildly alkaline. Carbonates are below a depth of 3 feet in some areas. Sloan soils vary greatly in texture and in thickness of layers within short distances.

Permeability is moderately slow, and available moisture capacity is high. There is a hazard of flooding. Runoff is slow, and some areas are ponded after flooding. Also, the water table is within 6 inches of the surface during the wettest time of the year. Artificial drainage is needed for most crops, but many areas are difficult to drain because of the lack of outlets.

If Sloan soils are drained, they are well suited to row crops. They are high in content of organic matter and generally have good tilth. Their root zone is deep in drained areas. The use of these soils depends upon the extent to which they are drained and protected from flooding. Some areas are used for crops, but many areas are used for pasture or trees. A few undrained areas have marsh or swamp vegetation.

Representative profile of Sloan silty clay loam, in a cultivated field, in the NW1/4NW1/4 sec. 4, T. 22 N., R. 18 W. (Franklin Township):

Ap—0 to 10 inches, very dark brown (10YR 2/2) light silty clay loam; moderate, medium, granular structure; friable; neutral; abrupt, smooth boundary.

A12—10 to 19 inches, black (10YR 2/1) silty clay loam; strong, fine, subangular blocky structure; friable; neutral; abrupt, smooth boundary.

B21g—19 to 22 inches, dark-gray (10YR 4/1) silty clay loam; common, medium, faint, yellowish-brown (10YR 5/4) mottles; moderate, medium, subangular blocky structure; firm, neutral; abrupt, smooth boundary.

B22g—22 to 30 inches, gray (10YR 5/1) light silty clay loam; many, coarse, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure; firm; neutral; abrupt, smooth boundary.

C1g—30 to 45 inches, gray (10YR 5/1) silt loam; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; massive; friable; neutral; clear, wavy boundary.

C2—45 to 53 inches, yellowish-brown (10YR 5/4) silt loam; many, fine, distinct, gray (10YR 5/1) and yellowish-brown (10YR 5/6) mottles; massive; friable; mildly alkaline; clear, smooth boundary.

C3—53 to 79 inches, yellowish-brown (10YR 5/4) silt loam; common, coarse, distinct, gray (5Y 5/1) mottles and many, coarse, distinct, strong-brown (7.5YR 5/6) mottles; massive; firm; few thin strata of silty clay loam; mildly alkaline.

The A1 horizon is 10 to 20 inches thick and is silt loam or silty clay loam. The color is black (10YR 2/1), very dark gray (10YR 3/1), or very dark brown (10YR 2/2). In some areas, the A12 horizon contains the highest percentage of clay in the profile.

The Bg and Cg horizons are stratified in some areas. Silt loam and silty clay loam are the dominant textures in these horizons, but loam and clay loam are common. Sandy and gravelly strata are common below a depth of 3 feet in some areas. The Bg and Cg horizons have a hue of 10YR, 2.5Y, or 5Y, a value of 4 or 5, and a chroma of 1 to 4. Adjacent strata generally differ slightly in color. A thin, buried A1 horizon that has a color as dark as black (10YR 2/1) is below a depth of 3 feet in some areas.

Reaction in the upper part of the B horizon is slightly acid to neutral and grades to mildly or moderately alkaline with depth. Carbonates are below a depth of 30 inches in some areas.

Sloan soils have a darker surface layer than Shoals, Holly, and Algiers soils. They also have poorer natural drainage than Shoals soils. Sloan soils have a dark layer at the surface; but Algiers soils have a dark layer at a depth of 12 to 20 inches. Sloan soils are similar to Luray soils in color, but they do not have the well-defined subsoil layers characteristic of those soils.

Sloan silty clay loam (So).—This soil is in low areas in the valleys of major streams. Generally the areas are away from the present stream channel.

Included with this soil in mapping are small areas of soils that have a silty clay surface layer and a few large areas of soils that have a silt loam surface layer. Also included are some areas of soils where the plow layer is the most clayey part of the profile. A few included areas of soils have a mucky surface layer. Also included are areas of Sloan soils that have slopes of less than 2 percent.

This soil is used for crops, pasture, or trees, depending on the adequacy of drainage, the degree of flooding, and the duration of ponding. Wetness and the susceptibility to flooding are limitations to many nonfarm uses. Capability unit IIIw-4; woodland suitability group 2w2.

Tiro Series

The Tiro series consists of nearly level to gently sloping, somewhat poorly drained soils. The upper part of these soils formed in water-laid deposits, and the lower part in glacial till deposits. Tiro soils are on knolls, mostly in the northwestern part of the county.

A representative profile of this series, in a cultivated field, has a dark grayish-brown silt loam plow layer 6 inches thick. This layer is underlain by a 2-inch subsurface layer of pale-brown silt loam mottled with yellowish brown. The subsoil is at a depth of 8 inches and extends to a depth of 32 inches. It is yellowish-brown silty clay loam mottled with gray and strong brown between depths of 8 and 12 inches; brown silty clay loam mottled with strong brown between depths of 12 and 18 inches; yellowish-brown silty clay loam mottled with grayish brown between depths of 18 and 25 inches; yellowish-brown loam mottled with grayish brown between depths of 25 and 28 inches; and yellowish-brown clay loam mottled with grayish brown between depths of 28 and 32 inches. The substratum is brown clay loam mottled with gray between depths of 32 and 60 inches. The boundary between the upper and lower parts of the subsoil is abrupt and is marked by a line of pebbles or gritty soil material in some areas. The clay loam of the substratum is compact glacial till that is limy in most areas. The upper 2 feet of it is almost free of pebbles, but there are generally a few pebbles below this depth.

Permeability is moderately slow, and available moisture capacity is high. Runoff is slow. Artificial drainage is generally needed for most crops. If these soils are drained, they are generally well suited to crops. They have good tilth and a deep root zone.

Most areas of these soils are too small to be used separately and are used along with surrounding soils, generally in cultivated fields, or in improved pasture.

Representative profile of Tiro silt loam, 2 to 6 percent slopes, in a cultivated field, in the SW1/4SE1/4 sec. 24, T. 21 N., R. 20 W. (Sharon Township):

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

A2—6 to 8 inches, pale-brown (10YR 6/3) silt loam; common, fine, distinct, yellowish-brown (10YR 5/6) mottles; moderate, thin, platy structure; friable; slightly acid; clear, irregular boundary.

B1—8 to 12 inches, yellowish-brown (10YR 5/4) light silty clay loam; few, medium, distinct, gray (10YR 5/1) mottles and few, fine, distinct, strong-brown (7.5YR 5/6) mottles; moderate, fine, subangular blocky structure; firm; grayish-brown (10YR 5/2) and light brownish-gray (10YR 6/2) ped coatings consisting of an outer silty coating and an inner clay film; strongly acid; clear, smooth boundary.

B21t—12 to 18 inches, brown (7.5YR 5/4) silty clay loam; common, fine, faint, strong-brown (7.5YR 5/6) mottles; strong, medium, angular blocky structure; firm; continuous, grayish-brown (2.5Y 5/2) ped coatings; thin, patchy, clay films; medium acid; clear, wavy boundary.

B22t—18 to 25 inches, yellowish-brown (10YR 5/4) silty clay loam; common, fine, faint, yellowish-brown (10YR 5/6) mottles and distinct grayish-brown (10YR 5/2) mottles; weak, coarse, prismatic structure that parts to moderate, fine and medium, subangular blocky structure; grayish-brown (10YR 5/2) ped coatings; patchy clay films; very few fine pebbles; slightly acid; abrupt, wavy boundary.

IIBt—25 to 28 inches, yellowish-brown (10YR 5/4) loam; common, fine, faint, grayish-brown (10YR 5/2) mottles; weak, fine, subangular blocky structure; friable; thin, patchy, grayish-brown (10YR 5/2) clay films on ped faces; 10 percent fine pebbles; slightly acid; abrupt, smooth boundary.

IIIB3—28 to 32 inches, yellowish-brown (10YR 5/4) clay loam; common, fine, distinct, grayish-brown (10YR 5/2) mottles; weak, coarse, subangular blocky structure; firm; very few thin clay films; 4 percent fine pebbles, some with grayish-brown (10YR 5/2) coatings; neutral; clear, irregular boundary.

IIIC—32 to 60 inches, brown (10YR 5/3) light clay loam; common, fine, faint, gray (10YR 5/1 mottles; massive; firm; a few gray (10YR 5/1) streaks; 5 percent fine pebbles; calcareous; mildly alkaline.

In uncultivated areas the A1 horizon is 1 to 4 inches thick and is very dark grayish brown (10YR 3/2). The A2 horizon, where present, is brown (10YR 5/3), pale brown (10YR 6/3), or grayish brown (10YR 5/2), and it is mottled.

The B1 horizon is as much as 8 inches thick. It is highly degraded in some areas. The B2t horizon is 16 to 30 inches thick. The ped interiors of this horizon have a hue of 7.5YR, 10YR, or 2.5Y, a value of 4 or 5, and a chroma of 3 to 6. Mottles of lower chroma are present. The ped exteriors have a hue of 10YR or 2.5Y, a value of 4 to 6, and a chroma of 1 or 2. The texture is heavy silt loam or light silty clay loam in the upper part of the B horizon, and silty clay loam

or clay loam in the lower part that extends into the underlying glacial till. Some degradational silt coatings are in the upper B2t horizon in some areas. In some areas the lower boundary of the B2t horizon coincides with the contact between the silty upper part of the profile and the glacial till. In others, this horizon extends as much as 12 inches into the till, and in others, it ends above the contact with the till. In the latter, a B3 horizon is between the B2t horizon and the underlying glacial till. It is friable silt loam, loam, gravelly loam, or fine sandy loam.

Depth to firm glacial till is 24 to 38 inches. This till is clay loam or silty clay loam. It is calcareous within a depth of 60 inches. Reaction in the silty part of the subsoil is slightly acid to very strongly acid in areas that are not limed. The underlying till, where not calcareous, is slightly acid to mildly alkaline. The upper 2 feet of the till is silty, and it contains relatively few pebbles. The 2 to 8 inches of soil just above the till is as much as 25 percent fine pebbles. The till-derived part of the profile is 3 to 5 percent pebbles.

Tiro soils differ from Fitchville soils in having compact glacial till at a depth of 24 to 38 inches. The upper part of Tiro soils is siltier, less pebbly, and not so firm, as the upper part of Bennington or Wadsworth soils, which formed entirely in glacial till.

Tiro silt loam, 0 to 2 percent slopes (TmA).—This soil is on flats and in depressions.

Included with this soil in mapping are spots of Fitchville, Bennington, or Wadsworth soils. Also included are small areas of the poorly drained Luray or Sebring soils in shallow depressions and along minor natural drainageways. The upper part of the subsoil is gravelly in a few areas.

Most areas of this soil are used for crops. Wetness is a moderate limitation. A seasonal high water table is a limitation to many nonfarm uses. Capability unit IIw-3; woodland suitability group 2w2.

Tiro silt loam, 2 to 6 percent slopes (TmB).—This soil is on low knolls where a thin mantle of lake deposits covers glacial till. This soil has the profile described as representative of the series. Depth to silty material is generally 20 to 40 inches. Included in mapping are some areas of soils where depth to silty materials is from 12 inches to as much as 60 inches. Also included are a few wet spots of Luray or Sebring soils and a few areas in which the upper part of the subsoil is gravelly.

Most areas of this soil are used for crops. Wetness is a moderate limitation if this soil is cultivated. A seasonal high water table is a limitation to many nonfarm uses. Capability unit IIw-3; woodland suitability group 2w2.

Titusville Series

The Titusville series consists of loamy, gently sloping to sloping, moderately well drained soils that formed in old glacial till. These soils have a dense fragipan in the subsoil that restricts the movement of water. They are on rounded hilltops, on the lower part of hillsides, and at the head of sloping valleys in the southeastern part of the county.

A representative profile of this series, in a cultivated field, has a brown silt loam plow layer 7 inches thick. The subsoil is 53 inches thick. Between depths of 7 and 11 inches, it is yellowish-brown silty clay loam; between depths of 11 and 21 inches, yellowish-brown clay loam mottled with grayish brown; between depths of 21 and 45 inches, yellowish-brown, very firm, brittle loam mottled with dark gray and gray in the upper part and light brownish gray in the lower part; and between depths of 45 and 60 inches, yellowish-brown loam mottled with yellowish red in the upper part and strong brown in the lower part. The substratum is yellowish-brown loam to a depth of 81 inches.

Permeability is moderate, except in the fragipan, where it is moderately slow. Available moisture capacity is medium. Runoff is moderate. Natural drainage is generally adequate for crops, although there are brief periods of wetness. The root zone is moderately deep, and reaction is commonly strongly acid or very strongly acid. These soils are subject to erosion if they are not protected. Erosion reduces tilth and available moisture holding capacity.

Titusville soils are moderately well suited to crops and are used mostly for crops or improved pasture.

Representative profile of Titusville silt loam, 2 to 6 percent slopes, in a cultivated field, in the SW1/4NE1/4 sec. 19, T. 21 N., R. 17 W. (Worthington Township) (laboratory data sample RC-25):

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

B1—7 to 11 inches, yellowish-brown (10YR 5/4) silty clay loam; weak, thick, platy structure that parts to moderate, very fine, subangular blocky structure; friable; few coarse fragments; very strongly acid; clear, wavy boundary.

B21t—11 to 16 inches, yellowish-brown (10YR 5/4) light clay loam; few, fine, faint, yellowish-brown (10YR 5/6) mottles; moderate, medium and fine, subangular blocky structure; firm; thin, patchy, brown (10YR 5/3) clay films on ped faces; few coarse fragments; strongly acid; clear, wavy boundary.

B22t—16 to 21 inches, yellowish-brown (10YR 5/3) light clay loam; common, fine, faint, grayish-brown (10YR 5/2) mottles and yellowish-brown (10YR 5/6) mottles; weak, coarse, prismatic structure that parts to moderate, medium, angular blocky structure; firm; prisms coated with brown (10YR 5/3), dark grayish brown (10YR 4/2), and gray (10YR 5/1); blocks coated with brown (10YR 5/3); coatings include thin, patchy clay films; 5 percent of prism surfaces coated with dark manganese stains; few coarse fragments; very strongly acid; abrupt, wavy boundary.

