SOIL SURVEY OF

Boyd and Greenup Counties, Kentucky

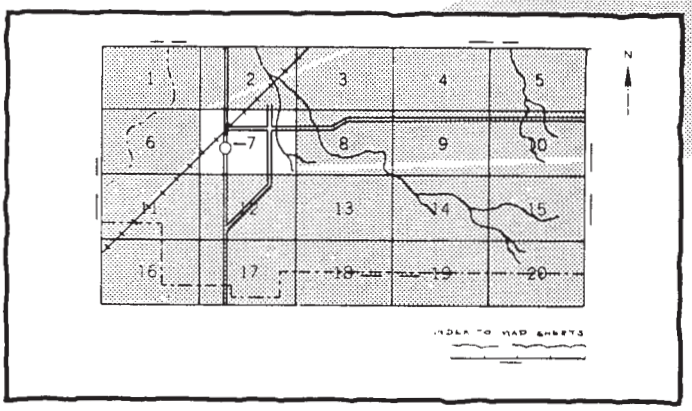
United States Department of Agriculture
Soil Conservation Service

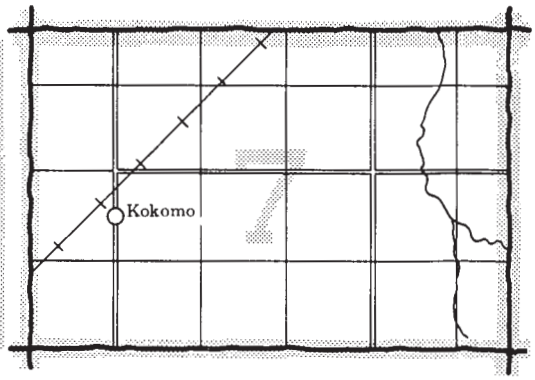
In cooperation with

Kentucky Agricultural Experiment Station

HOW TO USE

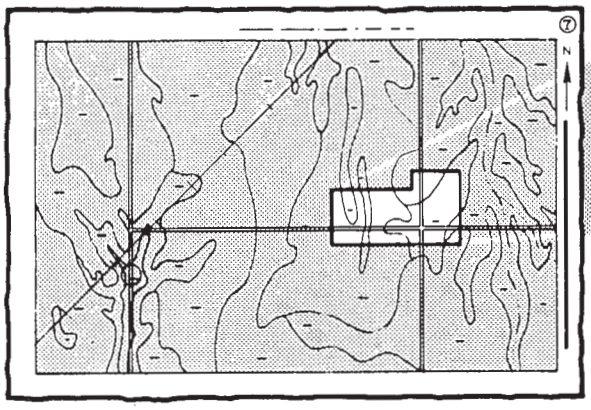
1. Locate your area of interest on the "Index to Map Sheets" (the last page of this publication).

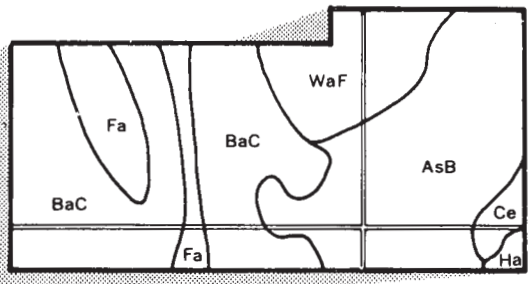




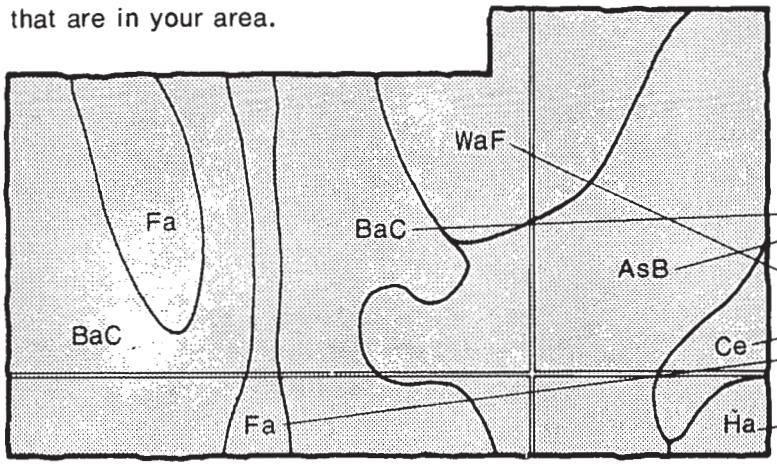
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.