Bx1—21 to 34 inches, yellowish-brown (10YR 5/4) loam; common, fine, distinct, dark-gray (10YR 4/1) and gray (10YR 5/1) mottles and common, medium, faint, yellowish-brown (10YR 5/6) mottles; strong, very coarse, prismatic structure that parts to moderate, thick, platy structure; very firm; brittle; prisms coated with thick, dark-gray (10YR 4/1) and gray (10YR 5/1) clay films; thin, patchy, brown (10YR 5/3) clay films on plates; manganese stains cover 10 to 30 percent of prism and plate surfaces; 5 percent coarse fragments; very strongly acid; diffuse, wavy boundary.

Bx2—34 to 45 inches, yellowish-brown (10YR 5/6) loam; common, coarse, prominent, light brownish-gray (10YR 6/2) mottles; moderate, very coarse, prismatic structure that parts to moderate, thick, platy structure; very firm, brittle; thick, dark-gray (10YR 4/1) and grayish-brown (10YR 5/2) clay films on prisms; thin, patchy, brown (10YR 5/3) clay films on plates; manganese stains cover 10 percent of vertical surfaces and 10 to 60 percent of horizontal faces; 8 percent coarse fragments; very strongly acid; clear, wavy boundary.

B31—45 to 52 inches, yellowish-brown (10YR 5/6) loam; few, medium, distinct, yellowish-red (5YR 5/8) mottles; weak, very coarse, prismatic structure

that parts to moderate, medium, subangular blocky structure; firm; common, vertical, gray (10YR 6/1) streaks and coatings on rock fragments; 5 percent manganese stains on horizontal and vertical faces; 10 percent coarse fragments; very strongly acid; gradual boundary.

B32—52 to 60 inches, yellowish-brown (10YR 5/6) loam; common, fine and medium, distinct, strong-brown (7.5YR 5/8) mottles; weak, very coarse, subangular blocky structure that parts to weak, thin, platy structure; firm; irregular, vertical, gray (10YR 6/1) streaks; gray (10YR 6/1) coatings on coarse fragments; 20 percent coarse fragments; strongly acid; clear, smooth boundary.

C1—60 to 68 inches, yellowish-brown (10YR 5/4) loam; common, coarse, faint, yellowish-brown (10YR 5/6) mottles; common, medium, faint, grayish-brown (10YR 5/2) mottles; and common, fine, distinct, strong brown (7.5YR 5/6) mottles; massive; firm; a few gray (N 6/0) streaks; 15 percent coarse fragments; strongly acid; clear, wavy boundary.

C2—68 to 81 inches, yellowish-brown (10YR 5/4) loam; few coarse, faint, yellowish-brown (10YR 5/6) mottles and common, fine, faint, grayish-brown (10YR 5/2) mottles; massive; friable; 10 percent coarse fragments; slightly acid.

The Ap horizon is dark grayish brown (10YR 4/2) in some areas. In uncultivated areas, the A1 horizon is very dark grayish brown (10YR 3/2) and is 2 to 5 inches thick. An A2 horizon is present in most uncultivated areas and in some cultivated areas. It is brown (10YR 5/3) or yellowish-brown (10YR 5/4) silt loam that is free of mottles.

The B1 horizon is 2 to 8 inches thick. It shows a varying amount of degradation. The B2t horizon above the fragipan is 8 to 18 inches thick. It is heavy loam, silt loam, light clay loam, or silty clay loam. It is yellowish brown (10YR 5/4 or 5/6) or dark yellowish brown (10YR 4/4) and is mottled with grayish brown (10YR 5/2) or gray (10YR 5/1) within 10 inches of its upper boundary. Degradational silt coatings are present in some areas.

The fragipan begins at a depth of 18 to 26 inches and is 16 to 30 inches thick. It is heavy loam, silt loam, or light clay loam. The base color of the ped interiors is typically 10YR 5/4 or 5/6 but includes 10YR 4/4 and 7.5YR 5/4. Prism faces are coated with grayish brown, brown, or yellowish brown. These coatings consist partly of clay films, but the films are not continuous. Degradational silt coatings are present in the upper part of the fragipan in some areas. The fragipan is as much as 15 percent sandstone fragments.

The B3 horizon extends from the base of the fragipan to a depth of at least 60 inches, or to rock. The percentage of sandstone channers increases with depth. Reaction in the solum is strongly acid or very strongly acid. There are no carbonates to a depth of at least 60 inches.

Titusville soils are similar to Hanover soils in texture but are mottled at a shallower depth and have poorer natural drainage. They have a more pebbly and less silty subsoil than Glenford soils and contain less rounded gravel than Bogart soils. In addition, Titusville soils have a fragipan, which is absent in Glenford and Bogart soils. Titusville soils are similar to Canfield soils, but they formed in glacial till that is older than that in which Canfield soils formed, and is acid to a greater depth.

Titusville silt loam, 2 to 6 percent slopes (TvB).—This soil is on hilltops and at the head of valleys between hills underlain by rock. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of the well-drained Hanover soils on some hilltops. Also included in depressions, around seeps and along narrow natural drainageways are soils that are grayer and more mottled than this soil and a few areas of soils that are stony on the surface. Included in many small areas is a soil in which gravel or broken sandstone occurs within a depth of 5 feet. These areas are more common where this soil is in valleys between steeply sloping areas of Loudonville, Berks, Lordstown, or other shallower soils.

Most areas of this soil are used for crops or for improved pasture. The hazard of erosion is moderate if this soil is farmed. Occasional wetness and moderately slow permeability are limitations to some nonfarm uses. Capability unit IIe-5; woodland suitability group 1ol.

Titusville silt loam, 6 to 12 percent slopes (TvC).—This soil is on hilltops and on the lower part of hillsides.

Included with this soil in mapping are small areas of the better drained Hanover soils on some hilltops. Also included around springs and seeps and in the bottom of natural drainageways are soils that are grayer and more mottled than this soil. Other inclusions are areas of soils where broken sandstone bedrock is at a depth of 3 to 5 feet and some areas that have a few stones and boulders on the surface. Some areas of eroded soils are included. In these soils, material from the subsoil has been mixed with that in the plow layer, and the surface layer is lighter colored than that of this soil.

This soil is used for crops, trees, or pasture. The hazard of erosion is severe if this soil is cultivated. Slope and occasional wetness are limitations to many nonfarm uses. Capability unit IIIe-4; woodland suitability group 1ol.

Urban Land

Urban land (Ur) is made up of areas that are mostly covered by buildings or pavement. Included are the business districts of cities, shopping centers, large industrial plants, and paved parking lots. The original soil in these areas has been disturbed or altered to the extent that no recognizable profile remains. Runoff from these areas is very rapid. Capability unit and woodland suitability group not assigned.

Wadsworth Series

The Wadsworth series consists of nearly level to gently sloping, somewhat poorly drained soils. These soils formed in glacial till that is low in content of lime. They have a very dense fragipan in the subsoil that restricts the downward movement of water. They are mostly in the central part of the county.

A representative profile of this series, in a cultivated field, has a dark grayish-brown silt loam plow layer 8 inches thick. The subsoil, between a depth of 8 and 13 inches, is yellowish-brown silt loam mottled with grayish brown. Between depths of 13 and 20 inches, it is firm, yellowish-brown silty clay loam. The yellowish-brown fragipan begins at a depth of 20 inches and extends to a depth of 38 inches. It is silty clay loam in the upper 8 inches and clay loam in the lower 10 inches, and is mottled with grayish brown. Through the soil mass are vertical grayish-brown streaks that intersect to form blocks 4 to 8 inches across. The interiors of these blocks are very firm and dense and are not easily penetrated by plant roots or water. The lower layer of subsoil, between depths of 38 and 44 inches, is firm, yellowish-brown clay loam glacial till. The substratum,

between depths of 44 to 60 inches, is yellowish-brown loam till mottled with grayish brown. Reaction is medium acid to very strongly acid in the surface layer and in the subsoil. A few small pebbles are throughout the profile.

Permeability is very slow in the fragipan and moderately slow below it. Available moisture capacity is medium, and runoff is slow to moderate. Artificial drainage is generally needed for most crops. The root zone is moderately deep.

If Wadsworth soils are drained, they are suited to crops. Most areas were formerly used for crops, but a large acreage is now used for residential developments and other nonfarm purposes.

Representative profile of Wadsworth silt loam, 2 to 6 percent slopes, in a cultivated field, in the SW1/4 NE1/4 sec. 11, T. 21 N., R. 18 W. (Madison Township) (laboratory data sample profile given in section "Laboratory Test Data"):

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

B1—8 to 13 inches, yellowish-brown (10YR 5/4) heavy silt loam; many, coarse, faint, grayish-brown (10YR 5/2) mottles and common, medium, faint, yellowish-brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure; firm; medium acid; clear, wavy boundary.

B2t—13 to 20 inches, yellowish-brown (10YR 5/4) light silty clay loam; many, coarse, faint, grayish-brown (10YR 5/2) mottles; moderate, medium, angular blocky structure; firm; thin, grayish-brown (10YR 5/2) clay films on ped faces; strongly acid; clear, wavy boundary.

Bx1—20 to 28 inches, yellowish-brown (10YR 5/4) light silty clay loam; many, coarse, distinct, grayish-brown (10YR 5/2) mottles; weak, coarse, prismatic structure that parts to weak, medium, platy structure; very firm, brittle; thick, pale-brown (10YR 6/3) silt coatings and grayish-brown (10YR 5/2) clay coatings on prism faces; strongly acid; gradual boundary.

Bx2—28 to 38 inches, yellowish-brown (10YR 5/6) clay loam; many, coarse, faint, yellowish-brown (10YR 5/4) mottles and common, medium, distinct, grayish-brown (10YR 5/2) mottles; moderate, coarse, prismatic structure that parts to weak, medium, platy structure; very firm, brittle; grayish-brown (10YR 5/2) clay films continuous on prism faces; strongly acid; clear, wavy boundary.

B3—38 to 44 inches, yellowish-brown (10YR 5/4) light clay loam; many, coarse, faint, grayish-brown (10YR 5/2) mottles and common, medium, faint, yellowish-brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure; firm; few grayish-brown (10YR 5/2) clay films on ped faces; medium acid; gradual boundary.

C—44 to 60 inches, yellowish-brown (10YR 5/4) heavy loam; many, coarse, distinct, grayish-brown (10YR 5/2) mottles; massive; firm; neutral.

In unplowed areas a very dark grayish-brown (10YR 3/2) A1 horizon is 2 to 4 inches thick. It is underlain by an A2 horizon that is grayish-brown (10YR 5/2) silt loam mottled with brown or yellowish brown. A part of the A2 horizon is in some cultivated areas. The thickness of the A horizon ranges from 6 to 12 inches.

The B1 horizon is 3 to 6 inches thick. Silt coatings are on peds in the B1 horizon in some areas. The B2t horizon above the fragipan is 6 to 10 inches thick. It is light silty clay loam. Ped faces in this horizon are covered by grayish-brown or gray clay films. Silt coatings are also on peds in the B2t horizon in some areas. The ped interiors have a hue of 10YR or 2.5Y, a value of 4 or 5, and a chroma of 4 to 6.

The fragipan is at a depth of 16 to 28 inches and is 12 to 30 inches thick. The color of ped interiors in the fragipan is a mixture of grayish brown, yellowish brown, and light olive brown in a hue of 10YR or 2.5Y. Dark-colored manganese concretions are in the fragipan in some areas. The texture of the fragipan is heavy silt loam, loam, light silty clay loam, or a combination of any of these.

Reaction in and above the fragipan is medium acid to very strongly acid. Reaction below the fragipan becomes less acid with depth. Depth to calcareous till ranges from 40 inches to more than 60 inches. Where carbonates are not present within a depth of 60 inches, reaction is neutral to mildly alkaline at a depth of 60 inches. The texture of the underlying till is heavy loam, silt loam, light clay loam, silty clay loam, or a combination of any of these. Coarse fragments are less than 2 percent in the A, B1, and B2t horizons and 2 to 5 percent in the Bx, B3, and C horizons.

Wadsworth soils are similar to Rittman soils in texture, but they are mottled at a shallower depth, have poorer natural drainage, and are generally lower on the landscape. Wadsworth soils have a less gray subsoil than Frenchtown soils and have better natural drainage. Wadsworth soils are more clayey than Ravenna soils, especially in the subsoil. They have a denser, but less clayey subsoil than Bennington soils. They have a denser subsoil than Fitchville soils, and they contain more pebbles.

Wadsworth silt loam, 0 to 2 percent slopes (WaA).—This soil is on flats and in depressions in the till plain. Included in mapping are small, low areas of the poorly drained Frenchtown soils and at the base of eroded areas are soils where the surface layer is thicker than in other areas. Also included are a few areas of soils that have rock or gravel below a depth of 4 feet.

Most areas of this soil are used for crops. A few areas are used for pasture, trees, or residential developments. Some of the more concave areas are ponded in winter and in spring.

Wetness is a severe limitation if this soil is farmed. Seasonal wetness and very slow permeability are limitations to many nonfarm uses. Capability unit IIIw-1; woodland suitability group 2w2.

Wadsworth silt loam, 2 to 6 percent slopes (WaB).—This soil is on low knolls and along drainageways on till plains. It has the profile described as representative of the series.

Included with this soil in mapping are spots of the poorly drained Frenchtown soils and the moderately well drained Rittman soils. These soils are commonly in undulating areas, where the Frenchtown soils are in the lowest depressions and the Rittman soils are on the highest knolls. In some of the depressions the soils are ponded for short periods in spring. On some of the knolls the soils are eroded and have a light brownish-gray surface layer. A few small areas are stony or gravelly on the surface.

This soil is used for crops, pasture, trees, and urban developments. Wetness is a severe limitation if this soil is farmed. Seasonal wetness and very slow permeability are limitations to many nonfarm uses. Capability unit IIIw-1; woodland suitability group 2w2.

Wallkill Series

The Wallkill series consists of nearly level, very poorly drained soils in depressions. These soils formed in loamy mineral material underlain by organic material. Their original surface layer was peat or muck.

This very dark-colored organic material was buried under lighter colored soil material that was washed from the hillsides. Unlike most soils, Wallkill soils have a surface layer that is lighter colored than the underlying layers of their profile. These soils are in the northern and central parts of the county.