4. List the map unit symbols that are in your area.

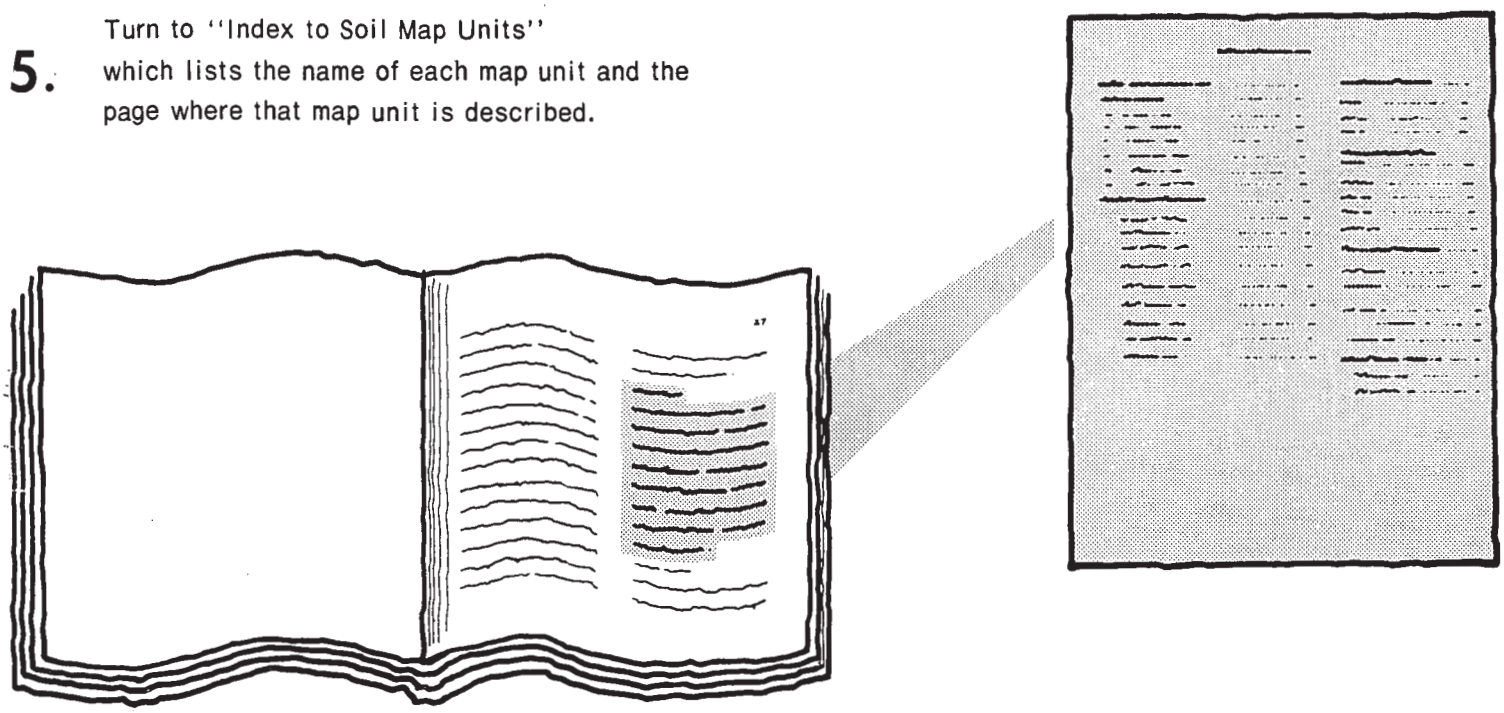


Symbols

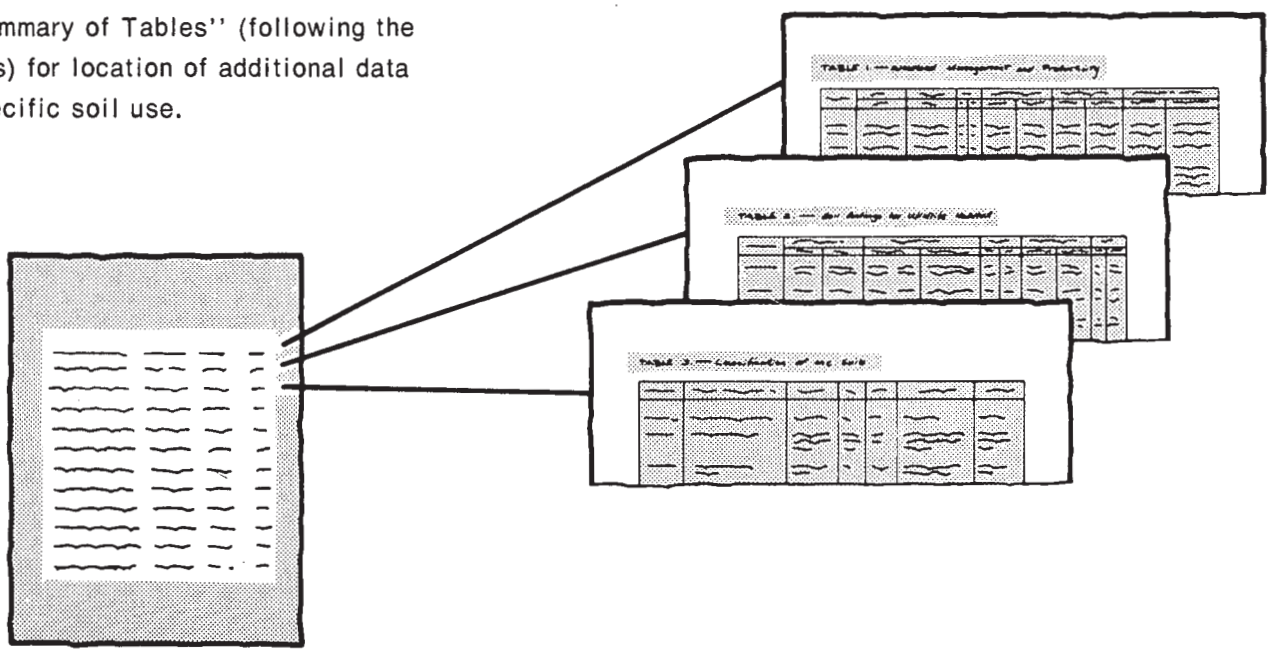
AsB
BaC
Ce
Fa
Ha
WaF

THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

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

Major fieldwork for this soil survey was completed in the period 1969-74. Soil names and descriptions were approved in 1975. Unless otherwise indicated, statements in the publication refer to conditions in the survey area in 1974. This survey was made cooperatively by the Soil Conservation Service and the Kentucky Agricultural Experiment Station. It is part of the technical assistance furnished to the Boyd County and Greenup County Conservation Districts.

Soil maps in this survey may be copied without permission, but any enlargement of these maps can cause misunderstanding of the detail of mapping and result in erroneous interpretations. Enlarged maps do not show small areas of contrasting soils that could have been shown at a larger mapping scale.

Cover: An area of Vandalia-Upshur map unit.

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Issued September 1979

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Foreword

The Soil Survey of Boyd and Greenup Counties, Kentucky, contains much information useful in any land-planning program. Of prime importance are the predictions of soil behavior for selected land uses. Also highlighted are limitations or hazards to land uses that are inherent in the soil, improvements needed to overcome these limitations, and the impact that selected land uses will have on the environment.

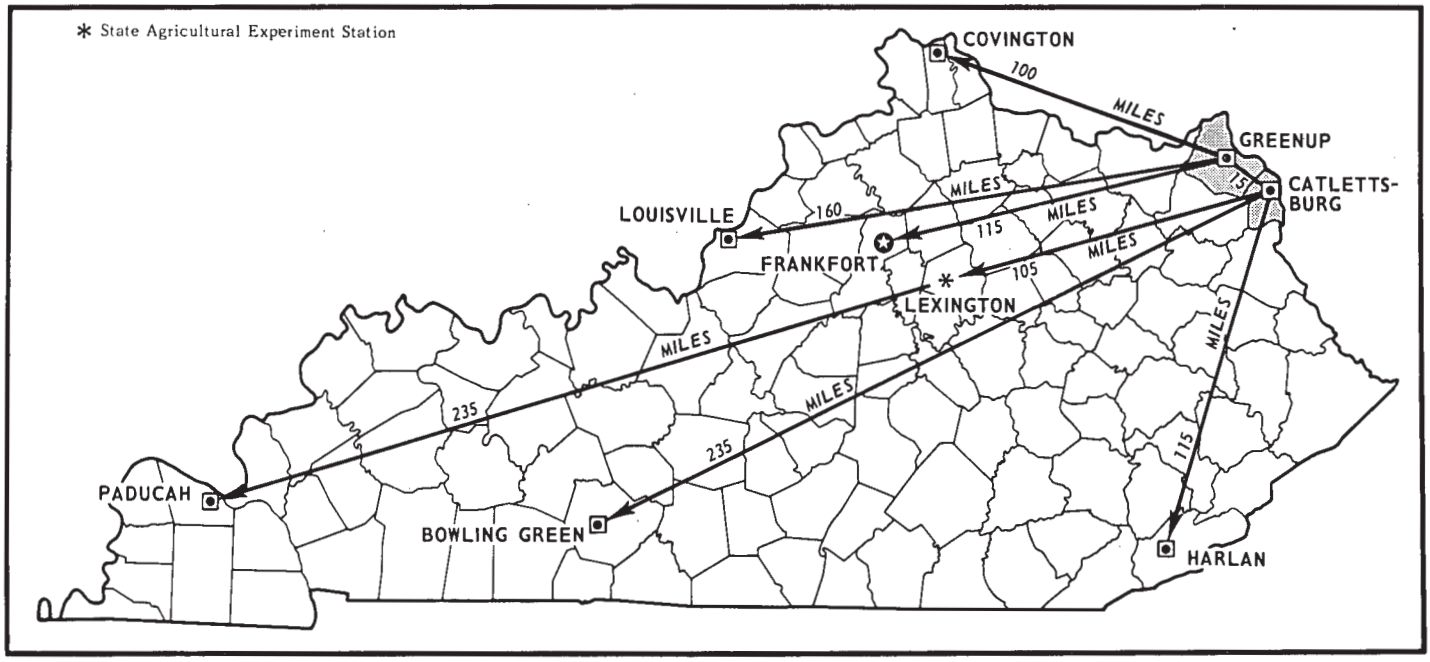
This soil survey has been prepared for many different users. Farmers, ranchers, foresters, and agronomists can use it to determine the potential of the soil and the management practices required for food and fiber production. Planners, community officials, engineers, developers, builders, and homebuyers can use it to plan land use, select sites for construction, develop soil resources, or identify any special practices that may be needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the soil survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur even within short distances. Soils may be seasonally wet or subject to flooding. They may be shallow to bedrock. They may be too unstable to be used as a foundation for buildings or roads. Very clayey or wet soils are poorly suited to septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map; the location of each kind of soil is shown on detailed soil maps. Each kind of soil in the survey area is described, and much information is given about each soil for specific uses. Additional information or assistance in using this publication can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

This soil survey can be useful in the conservation, development, and productive use of soil, water, and other resources.

Glen E. Murray
State Conservationist
Soil Conservation Service



Location of Boyd and Greenup Counties in Kentucky.