A representative profile of this series, in a cultivated field, has a dark grayish-brown silt loam plow layer 10 inches thick. The subsoil between depths of 10 and 24 inches, is grayish-brown silt loam mottled with yellowish brown. Below this is 10 inches of black muck underlain by 16 inches of very dark brown peat. Grayish-brown silt loam mottled with yellowish brown is at a depth of 50 inches and extends to a depth of more than 60 inches. The entire profile is neutral or slightly acid.

Permeability is moderate, and available moisture capacity is high. Runoff is very slow. Some areas are ponded for brief periods. The water table is within 6 inches of the surface during the wettest time of the year. Artificial drainage is needed for most crops. If these soils are adequately drained, the growth of crops is good. Drainage is not easily provided in some areas, however, because of the lack of outlets.

Drained areas of these soils are used for field and vegetable crops. Undrained areas are in pasture or remain as marshland.

Representative profile of Wallkill silt loam, in a cultivated field, in the SW1/4SE1/4 sec. 9, T. 21 N., R. 18 W. (Madison Township):

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

Bg—10 to 24 inches, grayish-brown (2.5Y 5/2) silt loam; common, coarse and medium, distinct, yellowish-brown (10YR 5/4 and 5/6) mottles; weak, medium, subangular, blocky structure; friable; slightly acid; abrupt, smooth boundary.

11Oa—24 to 34 inches, black (N 2/0) sapric material; 20 percent fibers, less than 5 percent when rubbed; massive in place, but parts to strong, fine, granular structure; friable; neutral; smooth, diffuse boundary.

11Oe—34 to 50 inches, very dark brown (10YR 2/2) hemic material; 40 percent fibers, 15 percent when rubbed; massive; friable; neutral; abrupt, wavy boundary.

IIICg—50 to 60 inches +, grayish-brown (10YR 5/2) silt loam; common, fine, distinct, yellowish-brown (10YR 5/6) mottles; massive; friable; neutral.

The upper, mineral part of the soil is 18 to 30 inches thick. The texture of this part is silt loam or light silty clay loam, and there are thin strata of other textures. The Ap horizon is dark gray (10YR 4/1) or dark grayish brown (10YR 4/2).

The Bg horizon has a hue of 10YR or 2.5Y, a value of 4 or 5, and a chroma of 1 or 2.

The organic horizons have a total thickness of at least 20 inches. These horizons consist of sapric or hemic material. The degree of decomposition decreases with depth. The IIIC horizon is not within a depth of 60 inches in all areas. This horizon is commonly silt loam or silty clay loam. Reaction is slightly acid to mildly alkaline throughout the profile.

The color sequence of light over dark in Wallkill soils distinguishes them from most other soils in the county. Algiers soils have a similar color sequence, but in these soils the buried dark layer is mineral soil, whereas in Wallkill soils it is organic.

Wallkill silt loam (Wc).—This soil is in small depressions, most of which are in the valleys of major streams. Included in mapping are a few small areas of soils that have a loam surface layer and soils where depth to muck is less than 18 inches and more than 30 inches in others. In some included areas, the muck layer is less than 10 inches thick and overlies mucky silt.

Some areas are subject to flooding and to ponding after flooding. Wetness is a moderate limitation if this soil is farmed. Seasonal wetness and flooding are limitations to most nonfarm uses. Capability unit IIw-1; woodland suitability group 2w1.

Wheeling Series

The Wheeling series consists of nearly level to moderately steep soils that are well drained. These soils formed in lacustrine sediment. They are mostly on stream terraces in the southern part of the county.

A representative profile of this series, in a cultivated field, has a dark grayish-brown silt loam plow layer 8 inches thick. The underlying subsoil is 52 inches or more thick. It is yellowish-brown silt loam between depths of 8 and 11 inches; brown silt loam between depths of 11 and 18 inches; and yellowish-brown clay loam between depths of 18 and 28 inches. Between depths of 28 and 36 inches, the subsoil is yellowish-brown, acid, gravelly sandy loam that is friable but sticky when wet, and between depths of 36 and 60 inches, it is loose, gravelly sandy loam that grades to sand and gravel with depth.

Permeability is moderate in the upper part of the soil and rapid in the lower part. Available moisture capacity is medium. Crops in some areas are affected by a lack of sufficient moisture during long dry periods. Runoff is slow to moderate. Natural drainage is adequate for most purposes, and the water table is generally deep enough for crops. The root zone is deep, and it is commonly medium acid or strongly acid. Sloping areas are subject to erosion if not protected. Erosion reduces the depth to sandy or gravelly soil material and thereby reduces the available moisture capacity. Tilth is good. In general, Wheeling soils are well suited to crops.

Most areas of these soils are used for crops. A few of the steeper areas are used for permanent pasture or trees.

Representative profile of Wheeling silt loam, 0 to 2 percent slopes, in a cultivated field, in the SW1/4NE1/4 sec. 1, T. 21 N., R. 17 W. (Worthington Township) (laboratory data sample RC-24):

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

B1—8 to 11 inches, yellowish-brown (10YR 5/4) silt loam; weak; medium, subangular blocky structure; friable; few pale-brown (10YR 6/3) silt coatings; neutral; clear, irregular boundary.

B21t—11 to 18 inches, brown (7.5YR 4/4) heavy silt loam; moderate, medium, subangular blocky structure; friable; thin, patchy, yellowish-brown (10YR 5/4) clay films on ped faces; 2 percent coarse fragments; very strongly acid; clear, wavy boundary.

B22t—18 to 28 inches, yellowish-brown (10YR 5/4) light clay loam; moderate, medium, subangular blocky structure; firm; moderately thick, patchy, brown (10YR 5/3) clay films on ped faces; 5 to 10 percent coarse fragments; very strongly acid; abrupt, smooth boundary.

IIBt—28 to 36 inches, yellowish-brown (10YR 5/4) gravelly

sandy loam; massive; very friable, sticky; sand grains and coarse fragments coated and bridged with clay; 25 percent gravel; very strongly acid; abrupt, smooth boundary.

IIIB3—36 to 60 inches, yellowish-brown (10YR 5/4) gravelly sandy loam, grading with depth to gravel and sand; single grain; loose; few coarse fragments coated and bridged with clay; 45 percent gravel, the percentage of coarser gravel increases slightly with depth; strongly acid.

The thickness of loamy material over sandy or gravelly material ranges from 20 to 40 inches. The Ap horizon is dark grayish brown (10YR 4/2) or brown (10YR 4/3). In uncultivated areas the A1 horizon is very dark grayish brown (10YR 3/2) or very dark brown (10YR 2/2). An A2 horizon is in some uncultivated areas. It is generally yellowish-brown (10YR 5/4), friable silt loam and has weak, platy or subangular blocky structure.

The B1 horizon is 2 to 7 inches thick. It has a hue of 10YR or 7.5YR, a value of 4 or 5, and a chroma of 4 to 6. It is silt loam and shows evidence of degradation in some areas. The B2t horizon is 18 to 28 inches thick. Typically, this horizon is partly in the upper, loamy material, and partly in the lower, sandy or gravelly material. The percentage of each material depends on the depth at which the boundary between the two materials occurs. In some profiles the B2t horizon is entirely in the upper material. The B2t horizon has a hue of 7.5YR or 10YR, a value of 4 or 5, and a chroma of 3 to 6. The texture of the upper B2t horizon is heavy silt loam, light silty clay loam, or clay loam. The texture of the lower part of the B2t horizon is gravelly sandy loam, gravelly loam, gravelly clay loam, or gravelly sandy clay loam. This part of the B2t horizon is 15 to 30 percent gravel. Clay films are on ped faces and have a range of color similar to that of ped interiors.

The B3 horizon is not present in all profiles. The B3 or C horizon, where present, is stratified. The texture of the strata varies between sand, gravel, gravelly sand, gravelly loamy sand, and gravelly sandy loam. The gravel component of the material consists mostly of partly rounded sandstone fragments but includes a high percentage of angular sandstone chips in some areas. The color is brown or yellowish brown. Adjacent strata generally differ slightly in color. Reaction is medium acid to strongly acid throughout the solum, except for the effects of liming in the Ap horizon. The C horizon is medium acid to neutral. Depth to carbonates exceeds 60 inches.

Wheeling soils are similar to Bogart silt loams in texture, but they have better natural drainage and do not have gray mottles in the upper part of the subsoil. The upper 20 to 40 inches of Wheeling soils is less gravelly than the upper part of Chili, Conotton, or Belmore soils. The upper part of the Wheeling and Mentor soils are similar, but Wheeling soils are gravelly at a depth of 20 to 40 inches, and Mentor soils are silty to a depth of 4 feet or more. Wheeling and Mentor soils that have slopes of more than 12 percent are mapped together as undifferentiated units.

Wheeling silt loam, 0 to 2 percent slopes (WhA).—This soil is on terraces along the sides of major valleys. It has the profile described as representative of the series.

Included with this soil in mapping are small, low areas of the moderately well drained Bogart soils and a few areas of the more gravelly Chili soils. Slopes are more than 2 percent in a few small included areas, generally narrow strips between nearly level areas at slightly different elevations.

This soil is well suited to crops, and all crops commonly grown in the county are suitable. It has few limitations to most nonfarm uses. Capability unit I-1; woodland suitability group 1o1.

Wheeling silt loam, 2 to 6 percent slopes (WhB).—This soil is on terraces along the sides of valleys. A few small areas are also on the till plain, on ridges, and in high valleys.

Included with this soil in mapping are a few small areas of the moderately well drained Bogart soils in depressions and along natural drainageways and a few areas of the more gravelly Chili soils. A few small areas of included soils are underlain by broken sandstone at a depth of 4 to 5 feet.

This soil is very well suited to crops, and all crops commonly grown in the county are suitable. The hazard of erosion is moderate. This soil has few limitations for most nonfarm uses. Capability unit IIe-2; woodland suitability group 1o1.

Wheeling silt loam, 6 to 12 percent slopes (WhC).—This soil is on terraces and hillsides, most of which are along the valleys of major streams. A few areas are also on the till plain and in high valleys.

Included with this soil in mapping are a few areas of eroded soils that have a brown or yellowish-brown surface layer. Also included are small areas of the more gravelly Chili soils and a few areas of soils underlain by angular sandstone fragments instead of gravelly or sandy material.

Most areas of this soil are used for crops or pasture. The hazard of erosion is severe if this soil is farmed. Slope is a limitation to most nonfarm uses. Capability unit IIIe-6; woodland suitability group 1o1.

Wheeling and Mentor silt loams, 12 to 18 percent slopes (WmD).—These soils are on the sides of major valleys and on breaks between two levels of terraces. Some areas consist mainly or entirely of Wheeling soils, some mainly or entirely of Mentor soils, and other areas consist of a mixture of the two. There is no set pattern. The depth to sandy or gravelly layers ranges from 20 inches to more than 60 inches.

Included with these soils in mapping are some small areas of eroded soils that have a lighter colored surface layer than the uneroded areas. Also included are a few small areas in which shattered sandstone bedrock is at a depth of 3 to 5 feet. Included around a few seeps and springs are soils that are grayer and more mottled than Wheeling or Mentor soils. A few areas of soils that have slopes of less than 12 percent and many areas of soils that have slopes greater than 18 percent are included.

Most areas are used for pasture or trees. The hazard of erosion is very severe if these soils are cultivated; and there is some hazard of erosion if they are in pasture. The soils are well suited to pasture if erosion is controlled. Slope is a limitation to most nonfarm uses. Capability unit IVe-1; woodland suitability group 1r1.

Wooster Series

The Wooster series consists of well-drained, gently sloping to very steep soils that formed in glacial till that is low in content of lime. These soils have a fragipan that restricts the movement of water. They are extensive in the southwestern and central parts of the county.

A representative profile of this series, in a cultivated field, has a dark-brown silt loam plow layer 8 inches thick. The upper part of the subsoil is yellowish-brown silt loam that extends to a depth of 24 inches. Below

this is the fragipan, which extends to a depth of 40 inches. It is yellowish-brown, very firm and brittle silt loam. Brown clay occurs as vertical streaks through the soil mass. Below the fragipan, and extending to a depth of 50 inches, the subsoil is friable, yellowish-brown loam glacial till. This part of the subsoil is medium acid. The substratum, between depths of 50 and 60 inches, is yellowish-brown, slightly acid loam, and stones are in all parts of the profile.

Available moisture capacity is medium, and permeability is moderately slow. Runoff is moderate to very rapid. Unprotected areas are subject to erosion that results in poor tilth and lower available moisture capacity. The root zone is moderately deep. The water table generally is at a depth of 4 feet or more, but for brief periods the soil above the fragipan is saturated. Natural drainage is adequate for crops, and tilth generally is good in uneroded areas.

The less strongly sloping areas of Wooster soils are used mainly for crops or improved pasture. Suitability for crops decreases as the slope becomes steeper and the degree of erosion increases. The steeper areas are mainly in pasture or trees. Some areas of Wooster soils are not farmed but are used for residential developments and for other nonfarm purposes.

Representative profile of Wooster silt loam, 6 to 12 percent slopes, moderately eroded, in a cultivated field, in the SE1/4SW1/4 sec. 25, T. 19 N., R. 19 W. (Perry Township):

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

B1—8 to 12 inches, yellowish-brown (10YR 5/4) silt loam; moderate, fine, subangular blocky structure; friable; few fine pebbles; medium acid; clear, wavy boundary.

B2t—12 to 24 inches, yellowish-brown (10YR 5/6) heavy silt loam; moderate, medium, subangular blocky structure; firm; few pale-brown (10YR 6/3) silt coatings and brown (10YR 5/3) clay films on ped surfaces; 5 percent pebbles; strongly acid; clear, smooth boundary.

Bx—24 to 40 inches, yellowish-brown (10YR 5/4) heavy silt loam; weak, very coarse, prismatic structure that breaks to moderate, medium, platy structure; very firm, brittle; medium, patchy, brown (10YR 5/3) clay films and pale-brown (10YR 6/3) silt coatings on ped faces; few, medium, prominent, black (10YR 2/1) manganese concretions; 5 to 10 percent coarse fragments; medium acid; clear, smooth boundary.

B3—40 to 50 inches, yellowish-brown (10YR 5/4) loam; few, fine, faint, grayish-brown (10YR 5/2) mottles; weak, medium, subangular blocky structure; firm; 5 to 10 percent coarse fragments; medium acid; gradual boundary.

C—50 to 60 inches, yellowish-brown (10YR 5/4) loam; few, fine, faint, grayish-brown (10YR 5/2) mottles; massive; firm; 5 to 10 percent coarse fragments; slightly acid.

In uncultivated areas the A1 horizon ranges from 1 to 4 inches in thickness and is very dark grayish brown (10YR 3/2). An A2 horizon is in uncultivated areas and in some cultivated areas. It is commonly brown or yellowish-brown, friable silt loam.

The B1 horizon is 2 to 6 inches thick. Its peds have a varying amount of silt coating. The A and B1 horizons are commonly silt loam but are loam in places. The B2t horizon is 6 to 16 inches thick. It has a hue of 10YR or 7.5YR, a value of 4 or 5, and a chroma of 4 to 6. The fragipan begins at a depth of 20 to 30 inches and is 12 to 26 inches thick. It is loam or silt loam and dominantly yellowish brown or brown in a hue of 10YR or 7.5YR. The color of ped interiors varies. Low-chroma mottles are in some areas. Dark manganese concretions are not present in all areas. A B3 horizon, 4 to 10 inches thick, that shows very slight evidence of clay movement is below the fragipan.

The C horizon is loam or silt loam. The fragipan and the horizons above it are medium acid to strongly acid, and the horizons below it are slightly acid to neutral. The depth to carbonates is more than 60 inches. Coarse fragments make up 5 to 15 percent, by volume, of the soil mass. Weathered sandstone is below a depth of 4 feet in some areas.

Wooster soils are similar to Canfield soils, but mottles begin deeper in the profile of Wooster soils, natural drainage is better, and landscape positions are typically higher and steeper. Mottles begin deeper in Wooster soils than in Rittman soils, and Wooster soils have less clay within subsoil. Also, they have a denser subsoil and are deeper to rock than Lordstown or Loudonville soils. Wooster soils have a denser subsoil than Chili or Mentor soils, are less gravelly than Chili soils, and are more pebbly and less silty than Mentor soils. They are less clayey and more acid than Alexandria soils. Wooster soils are similar to Hanover soils but are less acid at a shallower depth.

Wooster silt loam, 2 to 6 percent slopes (WsB).—This soil is on hilltops. Most areas are surrounded by steeper slopes or are divided by deeply incised valleys. This soil has a profile similar to the one described as representative of the series, but in most areas the surface layer is slightly darker.

Included with this soil in mapping are small, low areas of moderately well drained Canfield soils around a few seeps and springs. Also included in minor natural drainageways are soils that are grayer and more mottled than this soil. In addition, a few small areas of stony soils that have solid rock within a depth of 40 inches are included in some places.

Most areas of this soil are used for crops, improved pasture, or nonfarm purposes. If this soil is farmed, the hazard of erosion is moderate. Moderately slow permeability and slope are limitations to nonfarm uses. Capability unit IIe-2; woodland suitability group 1o1.

Wooster silt loam, 2 to 6 percent slopes, moderately eroded (WsB2).—This soil is on hilltops. Erosion has removed a part of the original surface layer, and the plow layer contains some material from the subsoil. The degree of erosion is more variable in gently sloping, undulating areas than in gently sloping, uniform areas. The color of the surface layer ranges from dark grayish brown in the least eroded spots to yellowish brown where erosion is greater.

Included with this soil in mapping are small areas of the moderately well drained Canfield soils in some depressions. Also included are a few areas of soils where broken rock is below a depth of 4 feet.

Most areas of this soil are in crops. Tilth is poorer and available moisture capacity is less in this Wooster soil than in uneroded Wooster soils that have similar slopes. Moderately slow permeability and slope are limitations to nonfarm uses. Capability unit IIe-2; woodland suitability group 1o1.

Wooster silt loam, 6 to 12 percent slopes (WsC).—This soil is on hillsides, undulating hilltops, and sides of natural drainageways. It has a profile similar to the one described as representative of the series, but the surface layer is slightly darker.

Included with this soil in mapping are small areas of the moderately well drained Canfield soils on the lower

part of some hillsides. Also included are wet soils around springs and seeps and in minor natural drainageways; a few areas of Loudonville soils that have rock within a depth of 40 inches, a few areas of Chili soils that are more gravelly than this soil; and a few small areas of eroded soils that have a dark-brown or yellowish-brown surface layer.

Most areas of this soil are in crops or pasture, but some are used for nonfarm purposes. If this soil is farmed, the hazard of erosion is severe. Slope is a limitation to many nonfarm uses. Capability unit IIIe-6; woodland suitability group 1o1.

Wooster silt loam, 6 to 12 percent slopes, moderately eroded (WsC2).—This soil is on hillsides, hilltops, and the sides of minor natural drainageways. It has the profile described as representative of the series. Erosion has removed a part of the surface layer, and the plow layer consists of a mixture of material originally in the surface layer and that from the subsoil.

Included with this soil in mapping are small areas of moderately well drained Canfield soils on the lower part of hillsides. Also included are areas of soils where rock is at a depth of 40 to 60 inches and a few spots that are stony.

Most areas of this soil are cultivated or have been cultivated. The loss of part of the surface layer through erosion has decreased the depth to the fragipan and made this soil slightly shallower than uneroded Wooster soils. The degree of erosion differs within short distances. Available moisture capacity is slightly less, infiltration is slower, and runoff is faster than on uneroded Wooster soils that have similar slopes. The loss of part of the original surface layer causes a decrease in content of organic matter and also results in poorer tilth. If this soil is farmed, the hazard of further erosion is severe. Slope is a limitation to many nonfarm uses. Capability unit IIIe-6; woodland suitability group 1o1.

Wooster silt loam, 12 to 18 percent slopes (WsD).—This soil is on hillsides and on the sides of valleys of small streams. Where there are surrounding areas of more gently sloping Rittman and Wadsworth soils, the profile of this soil is more clayey than the representative profile of the series. Most areas of this soil are long and narrow.

Included with this soil in mapping on long hillsides, are small areas of the moderately well drained Canfield soils on the lower part of the hillsides. Included around springs and seeps are gray, mottled soils. Loudonville soils that have rock at a depth of less than 40 inches are also included, as well as many areas of soils that have rock at a depth of 40 to 60 inches. A few spots of gravelly soils that have a few large stones on the surface are also included.

Most of this soil is in woods and permanent pasture. If it is farmed, the hazard of erosion is very severe. Slope is a limitation to most nonfarm uses. Capability unit IVe-1; woodland suitability group 1r1.

Wooster silt loam, 12 to 18 percent slopes, moderately eroded (WsD2).—This soil is on hillsides and on the sides of valleys of small streams. Erosion has removed a part of the surface layer, and the plow layer is light grayish brown and is a mixture of the material originally in the surface layer and that from the subsoil. Where there are surrounding areas of the more gently sloping Rittman and Wadsworth soils, the subsoil is somewhat more clayey than that of the representative profile.

Included with this soil in mapping are small areas of the moderately well drained Canfield soils on the lower part of some hillsides. Also included around springs and seeps are soils that are gray and mottled. Other inclusions are a few small areas of soils that are underlain by rock at a depth of 40 to 60 inches, and some spots of stony soils. On a few very narrow flood plains are included soils that are similar to Pewamo and Holly soils.

Most areas of this soil are now cultivated or were formerly cultivated. The loss of a part of the original surface layer through erosion has resulted in a decrease in organic matter and in poorer tilth. Infiltration is slower and runoff is faster in this Wooster soil than on uneroded Wooster soils. If this soil is farmed, the hazard of further erosion is very severe. Slope is a limitation to most nonfarm uses. Capability unit IVe-1; woodland suitability group 1r1.

Wooster silt loam, 12 to 18 percent slopes, severely eroded (WsD3).—This soil is on hillsides and the sides of valleys of small streams. Erosion has removed most of the surface layer; the plow layer is brown or yellowish brown and consists mostly of material from the upper part of the subsoil. Erosion is commonly greater in areas on the crests of the slopes, and the colors are lighter than in other areas. The surface layer is darker in protected areas that are less eroded. Soil material washed from higher areas has accumulated along the base of some of the hillsides. Where gently sloping Rittman and Wadsworth soils surround this soil, the subsoil is somewhat more clayey.

Included with this soil in mapping are small areas of moderately well drained Canfield soils on the lower part of some hillsides, and around springs and seeps are soils that are gray and mottled. Also included in a few small areas are soils that have rock at a depth of 40 to 60 inches and a few spots of stony soils are in places. On a few very narrow flood plains are included soils that are similar to the Pewamo and Holly soils.

Most areas of this soil are cultivated or were formerly cultivated. The loss of the surface layer through erosion has decreased the depth to the fragipan and has resulted in a decrease in the content of organic matter and in poorer tilth. The hazard of further erosion is very severe. Infiltration is slower and runoff is faster on this Wooster soil than on uneroded Wooster soils. Slope is a limitation to most nonfarm uses. Capability unit VIe-1; woodland suitability group 1r1.

Wooster silt loam, 18 to 25 percent slopes (WsE).—This soil is on the sides of valleys of narrow streams. It has a profile similar to the one described as representative of the series, but it is more variable in most areas. In some areas in the central part of the county, the soil is more clayey. These areas are near more gently sloping Rittman and Wadsworth soils.

Included with this soil in mapping are gray, mottled soils around springs and seeps and soils that have rock at a depth of 60 inches in many areas and at a depth of 30 inches where they occur on the lower part of some hillsides. Also included are many spots of gravelly and stony soils; in some areas boulders are on the surface. Trees have slipped down some of the short, nearly

vertical slopes, and the layers of soil have been mixed by tree throw. Also included on a few very narrow flood plains are soils that are similar to Holly and Shoals soils. Shallow gullies are in some areas, and if not controlled, these gullies can extend into areas of more nearly level soils.

Nearly all areas of this soil are at least partly wooded and have fair to good potential for tree growth. This soil is poorly suited to crops because of the very severe hazard of erosion and because of equipment limitations. Slope is a limitation to most nonfarm uses. Capability unit VIe-1; woodland suitability group 1r1.

Wooster silt loam, 18 to 40 percent slopes, severely eroded (WsE3).—This soil is on hillsides, most of which form the sides of valleys of narrow streams. Erosion has removed most of the original surface layer, and the present surface layer is mainly yellowish-brown material from the subsoil.

Included with this soil in mapping are a few nearly vertical banks cut by streams. Slopes are as steep as 50 percent in some areas. Also included on some narrow flood plains are soils that are similar to Holly or Shoals soils. Soil material washed from higher areas has accumulated along the base of some of the hillsides.

Most areas of this soil are in permanent pasture that has been overgrazed. The original surface layer has been removed by erosion, and depth to the restrictive fragipan has been reduced. The soil has poorer tilth and faster runoff than less eroded Wooster soils that have similar slopes. This soil is generally too steep for cultivation, but it is suited to pasture and trees. Seedings are generally difficult to establish in this eroded soil. Slope is a limitation to most nonfarm uses. Capability unit VIIe-1; woodland suitability group 1r1.

Wooster silt loam, 25 to 40 percent slopes (WsF).—This soil is on the sides of valleys along streams. The subsoil in a few areas in the central part of the county is more clayey than that of most other Wooster soils. Most areas are narrow, although some are a mile or more long.

Included with this soil in mapping are areas of soils that have stones and boulders on the surface and a few small pockets of gravel. Many areas of soils that have rock at a depth of 60 inches, and a few areas, commonly on the lower part of hillsides, that have rock at a depth of 40 inches are included. Also included on very narrow flood plains are soils that are similar to Shoals and Holly soils and wet soils around a few springs and seeps, especially in areas that are shallow to rock.

Most areas of this soil support fair to good stands of trees. The very steep areas are generally not suited to cultivation, and some woodland improvement practices are hampered. A few small gullies have formed along old logging roads, and these gullies can extend into the more nearly level soils upslope if erosion is not controlled. Slope is a limitation to most nonfarm uses. Capability unit VIe-1; woodland suitability group 1r1.

Wooster-Chili soils, 2 to 6 percent slopes (WtB).—These soils are on ground moraines and on knolls along the sides of valleys in the south-central part of the county. About 60 percent of the acreage consists of Wooster soils that have a thinner, less continuous fragipan than is typical of their series; 20 percent consists of Chili soils; and 20 percent consists of soils that are similar to Wooster soils, but they have gravelly layers of varying thickness.

Included with these soils in mapping are a few low spots of moderately well drained Canfield soils. The surface layer of these soils is silt loam, loam, gravelly loam, or gravelly silt loam. In a few small areas are eroded soils that have a brown surface layer.

Permeability is more rapid in the Wooster soil than is typical for the series. The rooting depth is not restricted. The soils are well suited to cultivated crops, but they are subject to a moderate hazard of erosion. The good natural drainage of these gently sloping soils are favorable for many nonfarm uses. Capability unit IIe-2; woodland suitability group 1o1.

Wooster-Chili soils, 6 to 12 percent slopes (WtC).—These soils are in undulating areas on ground moraines and on the sides of valleys. About 40 percent of the acreage consists of Wooster soils that have a thinner, less continuous fragipan than is typical of their series; 30 percent consists of Chili soils; and 20 percent consists of soils that are similar to Wooster soils, but they have gravelly or cobbly layers of varying thickness.

Included with these soils in mapping are some low areas of moderately well drained Canfield soils. Also included are some eroded soils in which the surface layer is dark grayish brown in the least eroded areas and yellowish brown where erosion is greater. The degree of erosion varies greatly within small areas. The surface layer is silt loam, loam, or gravelly loam.

Most areas of these Wooster and Chili soils are used for crops, and despite the severe hazard of erosion, they are suited to crops. Slope is a limitation to nonfarm uses. Capability unit IIIe-6; woodland suitability group 1o1.

Formation and Classification of the Soils

In this section the factors and processes of soil formation are described. In addition, the system of classifying soils in categories above the series level is explained, and laboratory test data for selected soils are given.

Factors of Soil Formation

A soil is a three-dimensional, natural body capable of supporting plant growth. The nature of the soil at a given site is the result of the interaction of many factors. For the sake of convenience, these factors can be grouped into five general categories: parent material, climate, plants and animals, relief, and time. Theoretically, if all these factors are identical at different sites, soils at these sites should also be identical. The variations among soils are caused by variations in one or more of these factors.