SOIL SURVEY OF BOYD AND GREENUP COUNTIES, KENTUCKY

By Carl W. Hail, Paul M. Love, and Rudy Forsythe, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service, in cooperation with the Kentucky Agricultural Experiment Station

Boyd and Greenup Counties are in the extreme northeastern part of Kentucky. The total land area of the two counties is 326,340 acres, or about 510 square miles. In 1970, according to the U.S. Bureau of Census, the total population was about 86,000.

Most of the farming in the area is done on a part-time basis, and most of the income in the two counties is derived from employment in industry and in nearby cities. Ashland is the major urban center within the survey area, and Portsmouth and Ironton, Ohio, and Huntington, West Virginia, are nearby major cities in adjoining states.

The counties are bounded by the Ohio River on the north and the Ohio and Big Sandy Rivers on the east. Boyd and Greenup Counties are part of the Mountains and Eastern Coalfields Physiographic Region. Most of the soils formed in material weathered from acid shale, sandstone, and siltstone, and minor amounts formed from calcareous shales.

Farming is mostly limited to the valleys. Some of the hills are used for grazing, but the grazing area consists mostly of unimproved pasture that is low in production. Most of the side slopes are steep and are more suited to woodland than to other uses.

General nature of the area

This section provides general information about Boyd and Greenup Counties. It briefly discusses climate and geology, relief, and drainage.

Climate

Data for this section were obtained from the National Climatic Center, Asheville, North Carolina.

Winters are cold and snowy in Boyd and Greenup Counties, but intermittent thaws preclude a long-lasting snow cover. Summers are warm with occasional very hot days. Rainfall is evenly distributed during the year, but it is slightly heavier on the windward, west-facing slopes than in the valleys. Average annual precipitation is adequate for all crops.

Table 1 gives data on temperature and precipitation for the survey area, as recorded at Ashland, Kentucky, for the period 1951 to 1974. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 35 degrees F, and the average daily minimum temperature is 25 degrees. The lowest temperature on record, which occurred at Ashland on January 29, 1963, is -15 degrees. In summer the average temperature is 73 degrees, and the average daily maximum temperature is 86 degrees. The highest recorded temperature, which occurred on July 14, 1954, was 105 degrees.

Growing degree days, shown in table 1, are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

Of the total annual precipitation, 23 inches, or 56 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 20 inches. The heaviest 1-day rainfall during the period of record was 5.61 inches at Ashland on July 20, 1973. Thunderstorms occur on about 43 days each year, and most occur in summer.

Average seasonal snowfall is 15 inches. The greatest snow depth at any one time during the period of record was 9 inches. On the average, 7 days have at least 1 inch of snow on the ground, but the number of such days varies greatly from year to year.

The average relative humidity in midafternoon in spring is less than 55 percent; during the rest of the year it is about 60 percent. Humidity is higher at night, and the average at dawn is about 85 percent. The prevailing wind is from the southwest. Average windspeed is highest, 9 miles per hour, in March.

Heavy rains, which occur throughout the year, and severe thunderstorms in summer sometimes cause flash flooding, particularly in narrow valleys.

Geology, relief, and drainage

The geology of Boyd and Greenup Counties consists of the Pennsylvanian and Mississippian System. The bedrock consists of interbedded shale, siltstone, and sandstone, with a few limestone layers in the Upper Pennsylvanian and Upper Mississippian. The most extensive bedrock in the area is the Breathitt Formation, and Latham and Shelocta soils are examples of those formed from shales and siltstones of this formation. In the southeastern part of Boyd County, Vandalia and Upshur soils are examples of those formed from clayey shales of the Conemaugh Formation of the Upper Pennsylvanian. This formation contains some massive sandstones, and the landscape is typically benched with numerous slips on the steep slopes. In the western part of Greenup County, the ridges consist of shales and siltstones of the lower Pennsylvanian. The side slopes consist of upper and lower members of the Borden Formation or lower Mississippian, which is largely siltstone. Berks and Cranston soils commonly formed in this siltstone parent material.

Approximately 80 percent of the survey area consists of steep to very steep hillsides, and about 15 percent of the area is nearly level to gently sloping flood plains and terraces. The remaining 5 percent of the area consists of gently sloping to moderately steep ridges and high stream terraces. Elevation ranges from approximately 500 feet along the Ohio River to more than 1,100 feet on the higher ridges. Elevation generally increases going from east to west.

The area is dissected by a dendritic pattern of streams that empty into tributaries that flow north into the Ohio River. The major tributaries of the Ohio River in the survey area are the Big Sandy River, Little Sandy River, and Tygarts Creek.

How this survey was made

Soil scientists made this survey to learn what kinds of soil are in the survey area, where they are, and how they can be used. The soil scientists went into the area knowing they likely would locate many soils they already knew something about and perhaps identify some they had never seen before. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; 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, which has been changed very little by leaching or by the action of plant roots.

The soil scientists recorded the characteristics of the profiles they studied, and they compared those profiles with others in counties nearby and in places more distant. Thus, through correlation, they classified and named the soils according to nationwide, uniform procedures.

After a guide for classifying and naming the soils was worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, roads, 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 soil map units. Some map units are made up of one kind of soil, others are made up of two or more kinds of soil, and a few have little or no soil material at all. Map units are discussed in the sections "General soil map for broad land use planning" and "Soil maps for detailed planning."

While a soil survey is in progress, samples of soils are taken as needed for laboratory measurements and for engineering tests. The soils are field tested, and interpretations of their behavior are modified as necessary during the course of the survey. New interpretations are added to meet local needs, mainly through field observations of different kinds of soil in different uses under different levels of management. Also, data are assembled from other sources, such as test results, records, field experience, and information available from state and local specialists. For example, data on crop yields under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it is readily available to different groups of users, among them farmers, managers of rangeland and woodland, engineers, planners, developers and builders, homebuyers, and those seeking recreation.

General soil map for broad land use planning

The general soil map at the back of this publication shows, in color, map units that have a distinct pattern of soils and of relief and drainage. Each map unit is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map provides a broad perspective of the soils and landscapes in the survey area. It provides a basis for comparing the potential of large areas for general kinds of land use. Areas that are, for the most part, suited to certain kinds of farming or to other land uses can be identified on the map. Likewise, areas of soils having properties that are distinctly unfavorable for certain land uses can be located.

Because of its small scale, the map does not show the kind of soil at a specific site. Thus, it is not suitable for planning the management of a farm or field or for select-

ing a site for a road or building or other structure. The kinds of soil in any one map unit differ from place to place in slope, depth, stoniness, drainage, or other characteristics that affect their management.

Map units of Boyd County

1. Latham-Shelocta

Moderately deep and deep, moderately well drained and well drained, sloping to steep soils; on narrow ridges and smooth, short side slopes

This map unit consists of narrow, sloping and moderately steep ridgetops, steep and very steep side slopes, and narrow valleys (fig. 1).

This map unit makes up about 45 percent of Boyd County. Latham soils make up about 45 percent of the map unit, Shelocta soils 30 percent, and minor soils the remaining 25 percent.

Latham soils formed in residuum from shale and have a heavy silty clay loam or silty clay subsoil. They are moderately deep, moderately well drained, sloping to steep soils on ridgetops and on short, convex side slopes.

Shelocta soils formed in colluvium from shale and siltstone and have a dominantly silty clay loam subsoil. They are deep, well drained, moderately steep and steep soils on smooth to concave side slopes.

The minor soils in this map unit are Gilpin, Wernock, and Steinsburg soils on ridgetops and Cotaco and Pope soils in valleys.

Most of this map unit is in forest, and some areas are used for pasture. Some ridgetop areas are in hay or pasture, and a few areas are used for cultivated crops.

This map unit has limited potential for farming. The soils on ridgetops are suited to hay and pasture, but pastures are difficult to establish and maintain on the steep side slopes. Farming is mostly limited to narrow valleys. This map unit is suited to woodland and wildlife habitat.

Most areas of this map unit are limited for urban uses by steep side slopes and slow permeability of the soils on ridgetops.

2. Allegheny-Riney-Monongahela

Deep, well drained and moderately well drained, gently sloping to moderately steep soils; on high stream terraces

This map unit consists of moderately wide, gently sloping to moderately steep terraces and short, steep side slopes.

This map unit makes up about 4 percent of Boyd County. Allegheny soils make up about 29 percent of the map unit, Riney soils about 28 percent, Monongahela soils about 18 percent, and minor soils the remaining 25 percent.

Allegheny soils formed in alluvium and have a clay loam or sandy clay loam subsoil. They are deep, well drained, gently sloping to moderately steep soils on high stream terraces.

Riney soils formed in alluvium and have a sandy clay loam or clay loam subsoil. They are deep, well drained, sloping soils on convex stream terraces.

Monongahela soils formed in alluvium and have a silt loam subsoil over a fine sandy loam fragipan. They are deep, moderately well drained, gently sloping to sloping soils on high stream terraces.

The minor soils in this map unit are Tilsit soils on terraces and Steinsburg, Latham, and Shelocta soils on steep side slopes.

Most of this map unit has been cleared and is used for homesites. Steep areas along drainageways and creeks are mostly wooded. Most of this map unit is suited to urban uses. The main limitations are a seasonal high water table in the more nearly level areas and gradient in the more sloping areas.

3. Cuba-Morehead-Whitley

Deep, well drained to somewhat poorly drained, nearly level to sloping soils; on flood plains and low terraces

This map unit consists of nearly level flood plains and nearly level to sloping terraces in moderately wide valleys.

This map unit makes up about 5 percent of Boyd County. Cuba soils make up about 31 percent of the map unit, Morehead soils about 28 percent, Whitley soils about 11 percent, and minor soils the remaining 30 percent.

Cuba soils formed in recent alluvium and have a silt loam subsoil. They are well drained, nearly level soils on first bottoms.

Morehead soils formed in alluvium and have a mottled silt loam or light silty clay loam subsoil. They are somewhat poorly drained, nearly level soils on low terraces.

Whitley soils formed in alluvium and have a light silty clay loam subsoil. They are well drained, nearly level to sloping soils on stream terraces.

The minor soils in this map unit are Pope, Stendal, and Nolin soils on flood plains; Tilsit soils on stream terraces; and Shelocta soils on foot slopes.

Most of this map unit has been cleared and is used for farming. It has a high potential for farming. Tile drainage is needed in many places and is used on the Morehead soils to remove excess water.

The main limitations of the soils in this map unit for urban use are flooding and wetness. The Cuba soils are subject to flooding, and some low areas of Morehead and Whitley soils are flooded occasionally. The Morehead soils have a seasonal high water table.

4. Elk-Huntington-Otwell

Deep, well drained and moderately well drained, nearly level soils; on terraces and flood plains

This map unit consists of broad, nearly level terraces and flood plains in wide valleys.