Parent material

Parent material is the raw material acted upon by the other soil-forming factors. It largely determines the soil texture. The soils of Richland County formed in

different kinds of parent material. Some of this material was deposited by glaciers that covered the area thousand of years ago, or by melt water from these glaciers. Other kinds of parent material have been deposited by flowing streams in relatively recent times, and still other kinds are rock that has weathered in place and organic material formed by decaying plants.

Glacial till is material that was deposited directly by glacial ice, with little or no action by water. The glacier contained assorted soil material, which was left behind when the glacier melted. Glacial till typically contains particles that vary in size, including some large stones. The smaller stones and pebbles have sharp angles, indicating that they have not been rounded by the action of water. The composition of the till depends on the nature of the area over which the ice passed before reaching the area of deposition. Some boulders were carried for long distances, but most of the material in the till was of local origin. Most of the glacial till in Richland County was deposited during the latest major glaciation, the Wisconsin Glaciation. The glacial till in the northern part of the county is relatively high in content of clay and lime. Bennington and Cardington soils, which formed in this till, have a subsoil of clay loam or silty clay loam and have natural lime below a depth of about 3 feet. Farther south the till contains less limestone and shale and more sandstone. Wooster and Canfield soils formed in this till. They have a subsoil of loam but have no lime within a depth of 5 feet.

In a small area of the county are glacial till deposits of an earlier glaciation, the Illinoian. Hanover and Titusville soils formed in these older deposits.

Soils that formed in glacial till are generally compact and have slow or moderately slow permeability. They generally make good foundation material because of the wide range in size of the soil particles.

Melt-water deposits were laid down by, or in, water from the melting glaciers. They are of two general kinds: lacustrine deposits, laid down in still water; and outwash deposits, laid down by moving water. The size of particles that can be carried suspended in water depends on the speed at which the water is moving. When water slows to a given speed, all particles larger than a given size that are suspended in the water will drop out. Reduction of speed occurs where a stream flows into a still lake. The coarser sand and gravel particles are dropped immediately near the mouth of the stream, and the fine clay particles are carried far into the lake, where they slowly settle from the still water.

Lacustrine soils are inextensive in Richland County. Fitchville, Luray, and Glenford are lacustrine soils. They formed in deposits laid down in small lakes that existed after the glaciers melted. The largest of these lakes was northwest of Shelby.

Soils that formed in outwash deposits are of great extent in the county. These outwash deposits were laid down as melt water from the glaciers poured down the valleys between the rock hills. Because of the speed of the water, the smaller silt and clay particles were carried along in the water, but the sand and gravel were left behind. Chili and Bogart soils formed in these outwash deposits and are gravelly and porous.

The speed of water at many points did not remain constant during the period of deposition. Changes in the speed of water caused the deposition of thin layers of material in which the predominant particle size differs from that in the layers above and below. This phenomenon is called stratification, and the individual layers are called strata. In many areas of Luray and Fitchville soils, for example, there are alternating thin strata of silt loam and silty clay loam. Even more drastic changes in material deposition are indicated by "two-story" soils like Wheeling. The upper part of these soils formed in loamy deposits laid down in still water, but the lower part formed in sandy or gravelly deposits laid down by moving water.

The melt-water deposits in the county also differ in content of lime. For example, the gravel in Belmore soils is mostly limestone and is calcareous, but that in Chili soils is mostly sandstone and is acid.

Alluvium is soil material deposited by flowing streams. The texture of alluvium varies because the speed and duration of floodwater varies considerably within small areas. The soil horizons are poorly expressed because the soil forming process starts over again with each new deposition. One or more buried surface layers are present in many areas, and the soils are highly stratified. The source of most alluvium is other soils farther upstream in the watershed. Lobdell, Shoals, and Holly soils formed in alluvium. Pewamo, overwash, soils are a special kind of soil that formed in recent local alluvium that was removed by erosion from adjacent slopes.

Weathered rock is the parent material of many soils in the county, especially in the southern part. Most of the rock in Richland County is sandstone. The coarse-grained Black Hand Sandstone weathers to form sand or loamy sand. Schaffenaker soils formed in this kind of material. They are very droughty and have low productivity. A finer grained sandstone weathers to silt loam such as that of the Lordstown soils. In general, soils that formed in weathered sandstone are well drained and are low in content of clay.

Carlisle soils and the upper part of Linwood soils formed in the residue from decomposed plants. Plants died and fell into shallow lakes. Here, the permanently wet condition prevented oxidation and slowed decomposition, and the residue accumulated. The very dark color of Carlisle and Linwood soils is from their organic parent material.

Climate

Climate in an area the size of Richland County is essentially a constant factor of soil formation. None of the soil differences in the county can be directly attributed to differences in climate. The county has a humid, temperate climate, which favors hardwood trees.

There are some differences in microclimate that affect the amount of precipitation. The amount of effective precipitation is reduced by runoff on steep slopes and is increased by drainage into depressional areas.

Plants and animals

The vegetation under which a soil forms influences the color, structure, and organic-matter content of the soil. Soils that formed under forest are generally lighter in color than those that formed under grass,

because grass is more effective than trees in returning organic matter to the soil. Grass also promotes granular structure in the surface layer of the soil.

Most of the soils in Richland County formed under hardwood forest. Wooster, Alexandria, and Lordstown soils formed under a forest consisting mostly of such hardwoods as red oak, white oak, and black oak. Sebring, Frenchtown, and most of the other poorly drained and very poorly drained soils formed under swamp forest.

Bacteria, fungi, and many other micro-organisms aid in the breakdown and return of plant residue to the soil. The kind of organic residue that is returned to the soil depends, to some extent, on the kind of organism involved in the breakdown. Generally fungi are most active in acid soils and bacteria in alkali soils.

Earthworms, burrowing insects, and other small animals constantly mix the soil. Their burrows help to make the soil porous and permit passage of water. Earthworms help to incorporate organic matter into the soil. Leaf fall that is well populated with earthworms is usually incorporated into the soil by early the next spring. If the earthworm population is low, part of the leaf fall will remain on the surface of the soil for 2 or 3 years.

Man is a late comer as an influence in soil formation, and his influence will be great on future soils. Accelerated erosion caused by cultivation and clearing is one example of his influence. Cultivation also affects soil structure and tends to lower the content of organic matter. Large areas of Pewamo, Luray, and other wet soils have been drained artificially. Future soil formation in these areas will take place under drier conditions than in the past. The change of vegetation from the native forest to cultivated crops can also be expected to affect future soil formation. The addition of lime, fertilizer, and other amendments changes, to some degree, the chemical composition of the soil.

Relief

Relief, along with parent material, affects the natural drainage of soils. Relief influences the amount of runoff and the depth to the ground-water table. In general, the steeper soils have better drainage than the nearly level soils. Different kinds of soil can form in the same kind of parent material under different drainage conditions. For example, Mentor and Luray soils formed in silty lacustrine deposits. Mentor soils are in high positions where the water table generally is not close to the surface. Water passes through these soils readily, and they are well drained. Luray soils, however, are in low, nearly level areas in which the water table is close to the surface. Even though these soils are permeable enough for water to pass through them, water tends to accumulate in them, and they are very poorly drained.

A group of soil series that formed in the same kind of parent material but have different natural drainage is called a toposequence, or soil catena. There are two to four soil series in most of the toposequences in Richland County. For example, the well-drained Wooster, the moderately well drained Canfield, the somewhat poorly drained Ravenna, and the poorly drained Frenchtown soils make up a toposequence of soils that formed in loam glacial till. Similarly, the Belmore, Haney, and Digby series make up a toposequence that formed in outwash deposits.

Relief varies greatly in Richland County. In the northern part of the county the most extensive landform is a nearly level to gently undulating till plain. Relief is stronger through the central part of the county, where the glacier had a less leveling effect on the hills underlain by rock. Relief is even stronger in the southeastern part of the county, where the glacier had little effect on the hills. The proportion of well-drained soils is considerably greater in the steeper, southern part of the county. Conversely, the proportion of poorly drained and somewhat poorly drained soils is much higher in the more nearly level northern part of the county.

Time

The length of time during which parent material has been exposed to the soil-forming processes affects the nature of the soil that forms. The youngest soils in the county, in terms of years, are the soils that are forming in recent stream deposits. Lobdell and Shoals soils are forming in these deposits and have less definite horizon development than older soils.

The county was covered by two major glaciations, the Wisconsin and the Illinoian. Geologists estimate that these glaciations occurred about 100,000 years apart. Hanover soils, which formed in the earlier Illinoian till deposits, have thicker horizons and are leached of bases (calcium and magnesium) to a greater depth than Wooster soils, which formed in the later Wisconsin deposits of similar texture. The differences between Hanover and Wooster soils, however, are not proportional to the supposed age difference, indicating that factors other than time are involved.

The same soil-forming factors act with different rates on different materials. The regolith of Schaffenaker soils, for example, is largely quartz, a very resistant mineral. Thus, although Schaffenaker soils are among the oldest in the county, they have very weak horizon development.

Processes of Soil Formation

Soils are formed by the five soil-forming factors through complex, continuing processes that can be grouped into four general categories: addition, removal, transfer, and transformation (*9*). These four processes occur in the formation of all soils, although their predominance varies.

In Richland County the accumulation of organic matter in the formation of organic soils is an example of the process of addition. This addition of organic residue is mainly responsible for the dark color of the surface layer. When the parent material was laid down, the top layer was no darker than the others, but the organic residue from plants that grew in the soil darkened the surface layer.

The loss of lime from the upper 3 to 6 feet of many of the soils in Richland County is an example of the removal process. The parent material of these soils was limy, but the lime has been leached from the upper part of the profile by water moving through the soil.

Water is the carrier for most of the transfers that occur in the formation of soils in this county. In many of the soils, clay has been transferred from the A horizon to the B horizon. Thus, the A horizon, especially the A2 horizon, is a zone of eluviation, or loss. The B horizon is a zone of illuviation, or gain. In the Cardington, Wooster, Loudonville, and other soils, the B horizon contains more clay than the parent material, and the A2 horizon contains less. In the B horizon of some soils, there are thin films of clay in the pores and on ped surfaces. This clay has been moved from the A horizon. The presence or absence of these clay films is an important criterion in soil classification.

An example of transformation is the weathering of shale into clay. All stages of this process can be observed in the profile of Latham soils. The sequence of transformation is from hard shale to soft shale to platy, shale-like clay to clay.

The four soil-forming processes have worked in all the soils of the county, but to varying degrees. For example, the accumulation of organic matter has been predominant in the formation of Luray and Pewamo soils, whereas the removal of carbonates and the transfer of clay have been predominant in the formation of Cardington and Glenford soils.

Classification of Soils

Classification of soils consists of an orderly grouping of soils according to a system designed to make it easier to remember soil characteristics and interrelationships. Classification is useful in organizing and applying the results of experience and research. Soils are placed in narrow classes for discussion in detailed soil surveys and for application of knowledge within farms and fields. The many thousands of narrow classes are then grouped into progressively fewer and broader classes in successively higher categories, so that information can be applied to large geographic areas.

The system currently used by the National Cooperative Soil Survey was adopted in 1965.[4] It is under continual study (*10*). This system has six categories. Beginning with the most inclusive, these categories are the order, the suborder, the great group, the subgroup, the family, and the series. The criteria for classification are soil properties that are observable or measurable, but the properties are selected so that soils of similar genesis are grouped together. The placement of some soil series in the current system of classification, particularly in families, may change as more precise information becomes available.

Table 8 shows the classification of each soil series of Richland County by family, subgroup, and order according to the current system. Classes of the current system are briefly defined in the following paragraphs.

ORDERS. 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 named with a word of three or four syllables ending in *sol* (Entisol).

Six soil orders are represented in Richland County—Entisols, Inceptisols, Mollisols, Alfisols, Ultisols, and Histosols.

In Entisols the soil materials have been only slightly altered by soil-forming processes. The only developed horizon is a thin A1 horizon in which organic matter has accumulated. There is little structure other than that inherited from the original material.

Inceptisols have started to develop horizons. They have more strongly developed horizons than Entisols, but they lack horizons of clay accumulation such as in Alfisols and Ultisols. The indications of weak horizon development in these soils include the leaching of original lime, the development of structure stronger than that of the original parent material, or the development of dull-gray colors from the reduction of iron compounds (gleying). The horizons in which these changes have taken place are called cambic horizons. Clay movement has not occurred to any appreciable extent in Inceptisols.

Mollisols have a dark-colored surface layer that is high in content of organic matter. This dark layer is called a mollic epipedon. The mollic epipedon is at least 10 inches thick.

More than half of the soils in Richland County are Alfisols. In Alfisols there is a horizon of clay accumulation called an argillic horizon. Alfisols have a higher percentage base saturation than Ultisols, and they have horizons of clay accumulation that Inceptisols do not have.

Ultisols have horizons of clay accumulation (argillic horizons). They are strongly acid to a greater depth than Alfisols and have less than 35 percent base saturation at a depth of 50 inches below the top of the argillic horizon or to a depth of 30 inches below the top of a fragipan if one occurs in the soil.

Histosols are organic soils, more commonly known as muck soils. These soils contain at least 30 percent organic matter in a surface layer that is at least 16 inches thick.

SUBORDERS. Each order is subdivided into suborders that are based primarily on those soil characteristics that seem to produce classes with the greatest genetic similarity. The suborders narrow the broad climatic range permitted in the orders. The soil properties used to separate suborders are mainly those that reflect either the presence or absence of water-logging, or soil differences resulting from the climate or vegetation. The names of suborders have two syllables. The last syllable indicates the order. An example is Aquent (Aqu, meaning water, or wet, and *ent*, from Entisol).

GREAT GROUPS. 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

[4] UNITED STATES DEPARTMENT OF AGRICULTURE. soil taxonomy of the national cooperative soil survey. Unpublished.