This map unit makes up about 5 percent of Boyd County. Elk soils make up about 41 percent of the map unit, Huntington soils about 23 percent, Otwell soils about 3 percent, and minor soils the remaining 33 percent.

Elk soils formed in alluvium and have a silty clay loam subsoil. They are well drained soils on stream terraces.

Huntington soils formed in alluvium and have a thick, dark, surface layer and a silt loam subsoil. They are well drained soils on first bottoms.

Otwell soils formed in alluvium and have a light silty clay loam subsoil over a fragipan at a depth of 2 feet. They are moderately well drained soils on stream terraces.

The minor soils in this map unit are Chavies soils on stream terraces and Newark and Bonnie soils on flood plains.

Most of this map unit has been cleared and is used for cultivated crops, homesites, towns, and industrial sites. In nonurban areas the potential for farming is high.

The Elk soils have few limitations for urban uses. The Huntington soils are severely limited by flooding. The Otwell soils are limited for some urban uses by a seasonal high water table and slow permeability.

5. Vandalia-Upshur

Deep, well drained, sloping to very steep soils; on narrow ridges, benches, and side slopes

This map unit consists of rough, broken topography. It is typically benched with alternating strata of shale, siltstone, and sandstone and is on ridgetops that are narrow and moderately steep and benches that are between the steep breaks on side slopes (fig. 2).

This map unit makes up about 41 percent of Boyd County. Vandalia soils make up about 35 percent of the map unit, Upshur soils about 25 percent, and minor soils the remaining 40 percent.

Vandalia soils formed in colluvium from shale and siltstone and have a silty clay subsoil. They are well drained, steep soils on lower side slopes, in coves, and on benches.

Upshur soils formed in residuum from clay shale and have a clay subsoil. They are well drained, sloping to very steep soils on ridges, benches, and side slopes.

The minor soils in this map unit are Latham, Gilpin, and Steinsburg soils on upper side slopes; Shelocta and Hayter soils on colluvial side slopes; and Newark, Lindside, and Nolin soils on bottoms.

This map unit has limited potential for farming. More than half of it has been cleared and largely is in unimproved pasture. Slips and severely eroded soils are common in cleared areas. The smoother ridges are suited to pasture and hay. Areas of low quality hardwoods are on ridges and south-facing slopes. White oak and yellow-poplar dominate the lower, north-facing slopes.

Most areas of this map unit are limited for urban uses by steep slopes and a slowly permeable subsoil.

Map units of Greenup County

1. Latham-Shelocta

Moderately deep and deep, moderately well drained and well drained, sloping to steep soils; on narrow ridges and smooth, short side slopes

This map unit consists of narrow, sloping and moderately steep ridgetops, steep and very steep side slopes, and narrow valleys (fig. 1).

This map unit makes up about 58 percent of Greenup County. Latham soils make up about 53 percent of the map unit, Shelocta soils about 31 percent, and minor soils the remaining 16 percent.

Latham soils formed in residuum from shale and have a heavy silty clay loam or silty clay subsoil. They are moderately deep, moderately well drained, sloping to steep soils on ridgetops and on short, convex side slopes.

Shelocta soils formed in colluvium from shale and siltstone and have a dominantly silty clay loam subsoil. They are deep, well drained, moderately steep and steep soils on smooth to concave side slopes.

The minor soils in this map unit are Wernock, Gilpin, and Tilsit soils on ridges and Cotaco soils in the valleys.

Most of this map unit is in forest. Some of the lower side slopes are in pasture, and some ridgetops have been cleared and are used for hay, pasture, and cultivated crops.

This map unit has limited potential for farming, except for some of the broader ridges and the narrow valleys. Pastures are difficult to establish and maintain on the steep side slopes. This map unit is suited to woodland and wildlife habitat.

Most areas of this map unit are limited for urban uses by steep side slopes and slowly permeable soils on ridgetops.

2. Allegheny-Riney-Monongahela

Deep, well drained and moderately well drained, gently sloping to moderately steep soils; on high stream terraces

This map unit consists of moderately wide, gently sloping to moderately steep terraces and short, steep side slopes.

This map unit makes up about 2 percent of Greenup County. Allegheny soils make up about 30 percent of the map unit, Riney soils about 18 percent, Monongahela soils about 17 percent, and minor soils the remaining 35 percent.

Allegheny soils formed in alluvium and have a clay loam or sandy clay loam subsoil. They are deep, well drained, gently sloping to moderately steep soils on high stream terraces.

Riney soils formed in alluvium and have a sandy clay loam or clay loam subsoil. They are deep, well drained, sloping soils on convex stream terraces.

Monongahela soils formed in alluvium and have a silt loam subsoil over a fine sandy loam fragipan. They are

deep, moderately well drained, gently sloping to sloping soils on high stream terraces.

The minor soils in this map unit are Tilsit and Whitley soils on stream terraces and Latham and Shelocta soils on steep side slopes.

Most of this map unit has been cleared and is used for homesites. Steep areas along drainageways and creeks are mostly wooded. Most of this map unit is suited to urban uses. The main limitations are a seasonal high water table in the more nearly level areas and gradient in the more sloping areas.

3. Cuba-Morehead-Whitley

Deep, well drained to somewhat poorly drained, nearly level to sloping soils; on flood plains and low terraces

This map unit consists of nearly level flood plains and nearly level to sloping terraces in moderately wide valleys.