TABLE 8.—*Classification of soil series of Richland County*

Series	Family	Subgroup	Order
Alexandria	Fine, illitic, mesic	Typic Hapludalfs	Alfisols.
Algiers	Fine-loamy, mixed, nonacid, mesic	Aquic Udifluvents	Entisols.
Belmore	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols.
Bennington	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols.
Berks	Loamy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols.
Bogart	Fine-loamy, mixed, mesic	Aquic Hapludalfs	Alfisols.
Canfield	Fine-loamy, mixed, mesic	Aquic Fragiudalfs	Alfisols.
Cardington	Fine, illitic, mesic	Aquic Hapludalfs	Alfisols.
Carlisle	Euic, mesic	Typic Medisaprists	Histosols.
Chili	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols.
Condit	Fine, illitic, mesic	Typic Ochraqualfs	Alfisols.
Conotton	Loamy-skeletal, mixed, mesic	Typic Hapludalfs	Alfisols.
Digby	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Fitchville	Fine-silty, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Fitchville, gravelly subsoil variant	Fine-silty, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Frenchtown	Fine-loamy, mixed, mesic	Typic Fragiaqualfs	Alfisols.
Glenford	Fine-silty, mixed, mesic	Aquic Hapludalfs	Alfisols.
Gresham	Fine-loamy, mixed, mesic	Aeric Fragiaqualfs	Alfisols.
Haney	Fine-loamy, mixed, mesic	Aquic Hapludalfs	Alfisols.
Hanover	Fine-loamy, mixed, mesic	Typic Fragiudults	Ultisols.
Holly	Fine-loamy, mixed, nonacid, mesic	Typic Fluvaquents	Entisols.
Landes	Coarse-loamy, mixed, mesic	Fluventic Hapludolls	Mollisols.
Latham	Clayey, mixed, mesic	Aquic Hapludults	Ultisols.
Linwood	Loamy, mixed, euic, mesic	Terric Medisaprists	Histosols.
Lobdell	Fine-loamy, mixed, mesic	Fluvaquentic Eutrochrepts	Inceptisols.
Lordstown	Coarse-loamy, mixed, mesic	Typic Dystrochrepts	Inceptisols.
Loudonville	Fine-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols.
Luray	Fine-silty, mixed, mesic	Typic Argiaquolls	Mollisols.
Mentor	Fine-silty, mixed, mesic	Typic Hapludalfs	Alfisols.
Orrville, moderately shallow variant	Loamy-skeletal, mixed, nonacid, mesic	Aeric Fluvaquents	Entisols.
Pewamo	Fine, mixed, mesic	Typic Argiaquolls	Mollisols.
Ravenna	Fine-loamy, mixed, mesic	Aeric Fragiaqualfs	Alfisols.
Rittman	Fine-loamy, mixed, mesic	Aquic Fragiudalfs	Alfisols.
Schaffenaker	Mesic, coated	Typic Quartzipsamments	Entisols.
Sebring	Fine-silty, mixed, mesic	Typic Ochraqualfs	Alfisols.
Shoals	Fine-loamy, mixed, nonacid, mesic	Aeric Fluvaquents	Entisols.
Shoals, coarse subsoil variant	Sandy-skeletal, mixed, calcareous, mesic	Aeric Fluvaquents	Entisols.
Sloan	Fine-loamy, mixed, mesic	Fluvaquentic Haplaquolls	Mollisols.
Tiro	Fine-silty, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Titusville	Fine-loamy, mixed, mesic	Aquic Fragiudalfs	Alfisols.
Wadsworth	Fine-silty, mixed, mesic	Aeric Fragiaqualfs	Alfisols.
Wallkill	Fine-loamy, mixed, nonacid, mesic	Thapto-Histic Fluvaquents	Entisols.
Wheeling	Fine-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols.
Wooster	Fine-loamy, mixed, mesic	Typic Fragiudalfs	Alfisols.

with basic rocks, 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 Haplaquents (*Hapl,* meaning simple horizons, *aqu* for wetness or water, and *ent,* from Entisols).

SUBGROUPS. Great groups are subdivided into subgroups, one representing the central (typic) segment of the group, and others called intergrades that have properties of the group and also one or more properties of another great group, suborder, or order. Subgroups may also be made in those instances where soil properties intergrade outside of the range of any other great group, suborder, or order. The names of subgroups are derived by placing one or more adjectives before the name of the great group. An example is Typic Haplaquents (a typical Haplaquent).

FAMILIES. 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 (see table 8). An example is the coarse-loamy, mixed, mesic, family of Typic Dystrochrepts.

Laboratory Test Data

Laboratory test data are given in table 9 for 10 soils in Richland County. These data are based on the representative profiles of the series described in the section "Descriptions of the Soils," except for the Canfield and Wadsworth soils. The profiles of these two soils that were sampled for test data are within the range of the series but are somewhat siltier than is typical of these series in the county, and the siltier profiles are described in this section. Data in table 9 were obtained by laboratory analyses at the Agronomy Department, Ohio Agricultural Research and Development Center (OARDC), Columbus, Ohio. The soils analyzed were selected to add to the knowledge of Ohio soils and to aid in their proper classification.

Published and unpublished laboratory data are available for nearly all the soil series in Richland County. Published data are available in the published soil surveys of nearby counties. Unpublished data are on file at the Agronomy Department, OARDC; the Ohio Department of Natural Resources, Division of Lands and Soil; and the Soil Conservation Service State Office; all at Columbus, Ohio.

The following paragraphs outline some of the procedures used to obtain the data presented in table 9.

Particle-size distribution was obtained by the pipette method (*11*), but using sodium hexametaphosphate as the dispersing agent and a 10-gram soil sample. The sand fractions were determined by sieving. The fine silt and coarse clay, 20 microns to 0.2 microns, were determined by sedimentation, and the fine clay, less than 0.2 microns, by sedimentation in a centrifuge. Coarse silt was obtained by subtracting sand, fine silt, and clay from the total sample. The percentage of organic matter was determined by a dry combustion method.

Extractable bases were extracted with a neutral solution of ammonium acetate. The extractable potassium in this solution was determined with a flame photometer (*7*). Extractable calcium and magnesium in this solution were determined by the EDTA titration method (*3*). Extractable hydrogen, which also includes titratable aluminum, was determined by the triethanolamine method (*7*), and cation exchange capacity by the summation of extractable cations. Calcium carbonate equivalent was determined titrimetrically (*8*).

CANFIELD SERIES

Profile of gently sloping Canfield silt loam, in a wooded area, sec. 1, Springfield Township, sample number RC-7; sample data are within the defined range of the Canfield series, but the profile has a somewhat higher content of silt throughout than is typical for the series in the county:

A1—0 to 3 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, fine, granular structure; friable; many roots as much as 2 inches in diameter; 5 percent pebbles ⅛ inch to 2 inches in diameter; medium acid; clear, wavy boundary.

B1—3 to 8 inches, brown (10YR 4/3) silt loam; weak, coarse, subangular blocky structure; friable; many roots; 20 percent coarse fragments 1 inch to 3 inches in diameter; tongues of A1 horizon material; strongly acid; clear, wavy boundary.

B2t—8 to 26 inches, yellowish-brown (10YR 5/4) loam; common, fine, faint mottles of yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) and few, medium, distinct mottles of yellowish red (5YR 5/6); moderate, medium, subangular blocky structure; firm, discontinuous, thin, brown (10YR 5/3) clay films on ped faces; 20 percent, by volume, angular sandstone fragments as much as 6 inches in diameter and 1 inch in thickness; many roots of all sizes; very strongly acid; clear, smooth boundary.

Bx1—26 to 32 inches, yellowish-brown (10YR 5/6) silt loam; many, coarse, faint mottles of yellowish brown (10YR 5/4) and common, medium, distinct mottles of grayish brown (10YR 5/2); weak, very coarse (6 inches), prismatic structure that breaks to weak, medium, platy structure; very firm, brittle, pale-brown (10YR 6/3), grainy silt coatings, nearly continuous on horizontal ped faces, patchy on vertical ped faces; thin, patchy, grayish-brown (10YR 5/2) clay films on vertical faces not covered by silt coating; fine roots, fairly well distributed; 10 percent angular gravel; very strongly acid; gradual boundary.

Bx2—32 to 42 inches, yellowish-brown (10YR 5/4) silt loam; few, fine, faint mottles of yellowish brown (10YR 5/6) and common, medium, distinct mottles of light brownish gray (10YR 6/2); moderate, very coarse (4 to 6 inches), prismatic structure that breaks to moderate, medium, platy structure; very firm, brittle; thick, continuous, grayish-brown (10YR 5/2) clay films on prism faces, on which is superimposed a network of fine, dark-brown (7.5YR 3/2) root channels; roots concentrated between peds; common, medium, distinct, very dark grayish-brown (10YR 3/2) manganese concretions; 5 percent gravel; strongly acid; clear, irregular boundary.

B3—42 to 60 inches, dark yellowish-brown (10YR 4/4) silt loam; common, medium, distinct mottles of light brownish gray (10YR 6/2) and common, fine, faint mottles of yellowish brown (10YR 5/6); very weak, coarse, prismatic structure that breaks to weak, thin, platy structure; firm; continuous, brown (10YR 4/3) clay films, in which is imbedded a fibrous pattern of very dark brown (10YR 2/2) organic stains on prism faces; few roots; 5 percent gravel; slightly acid; clear, smooth boundary.

C—60 to 70 inches+, yellowish-brown (10YR 5/4) loam; common, medium, faint mottles of light brownish gray (10YR 6/2) and few, fine, faint mottles of yellowish brown (10YR 5/6); massive; firm; 5 percent pebbles; weakly calcareous, mildly alkaline.

WADSWORTH SERIES

Profile of nearly level Wadsworth silt loam, in a cultivated field, sec. 11, Madison Township, sample number RC-22; sample data are within the defined range for those in the Wadsworth series, but the content of silt is somewhat higher throughout much of the profile than is typical for the series in the county.

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, crumb structure; friable; 2 percent coarse fragments; abundant roots; medium acid; abrupt, smooth boundary.

B1—8 to 11 inches, brown (10YR 5/3) silt loam; common, medium, faint mottles of grayish brown (10YR 5/2) and few, fine, distinct mottles of yellowish brown (10YR 5/6); weak, fine, subangular blocky structure; friable; 5 percent coarse fragments; very strongly acid; clear wavy boundary.

B2t—11 to 20 inches, yellowish-brown (10YR 5/6) silty clay loam; common, medium, distinct mottles of gray (10YR 5/1) and common, coarse, faint mottles of yellowish brown (10YR 5/4); moderate, medium, subangular blocky structure; firm; continuous, grayish-brown (10YR 5/2) clay films and patches of gray (10YR 5/1) and brown (10YR 5/3) on ped faces; few, light brownish-gray (10YR 6/2), degradational silt coatings in upper part of horizon; 5 percent coarse fragments; extremely acid; clear, smooth boundary.

Bx1—20 to 26 inches, yellowish-brown (10YR 5/6) silty clay loam; common, coarse, distinct mottles of gray (10YR 5/1) and grayish brown (10YR 5/2) and common, medium, distinct mottles of dark gray (10YR 4/1); moderate, medium, prismatic structure that parts to weak, fine, subangular blocky structure; very firm, brittle; thick, continuous grayish-brown (10YR 5/2) clay films and patches of light brownish gray (10YR 6/2) and brown (10YR 5/3) on prism faces; 5 percent coarse fragments; very strongly acid; diffuse, wavy boundary.

Bx2—26 to 36 inches, yellowish-brown (10YR 5/4) clay loam; common, medium, faint mottles of yellowish brown (10YR 5/6) and common, medium, distinct, mottles of gray (10YR 5/1) and grayish brown (10YR 5/2); 2-inch to 4-inch polygonal structure that parts to weak, thick, platy structure; very firm, brittle; thick, gray (10YR 5/1) clay coatings on polygon faces; common very dark brown (10YR 2/2) manganese concretions; 8 percent coarse fragments; very strongly acid; clear, wavy boundary.

B3—36 to 53 inches, yellowish-brown (10YR 5/4) light clay loam; common, medium, distinct mottles of yellowish brown (10YR 5/6) and gray (10YR 5/1); massive, except for widely spaced vertical cleavage faces with gray (10YR 5/1) coatings; firm; 8 percent coarse fragments; slightly acid; clear, irregular boundary.

C—53 to 63 inches, yellowish-brown (10YR 5/4) silt loam; common, medium, distinct mottles of yellowish brown (10YR 5/6) and gray (10YR 5/1); massive; firm; 10 percent coarse fragments, including some unweathered sandstone fragments; calcareous, mildly alkaline.

General Nature of the County

This section contains some information of historical interest about the county; some statistics about farming and other land use; and information about industry, community facilities, physiography, and climate.

The area that is now Richland County was originally inhabited by several tribes of Indians (*5*). Among these tribes were the Wyandotte and Huron in the north, the Ottawa and Delaware in the southeast, and the Shawnee in the southwest.

Early settlers came to the county from Pennsylvania, New York, New England, Virginia, and Maryland. Mansfield was settled about 1808.

This county was first a part of Wayne County, then a part of Fairfield County. Richland County was formed by the Ohio legislature in 1813, and assumed its present boundaries in 1849 (*4*). It was named for the fertility of its land. The population was 9,179 in 1820, 30,879 in 1850, 44,289 in 1900, and 129,997 in 1970.

Farming

In 1969 the value of farm products sold from the county was substantial, but it was less than that of most surrounding counties, most of which are smaller than Richland County. Farming accounts for only about 3 percent of the total income of the county. Many farmers have off-farm jobs in Mansfield and Shelby.

According to the U.S. Census of Agriculture, there were 1,475 farms in Richland County in 1969. The average size of farms was 135 acres, including the many smaller farms worked part time, as well as the much larger commercial farms.

Dairy farming predominates in the southern part of the county, but a few dairy farms are in other areas. The sale of dairy products accounted for 26 percent of the farm income in 1969.

Cash grain and general farming predominate in the northern and western parts of the county. Corn, soybeans, wheat, and oats are the main crops. Soybeans and some of the corn are sold for cash. The rest of the corn and most of the small grain are fed to beef cattle and hogs.

Farmland is being converted to other uses in two areas of the county. The area around Mansfield is being used for residential and industrial purposes. In the southeastern part of the county, most of the land taken out of farming is being used for recreation, wildlife habitat, or forestry.

Transportation

The Penn Central, Erie-Lackawanna, and Baltimore and Ohio Railroads provide freight service to Mansfield, Shelby, Shiloh, and other towns of the county.

Interstate Highway No. 71, the main link between Cleveland and Columbus, passes through Richland County and provides access to most of the central part. Other main highways in the county are U.S. Route No. 30, Route No. 13, and Route No. 39.

Mansfield Municipal Airport offers complete service, including regularly scheduled passenger flights. A small airport at Shelby offers charter and freight service. Another airport is located at Galion.