This map unit makes up about 10 percent of Greenup County. Cuba soils make up about 31 percent of the map unit, Morehead soils about 25 percent, Whitley soils about 23 percent, and minor soils the remaining 21 percent.

Cuba soils formed in recent alluvium and a have silt loam subsoil. They are well drained, nearly level soils on first bottoms.

Morehead soils formed in alluvium and have a mottled silt loam or light silty clay loam subsoil. They are somewhat poorly drained, nearly level soils on low terraces.

Whitley soils formed in alluvium and have a light silty clay loam subsoil. They are well drained, nearly level to sloping soils on stream terraces.

The minor soils in this map unit are Pope and Stendal soils on flood plains; Tilsit, Markland, and Cotaco soils on terraces; and Shelocta soils on alluvial fans.

Most of this map unit has been cleared and is used for farming. Tile drainage is needed in many places and is used to remove excess water from Morehead soils.

The main limitations of the soils in this map unit for urban use are flooding and wetness. The Cuba soils are subject to flooding, and some low areas of Morehead and Whitley soils are flooded occasionally. Morehead soils have a seasonal high water table.

4. Elk-Huntington-Otwell

Deep, well drained and moderately well drained, nearly level soils; on terraces and flood plains

This map unit consists of broad, nearly level terraces and flood plains in wide valleys.

This map unit makes up about 7 percent of Greenup County. Elk soils make up about 33 percent of the map unit, Huntington soils about 18 percent, Otwell soils about 17 percent, and minor soils the remaining 32 percent.

Elk soils formed in alluvium and have a silty clay loam subsoil. They are well drained soils on stream terraces.

Huntington soils formed in alluvium and have a thick, dark surface layer and a silt loam subsoil. They are well drained soils on first bottoms.

Otwell soils formed in alluvium and have a light silty clay loam subsoil over a fragipan at a depth of 2 feet. They are moderately well drained soils on stream terraces.

The minor soils in this map unit are Chavies, Ashton, and Weinbach soils on stream terraces and Newark and Nolin soils on bottoms.

Most of this map unit has been cleared and is used for cultivated crops, homesites, towns, and industrial sites. In nonurban areas the potential for farming is high.

The Elk soils have few limitations for urban uses. The Huntington soils are severely limited by flooding. The Otwell soils are limited for some urban uses by a seasonal high water table and slow permeability.

5. Berks-Cranston

Moderately deep and deep, well drained, very steep soils; on side slopes and narrow ridgetops

This map unit consists of narrow, moderately steep ridgetops and very steep side slopes (fig. 3).

This map unit makes up about 23 percent of Greenup County. Berks soils make up about 45 percent of the map unit, Cranston soils about 35 percent, and minor soils the remaining 20 percent.

Berks soils formed in residuum and have a channery silt loam subsoil. They are moderately deep, well drained, very steep soils on upper side slopes.

Cranston soils formed in colluvium and have a channery silt loam subsoil. They are deep, well drained, very steep soils on lower side slopes.

The minor soils in this map unit are Latham and Gilpin soils on upper side slopes, Shelocta soils on alluvial fans, and Pope soils on bottoms.

This map unit is mainly used for woodland and wildlife habitat. It has low potential for farming, which is restricted to the narrow valleys. The steep slopes severely limit this map unit for other uses.

Soil maps for detailed planning

The map units shown on the detailed soil maps at the back of this publication represent the kinds of soil in the survey area. They are described in this section. The descriptions together with the soil maps can be useful in determining the potential of a soil and in managing it for food and fiber production; in planning land use and developing soil resources; and in enhancing, protecting, and preserving the environment. More information for each map unit, or soil, is given in the section "Use and management of the soils."

Preceding the name of each map unit is the symbol that identifies the soil on the detailed soil maps. Each soil description includes general facts about the soil and a

brief description of the soil profile. In each description, the principal hazards and limitations are indicated, and the management concerns and practices needed are discussed.

The map units on the detailed soil maps represent an area on the landscape made up mostly of the soil or soils for which the unit is named. Most of the delineations shown on the detailed soil map are phases of soil series.

Soils that have a profile that is almost alike make up a *soil series*. Except for allowable differences in texture of the surface layer or of the underlying substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement in the profile. A soil series commonly is named for a town or geographic feature near the place where a soil of that series was first observed and mapped.

Soils of one series can differ in texture of the surface layer or in the underlying substratum and in slope, erosion, stoniness, salinity, wetness, or other characteristics that affect their use. On the basis of such differences, a soil series is divided into phases. The name of a *soil phase* commonly indicates a feature that affects use or management. For example, Allegheny loam, 2 to 6 percent slopes, is one of several phases within the Allegheny series.

Some map units are made up of two or more dominant kinds of soil. Such map units are called soil complexes.

A *soil complex* consists of areas of two or more soils that are so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area includes some of each of the two or more dominant soils, and the pattern and proportion are somewhat similar in all areas. Vandalia-Upshur complex, 30 to 60 percent slopes, is an example.

Most map units include small, scattered areas of soils other than those that appear in the name of the map unit. Some of these soils have properties that differ substantially from those of the dominant soil or soils and thus could significantly affect use and management of the map unit. These soils are described in the description of each map unit. Some of the more unusual or strongly contrasting soils that are included are identified by a special symbol on the soil map.