Industrial, Cultural, and Recreational Facilities

Mansfield, the county seat and largest city, had a population of 53,610 in 1970. A concentrated population is also present in unincorporated areas adjacent to Mansfield. Mansfield is an industrial city. Steel, pumps, household appliances, tires, and auto bodies are among the products of the city's factories. Shelby, the county's second largest city, had a population of 9,864 in 1970. Its largest industrial firm produces steel tubing. Shelby is also an important farm trading center. The other towns in the county are local trading centers and places of residence for city workers.

Complete high school facilities are available in all parts of the county. Technical and vocational education are offered at the high school and college levels. A branch of Ohio State University is located at Mansfield and provides 2 years of college courses. There is a Roman Catholic seminary between Mansfield and Shelby.

Malabar Farm, the home of author-conservationist Louis Bromfield, is in Monroe Township, and continues to be a tourist attraction. Kingwood Center in Mansfield is an outstanding botanical garden. Parts of three

TABLE 9.—*Laboratory*

[Analyses made by 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 to 0.05 mm)	Silt (0.05 to 0.002 mm)
		Inches	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Bennington silt loam, RC–23	Ap	0–6	1.0	3.0	2.8	6.9	7.5	21.2	60.7
	B1	6–9	3.2	5.0	3.0	7.4	7.7	27.0	54.4
	B21t	9–14	1.0	2.4	2.3	6.2	6.3	18.2	48.6
	B22t	14–22	1.2	2.5	2.3	6.4	6.0	18.4	44.7
	B23t	22–29	1.2	2.5	2.1	6.6	6.4	18.8	45.3
	B3	29–36	1.3	2.7	2.3	6.8	6.4	19.5	48.0
	C1	36–56	2.1	4.7	3.2	7.1	6.9	24.0	48.8
	C2	56–76	3.4	5.4	4.2	9.8	8.4	31.2	47.9
	C3	82–96	3.5	4.4	3.4	9.2	7.9	28.4	46.8
Canfield silt loam, RC–7	A1	0–3	1.9	3.3	2.7	7.6	9.1	24.6	59.1
	B1	3–8	2.2	4.5	3.4	8.2	9.8	28.1	56.9
	B2t	8–26	1.2	3.0	2.3	9.1	14.3	29.9	49.4
	Bx1	26–32	.6	1.3	1.5	8.6	12.4	24.4	52.1
	Bx2	32–42	.9	1.8	1.9	7.9	9.5	22.0	51.4
	B3	42–60	1.4	2.0	1.9	7.6	9.2	22.1	52.7
	C	60–70	1.4	2.7	2.9	10.5	10.6	28.1	49.6
Cardington silt loam, RC–9	Ap	0–8	1.3	1.8	1.8	5.3	6.8	17.0	63.2
	B1	8–15	1.4	2.2	2.0	5.2	5.6	16.4	57.3
	B21t	15–25	1.7	2.1	1.9	4.9	5.8	16.4	53.3
	B22t	25–34	1.9	3.0	2.4	6.6	6.9	20.8	40.5
	C	34–60	2.8	3.8	2.8	7.5	7.8	24.7	45.3
Hanover silt loam, RC–18	Ap	0–7	1.9	4.0	4.4	13.6	6.8	30.7	53.8
	B1	7–10	1.6	3.6	3.9	12.4	7.2	28.7	52.2
	B2t	10–22	2.7	4.5	5.4	17.1	8.6	38.3	37.0
	Bx1	22–34	2.7	5.2	6.8	22.5	8.9	46.1	30.2
	Bx2	34–48	3.0	4.5	6.1	24.5	9.2	47.3	31.2
	Bx3	48–60	2.5	5.5	6.9	24.3	9.5	48.7	31.1
	Bx4	60–72	2.3	4.3	5.8	22.9	9.6	44.9	34.0
	C	72–76	2.4	4.5	4.6	15.0	16.5	43.0	36.5
Lordstown silt loam, RC–13	A1	0–2	1.4	3.9	6.5	7.0	16.0	34.8	53.5
	B21	2–12	1.8	3.5	7.2	7.4	15.9	35.8	52.6
	B22	12–24	2.0	3.3	5.6	6.7	18.7	36.3	52.1
	C	24–36	2.6	1.7	1.2	3.9	40.1	49.5	37.7
Loudonville silt loam, RC–12	A1	0–3	1.4	1.9	2.2	11.8	7.0	24.3	58.5
	A2	3–7	1.3	2.3	2.6	13.2	7.7	27.1	58.8
	B21t	7–14	1.6	2.0	1.9	7.9	6.1	19.5	57.5
	B22t	14–26	1.5	2.1	2.5	13.1	8.4	27.6	42.8
	IIC1	26–31	.3	.9	6.1	55.2	6.3	68.8	16.0
	IIC2	31–38	.9	4.0	10.3	61.3	6.2	82.7	7.3
Schaffenaker sand, RC–14	A1	0–4	2.3	51.1	31.4	4.4	.9	90.1	6.0
	A&B	4–10	2.3	46.8	33.8	5.3	.9	89.1	7.7
	B2	10–20	4.5	49.3	30.0	4.3	.6	88.7	8.4
	B3	20–28	4.9	50.9	32.5	4.4	.4	93.1	5.0
Titusville silt loam, RC–25	Ap	0–7	1.1	3.0	3.2	10.8	6.4	24.5	57.9
	B1	7–11	.6	1.9	2.3	8.1	4.5	17.4	55.4
	B21t	11–16	1.8	2.8	3.1	11.4	5.3	24.3	44.6
	B22t	16–21	2.2	3.3	3.7	15.8	6.9	31.9	36.5
	Bx1	21–34	1.7	2.7	4.4	20.7	11.5	41.0	34.6
	Bx2	34–45	1.3	2.6	3.5	12.7	13.8	33.9	46.2
	B31	45–52	1.8	2.9	3.9	16.2	15.2	40.0	39.6
	B32	52–60	1.1	2.4	3.7	16.5	17.1	40.8	38.9
	C1	60–68	1.4	2.6	3.7	16.7	15.2	39.6	38.7
	C2	68–81	4.4	3.1	3.6	15.8	14.6	41.5	38.5

test data

Center, Columbus, Ohio. Absence of an entry indicates that no determination was made]

Particle-size distribution—cont.		Textural class	Reaction (1:1 soil water ratio)	Organic matter	Calcium carbonate equivalent	Extractable cations (milliequivalents per 100 grams of soil)				Sum of extractable cations	Sum of bases	Base saturation (sum)
Clay (less than 0.002 mm)	Fine clay (less than 0.0002 mm)					Hydrogen	Calcium	Magnesium	Potassium			
Percent	*Percent*		*pH*	*Percent*	*Percent*							*Percent*
18.1	2.9	Silt loam	5.3	2.7		11.2	3.3	1.1	0.25	15.8	4.6	29
18.6	3.8	Silt loam	5.3	1.0		8.0	3.5	1.4	.20	13.1	5.1	39
33.2	10.2	Silty clay loam	4.7	.8		12.1	5.6	1.7	.27	19.7	7.6	38
36.9	13.2	Silty clay loam	4.6	.8		11.3	7.5	2.4	.28	21.5	10.2	47
35.9	12.5	Silty clay loam	5.9	1.0		5.3	10.9	2.9	.28	19.4	14.1	73
32.5	10.1	Silty clay loam	7.3		8.3							
27.2	7.1	Clay loam	7.7		20.1							
20.9	5.6	Loam	7.8		18.8							
24.8	6.1	Loam	7.8		14.8							
16.3	4.0	Silt loam	5.6	5.3		11.3	7.4	1.6	.41	20.7	9.4	45
15.0	2.8	Silt loam	5.1	.7		7.3	1.9	.5	.10	9.8	2.5	26
20.7	8.2	Loam	4.8	.5		9.3	2.2	1.1	.14	12.7	3.4	27
23.5	10.0	Silt loam	4.8	.5		8.6	3.1	1.4	.14	13.2	4.6	35
26.6	9.9	Silt loam	5.3	.5		7.5	6.8	2.2	.11	16.6	9.1	55
25.2	8.5	Silt loam	6.1	.7		3.2	7.6	2.4	.18	13.4	10.2	76
22.3	6.7	Loam	7.6		6.4							
19.8	4.2	Silt loam	6.8	5.1		11.5	6.4	1.0	.51	19.4	7.9	41
26.3	7.3	Silt loam	4.5	1.0		14.6	2.3	.9	.22	18.0	3.4	19
30.3	9.3	Silty clay loam	4.5	.8		15.8	2.2	1.8	.22	20.0	4.2	21
38.7	16.2	Clay loam to silty clay loam.	5.3	1.0		10.2	10.0	3.5	.30	24.0	13.8	58
30.0	10.3	Clay loam	7.6		13.2							
15.5	2.8	Silt loam	6.0	2.4		6.4	4.6	1.1	.60	12.7	6.3	50
19.1	5.4	Silt loam	6.2	.8		4.7	4.1	1.6	.28	10.7	6.0	56
24.7	10.5	Loam	6.1	.7		4.9	5.7	1.8	.24	12.6	7.7	61
23.7	10.9	Loam	5.6	.3		5.7	4.9	2.0	.29	12.9	7.2	56
21.5	8.4	Loam	4.8	.3		7.8	1.6	2.3	.21	11.9	4.1	34
20.2	6.4	Loam	4.8	.3		8.4	1.7	1.9	.33	12.3	3.9	32
21.1	5.8	Loam	4.8	.3		6.4	1.9	2.4	.30	11.0	4.6	42
20.5	6.1	Loam	4.8	.3		5.1	1.8	2.2	.34	9.4	4.3	46
11.7	3.4	Silt loam	4.4	10.0		22.9	2.5	.8	.32	26.5	3.6	14
11.6	1.9	Silt loam	4.5	1.4		6.9	.1	.3	.20	7.5	.6	8
11.6	2.1	Silt loam	4.6	.5		4.2	.1	.4	.18	4.9	.7	14
12.8	3.2	Loam	4.7	.3		5.2	.8	1.1	.18	7.3	2.1	29
17.2	4.4	Silt loam	6.0	4.8		9.1	7.2	2.4	.86	19.6	10.5	53
14.1	1.7	Silt loam	5.0	2.0		8.4	1.5	.9	.55	11.3	2.9	26
23.0	5.8	Silt loam	5.1	1.0		7.0	2.8	1.6	.47	11.9	4.9	41
29.6	12.8	Clay loam	5.1	.5		8.4	3.3	2.2	.37	14.3	5.9	41
15.2	6.1	Fine sandy loam	4.9	.3		3.6	1.4	1.5	.21	6.7	3.1	46
10.0	4.0	Loamy fine sand	5.0	.2		3.7	1.1	1.2	.17	6.2	2.5	40
3.9	1.2	Sand	4.0	4.1		11.1	.1	.3	.09	11.6	.5	4
3.2	.8	Sand	4.6	.5		4.5	.1	.2	.06	4.9	.4	8
2.9	.6	Sand	4.7	.5		3.3	.1	.3	.07	3.8	.5	13
1.9	.6	Sand	4.9	.3		2.7	.1	.2	.04	3.0	.3	10
17.6	5.1	Silt loam	4.6	1.9		5.4	1.7	.7	.26	8.1	2.7	33
27.2	11.4	Silty clay loam	4.8	.5		10.9	2.9	1.2	.27	15.3	4.4	29
31.0	13.5	Clay loam	5.3	.5		12.8	2.8	1.3	.36	17.3	4.5	26
31.6	13.2	Clay loam	4.7	.3		12.1	2.1	1.8	.32	16.3	4.2	26
24.4	9.7	Loam	4.8	.2		9.2	1.4	1.0	.26	11.9	2.7	23
19.9	7.6	Loam	4.8	.2		9.6	1.3	1.4	.21	12.5	2.9	23
20.4	6.9	Loam	4.8	.2		6.7	1.8	2.0	.21	10.7	4.0	37
20.3	7.7	Loam	5.2	.2		6.0	2.4	2.4	.19	11.0	5.0	45
21.7	7.6	Loam	5.2	.3		4.0	3.8	3.4	.20	11.4	7.4	65
20.0	6.9	Loam	6.1	.3		4.0	4.6	3.4	.19	12.2	8.2	67

TABLE 9.—*Laboratory*

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 to 0.05 mm)	Silt (0.05 to 0.002 mm)
		Inches	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Wadsworth silt loam, RC–22	Ap	0–8	.7	1.9	1.8	5.3	6.1	15.8	66.5
	B1	8–11	1.5	2.6	2.2	7.5	6.6	20.4	59.2
	B2t	11–20	.3	1.1	1.1	3.0	3.4	8.9	59.2
	Bx1	20–26	.6	1.4	1.5	4.5	5.8	13.8	54.5
	Bx2	26–36	1.3	2.8	3.4	10.1	7.9	25.5	42.5
	B3	36–53	1.7	2.7	2.3	8.6	9.4	24.7	47.5
	C	53–63	2.1	2.8	2.2	9.2	10.5	26.8	50.6
Wheeling silt loam, RC–24	Ap	0–8	.5	1.7	2.2	6.4	10.6	21.4	65.7
	B1	8–11	.2	.8	1.2	3.7	8.0	13.9	67.7
	B21t	11–18	.3	.9	1.3	4.1	9.0	15.6	60.1
	B22t	18–28	1.7	3.2	3.4	8.1	12.5	28.6	43.9
	IIB23t	28–36	12.0	17.3	12.5	14.5	8.4	64.7	16.0
	IIC1	36–60	8.8	20.1	16.5	19.7	11.1	76.2	13.7

large artificial lakes—Pleasant Hill, Charles Mill, and Clear Fork reservoirs—are important centers for water sports and recreation.

Physiography, Relief, and Drainage

Richland County is a county of contrasts. The northern part is a till plain that has low to moderate relief. Glaciers leveled the bedrock hills and filled the valleys in this part of the county. The soils formed in material laid down by the glaciers or in material deposited in shallow lakes that existed after the glaciers melted. Slopes are gentle in this part of the county, and many areas require artificial drainage for crops.

Farther south the glaciers thinned out, and their leveling effect is less pronounced. Compared with the soils in the northern part of the county, the soils contain more material weathered from the underlying bedrock and less transported glacial material. The slope is steeper, and the depth to rock is shallower. Some hills in the southern part of the county show little evidence of glaciation. The soils are better drained, and erosion control, rather than drainage, is the chief management concern. Valleys in the southern part of the county received a large volume of glacial melt water, and extensive gravel deposits were laid down by this swiftly flowing water.

The highest elevation, 1,505 feet, is on a hilltop southwest of Mansfield in Springfield Township. The lowest point, about 980 feet, is where the Black Fork leaves the county.

Most of the county is drained by the Black Fork, Clear Fork, and Muddy Fork of the Mohican River and their tributaries. The Mohican River is part of the Muskinghum watershed, and water draining into it eventually reaches the Gulf of Mexico via the Ohio River and the Mississippi River. A strip 1 to 3 miles wide along the northern edge of the county drains northward through the Vermillion River and the Huron River to Lake Erie. Water draining this way goes to the Atlantic via the St. Lawrence River.

The drainage afforded by natural streams is adequate in much of the county, but a network of artificial drainageways is needed in some of the more nearly level areas, particularly in the northwestern part of the county.

Land Use

The total land area of Richland County is 318,080 acres. According to the conservation needs inventory made in 1967 (*6*), 280,774 acres was classed as rural land. The remaining 37,306 acres was in urban use, in small water areas, and in other inextensive uses. A similar inventory in 1958 showed 291,040 acres of rural land in the county. Therefore, between 1958 and 1967 a total of 10,266 acres was removed from rural land use.

The 1967 inventory also showed 157,540 acres in crops, 34,363 acres in permanent pasture, 70,759 acres in forest, and 18,112 acres in other rural uses. Capabilities of the soils have been determined for all of these land uses. The local office of the Soil Conservation Service can provide detailed information about acreage, capabilities, farming practices, and treatment needed for all soils in the county.

Climate[5]

The climate of Richland County is marked by a wide range in annual, daily, and day-to-day temperature, as shown in table 10. Summer is moderately warm and humid and has an average of only 10 days in which the temperature is 90° F. or higher. Winter is reason-

[5] By MARVIN E. MILLER, climatologist for Ohio, National Weather Service, U.S. Department of Commerce.

test data—continued

Particle-size distribution—Cont.		Textural class	Reaction (1:1 soil water ratio)	Organic matter	Calcium carbonate equivalent	Extractable cations (milliequivalents per 100 grams of soil)				Sum of extractable cations	Sum of bases	Base saturation (sum)
Clay (less than 0.002 mm)	Fine clay (less than 0.0002 mm)					Hydrogen	Calcium	Magnesium	Potassium			
Percent	*Percent*		*pH*	*Percent*	*Percent*							*Percent*
17.7	3.3	Silt loam	5.6	2.9		9.0	4.6	1.4	.20	15.2	6.2	41
20.4	4.9	Silt loam	4.9	.7		7.7	2.1	1.2	.17	11.2	3.5	31
31.9	13.2	Silty clay loam	4.4	.7		11.6	3.9	2.7	.32	18.5	6.9	37
31.7	15.3	Silty clay loam	4.5	.5		11.1	5.5	3.7	.35	20.6	9.5	46
32.0	14.2	Clay loam	4.8	.5		9.1	6.4	4.2	.33	20.0	10.9	55
27.8	8.5	Clay loam	6.2	.8		3.3	6.8	3.8	.21	14.1	10.8	77
22.6	6.8	Silt loam	7.4		5.5							
12.9	2.9	Silt loam	7.1	1.9	4	4.3	4.9	1.3	.24	10.7	6.4	60
18.4	5.1	Silt loam	6.6	1.0		5.7	5.2	2.0	.21	13.1	7.4	57
24.3	10.8	Silt loam	4.6	.7		10.2	3.6	1.8	.26	15.9	5.7	36
27.2	15.6	Clay loam	4.8	.5		12.5	4.5	1.7	.32	19.0	6.5	34
19.3	10.9	Sandy loam	4.8	.5		9.9	3.1	1.6	.27	14.9	5.0	33
10.1	4.6	Sandy loam	5.5	.3		4.0	3.2	1.9	.15	9.2	5.2	57

ably cold and cloudy and has an average of 5 days in which the temperature is below 0°. Weather changes occur every few days as a result of passing cold or warm fronts and their associated centers of high and low pressure. Average extreme annual temperatures given in table 10 differ from those in any month because the annual extremes in temperature do not occur in the same month each year. Inasmuch as the terrain of Richland County is rolling the dates of occurrence of selected spring and fall temperatures are likely to vary from those dates shown in table 11. Valleys generally have the latest spring and earliest fall freezes, because on nights when skies are clear and winds are light, cool air drains down the slopes into the valleys.

During most summer days afternoon relative humidity ranges from 50 to 60 percent. For the year, the average relative humidity is about 80 percent at 1 a.m. and 7 a.m., 60 percent at 1 p.m., and 65 percent at 7 p.m. Cloudiness is greatest in winter and least in summer. The annual average number of clear days (less than $\frac{4}{10}$ sky cover) is 70; partly cloudy days (between $\frac{3}{10}$ and $\frac{8}{10}$ sky cover), 107; and cloudy days (more

TABLE 10.—*Temperature and precipitation*

[Data based on records kept at Mansfield Municipal Airport and Mansfield 6W, 1960–68]

Month	Temperature					Precipitation			
	Average daily maximum	Average daily minimum	Average highest maximum	Average lowest minimum	Average total	One year in 10 will have—		Average snowfall	Average number of days with 1 inch or more of snow
						Less than—	More than—		
	°F.	°F.	°F.	°F.	*Inches*	*Inches*	*Inches*	*Inches*	*Days*
January	36	21	55	−2	2.38	0.85	5.17	9.2	3
February	38	21	58	0	2.11	1.09	3.62	10.5	4
March	48	29	69	9	3.21	1.61	5.64	8.1	3
April	60	39	79	22	3.33	1.71	5.74	1.4	(1)
May	72	49	85	33	3.36	1.75	5.74	.1	(1)
June	82	59	91	43	3.53	1.87	5.96	0	0
July	86	63	93	49	3.51	1.89	5.86	0	0
August	85	62	92	46	3.11	1.77	5.01	0	0
September	78	55	90	36	2.46	1.10	4.67	0	0
October	66	44	81	26	1.93	.71	4.12	.1	0
November	50	33	69	14	2.20	1.09	3.90	2.2	1
December	38	24	57	0	2.03	.92	3.81	8.4	3
Year	62	42	95	−5	35.76	29.04	43.46	40.0	14

[1] Less than one-half day.

TABLE 11.—*Probability of last freezing temperature in spring and first in fall.*

[Data based on records kept at Mansfield Municipal Airport and Mansfield 6W, 1960–68]

Probability	Dates for given probability and temperature				
	20° F. or lower	24° F. or lower	28° F. or lower	32° F. or lower	36° F. or lower
Spring:					
1 year in 10 later than	April 15	April 23	May 3	May 19	June 2.
2 years in 10 later than	April 10	April 19	April 29	May 15	May 28.
5 years in 10 later than	March 30	April 7	April 20	May 4	May 17.
Fall:					
1 year in 10 earlier than	November 4	October 18	October 4	September 24	September 14.
2 years in 10 earlier than	November 8	October 22	October 8	September 28	September 17.
5 years in 10 earlier than	November 16	November 1	October 19	October 6	September 24.

than 7/10 sky cover), 188. The average wind speed is 8 miles per hour in summer and 13 miles per hour in winter. Damaging winds of 35 to 85 miles per hour occur most often in spring and summer and are associated with thundershower activity.

As is characteristic of a continental climate, precipitation in Richland County varies widely from year to year, but it is generally abundant and well distributed. Fall is the driest season. The average number of days a year having 0.01, 0.10, 0.50, and 1.00 inch or more of precipitation is 136, 77, 22 and 6 days, respectively. Thunderstorms occur on about 40 days a year and are most frequent from April through August. Heavy rains of 2.0, 2.7, 3.1, 3.7, 4.1, and 4.5 inches in 24 hours can be expected to occur at least once in 2, 5, 10, 25, 50, and 100 years, respectively. Sums of the 12 monthly 1-year-in-10 values in table 10 do not equal the annual values, because all dry and wet months do not occur in the same year.

When evaporation exceeds rainfall for long periods, a drought is likely to occur. Since 1929, extended periods of moderate to extreme drought in the central hills of Ohio, as determined from the Palmer Drought Severity Index, have occurred during the growing season in 1930, 1931, 1934, 1941, 1944, 1953, 1954, 1962, and 1963. The longest continuing period of moderate to extreme drought in the central hills was 24 months from October 1952 to September 1954.

Soil moisture goes through a seasonal cycle each year that is almost independent of the amount of precipitation received. It reaches its lowest point in October and is replenished during winter and spring when precipitation exceeds evaporation loss. Because all crops reach a maximum need of water in July and August and receive insufficient rainfall to meet those needs, there is a progressive drying of all soils.

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Glossary

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as crumbs, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Available moisture capacity (also termed available water capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the

amount at wilting point. It is commonly expressed as inches of water per inch of soil. The classes used in this survey are: *Very low,* less than 3 inches of water available above a root-restricting zone or a depth of 60 inches; *low,* 3 to 6 inches; *medium,* 6 to 9 inches; *high,* 9 to 12 inches; and *very high,* more than 12 inches.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Channery soil. A soil that contains thin, flat fragments of sandstone, limestone, or schist, as much as 6 inches long. 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.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Drainage (natural). The frequency and duration of saturation or partial saturation that existed during the formation of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low moisture-holding capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizon and have mottling in the lower B and the C horizon.

Somewhat poorly drained soils are wet for significant periods but not all the time and some poorly drained soils commonly have mottling at a depth below 6 to 16 inches.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Erosion. The wearing away of the land surface by wind (soil blowing), running water, or other geological agents.

Esker (geology). A narrow, winding ridge or mound of stratified gravelly and sandy drift that was deposited by a subglacial stream.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Fragipan. A loamy, brittle, subsurface horizon that is very low in content of organic matter and clay but rich in silt or very fine sand. The layer seems to be cemented. When dry it is hard or very hard and has a high bulk density in comparison with the horizon or horizons above it. When moist the fragipan tends to rupture suddenly if pressure is applied, rather than to deform slowly. The layer is generally mottled, is slowly or very slowly permeable to water, and has few or many bleached fracture planes that form polygons. A fragipan ranges from a few inches to several feet in thickness. It generally occurs below the B horizon, 15 to 40 inches below the surface of the soil.

Glacial lake (geology). A lake whose basin was formed by glacial action; either drift depressions, ice-scoured rock depressions, or glaciated valleys.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glacial outwash (geology). Stratified drift deposited by melt water from a glacier.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residue.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active, and it therefore is marked by the accumulation of humus. This horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Illuviation. The accumulation of material in a soil horizon through the deposition of suspended material and organic matter removed from horizons above. Since part of the fine clay in the B horizon of many soils has come from the A horizon above, the B horizon is called an illuvial horizon.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Kame (geology). An irregular, short ridge or hill of stratified glacial drift.

Lacustrine deposit (geology). Material deposited in lake water and exposed by lowering of the water level or elevation of the land.

Leaching. The removal of soluble materials from soil or other material by percolating water.

Loam. The textural class of soil that contains 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand.

Mottled, soil. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and 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: *fine,* less than 5 millimeters (about 0.2 inch) in length; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in length; and *coarse,* more than 15 millimeters (about 0.6 inch) in length.

Munsell notation. A system for designating color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with a hue of 10YR, a value of 6, and a chroma of 4.

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod, which is formed by plowing or some other disturbance of the soil.

Permeability. The quality of a soil that enables water or air to move through it. Terms used to describe permeability are: *Very slow*, less than 0.06 inch per hour; *slow*, 0.06 to 0.2 inch per hour; *moderately slow*, 0.2 to 0.63 inch per hour; *moderate*, 0.63 inch to 2.0 inches per hour; *moderately rapid*, 2.0 to 6.3 inches per hour; *rapid*, 6.3 to 12 inches per hour; and *very rapid*, more than 12 inches per hour.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Mildly alkaline	7.4 to 7.8
Very strongly acid	4.5 to 5.0	Moderately alkaline	7.9 to 8.4
Strongly acid	5.1 to 5.5	Strongly alkaline	8.5 to 9.0
Medium acid	5.6 to 6.0	Very strongly alkaline	9.1 and higher
Slightly acid	6.1 to 6.5		
Neutral	6.6 to 7.3		

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock. Only the upper part of this, modified by organisms and other soil-building forces, is regarded by soil scientists as soil. Most American engineers speak of the whole regolith, even to great depths, as "soil."

Rooting zone. The part of the soil that is penetrated, or can be penetrated by plant roots. The classes used in this survey are: *Shallow*, less than 20 inches; *moderately deep*, 20 to 40 inches; and *deep*, 40 to 60 inches.

Sand. As a soil separate, individual rock or mineral fragments in a soil that range in diameter from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that is 85 percent or more sand and not more than 10 percent clay.

Silt. As a soil separate, individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Soil separates. Mineral particles, less than 2 millimeters in diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows: *Very coarse sand* (2.0 to 1.0 millimeter); *coarse sand* (1.0 to 0.5 millimeter); *medium sand* (0.5 to 0.25 millimeter); *fine sand* (0.25 to 0.10 millimeter); *very fine sand* (0.10 to 0.05 millimeter); *silt* (0.05 to 0.002 millimeter) and *clay* (less than 0.002 millimeter). The separates recognized by the International Society of Soil Science are as follows: I (2.0 to 0.2 millimeter); II (0.2 to 0.02 millimeter); III (0.02 to 0.002 millimeters); IV (less than 0.002 millimeter).

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristics of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically, the part of the soil below the solum.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or sea. Stream terraces are frequently called second bottoms, as contrasted with flood plains, and are seldom subject to overflow. Marine terraces were deposited by a sea and are generally wide.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand*, *loamy sand*, *sandy loam*, *loam*, *silt loam*, *silt*, *sandy clay loam*, *clay loam*, *silty clay loam*, *sandy clay*, *silty clay*, and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Tilth, soil. The condition of the soil, especially its structure, in relation to the growth of plants. Good tilth refers to the friable state of the soil and is associated with high, noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Variant, soil. A soil having properties sufficiently different from those of other known soils to suggest establishing a new soil series, but a soil of such limited known area that creation of a new series is not believed to be justified.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table is separated from a lower one by a dry zone.

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