Most mapped areas include places that have little or no soil material and support little or no vegetation. Such places are called *miscellaneous areas*; they are delineated on the soil map and given descriptive names. Strip mines is an example. Some of these areas are too small to be delineated and are identified by a special symbol on the soil map.

The acreage and proportionate extent of each map unit are given in table 4, and additional information on properties, limitations, capabilities, and potentials for many soil uses is given for each kind of soil in other tables in this survey. (See "Summary of tables.") Many of the terms used in describing soils are defined in the Glossary.

Soil descriptions and potentials

AlB—Allegheny loam, 2 to 6 percent slopes. This deep, well drained soil is mostly on low terraces and alluvial fans in narrow valleys. Slopes are slightly convex and are 150 to 300 feet long. The areas are long and narrow and range from 3 to 15 acres in size.

In a representative profile the surface layer is brown loam about 9 inches thick. The subsoil, about 36 inches thick, is yellowish brown or strong brown heavy loam, clay loam, or sandy clay loam. The substratum, to a depth of 66 inches, is strong brown sandy loam with brownish gray mottles and contains quartzite and sandstone pebbles and many oxide concretions.

Included with this soil in mapping are small areas of Chavies and Whitley soils and a few areas of soils that have slopes of 0 to 2 percent.

The available water capacity of this soil is high, and permeability is moderate. Runoff is medium. Natural fertility is medium, and organic matter content is moderate. Reaction is generally strongly acid or very strongly acid unless the soil is limed. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. The root zone extends to a depth of 36 to 48 inches.

Most of this soil has been cleared and is used for cultivated crops, hay, and pasture. Some areas are used for homesites and gardens. This soil has good potential for farming and is suited to most urban uses.

Crops commonly grown in the area, such as corn, tobacco, small grain, and all pasture and hay crops, are suited to this soil. Response of crops to fertilizer and lime is good. The erosion hazard is moderate, and measures for controlling erosion are needed if cultivated crops are grown. Contour tillage, stripcropping, minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help in controlling erosion and maintaining organic matter content.

This soil is suited to pasture and hay plants commonly grown in the area and produces high yields if properly managed. Plant species that produce adequate forage and provide satisfactory ground cover are needed. Pasture renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the chief management needs.

Although most of this soil is cleared, it has high productivity potential for woodland. Plant competition is a management concern.

This soil is suited to most urban uses. It is limited for sewage lagoons by seepage and flooding in a few low areas. These low flooded areas are limited for most urban uses. Capability subclass IIe; woodland ordination 2o.

AlC—Allegheny loam, 6 to 12 percent slopes. This deep, well drained soil is on small alluvial fans and high stream terraces. Slopes are mostly convex. Areas range from 5 to 15 acres in size.

In a representative profile the surface layer is brown loam about 9 inches thick. The subsoil, about 36 inches thick, is yellowish brown or strong brown heavy loam, clay loam, or sandy clay loam. The substratum, to a depth of 66 inches, is strong brown sandy loam with brownish gray mottles and contains quartzite and sandstone pebbles and many oxide concretions.

Included with this soil in mapping are small areas of Riney, Monongahela, Tilsit, and Whitley soils.

The available water capacity of this soil is high, and permeability is moderate. Runoff is medium. Natural fertility is medium and organic matter content is moderate. In unlimed areas, reaction in the surface layer and the subsoil ranges from strongly acid to very strongly acid. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. The root zone extends to a depth of 36 to 48 inches.

Most areas of this soil are used for homesites. Some areas are used for pasture and hay and a few areas are used for cultivated crops. This soil has fair potential for farming and is suited to most urban uses.

Although this soil is suited to most cultivated crops, it is better suited to pasture and hay crops. Response of crops to fertilizer and lime is good. The hazard of erosion is severe, and measures for controlling erosion are needed if cultivated crops are grown. Contour tillage, stripcropping, minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help in controlling erosion and maintaining organic matter content.

This soil is suited to pasture and hay plants commonly grown in the area and produces high yields if properly managed. Plant species that produce adequate forage and provide satisfactory ground cover are needed. Pasture renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the management needs.

Although most of this soil is cleared, it has high productivity potential for woodland. Plant competition is a management concern.

This soil is suited to most urban uses. It is limited for sewage lagoons by seepage. Capability subclass IIIe; woodland ordination 2o.

AlD—Allegheny loam, 12 to 20 percent slopes. This deep, well drained soil is on high stream terraces. It is on concave and smooth side slopes in areas that range from 5 to 20 acres in size.

In a representative profile the surface layer is brown loam about 7 inches thick. The subsoil, about 36 inches thick, is yellowish brown or strong brown heavy loam, clay loam, or sandy clay loam. The substratum, to a depth of 66 inches, is strong brown sandy loam with brownish gray mottles and contains quartzite and sandstone pebbles and many oxide concretions.

Included with this soil in mapping are areas of Riney and Whitley soils. Also included are small spots of wet, seepy soils.

The available water capacity of this soil is high, and permeability is moderate. Runoff is medium. Natural fertility is medium, and organic matter content is moderate. In unlimed areas, the surface layer and subsoil range from strongly acid to very strongly acid. This soil can be worked throughout a wide range of moisture content without clodding or crusting. The root zone extends to a depth of 34 to 46 inches.

Most areas of this soil are used for homesites. Some areas are in pasture and hay, and a few areas are wooded. This soil has low potential for farming and is limited for urban uses by slope.

This soil is suited to occasional cultivation but is better suited to pasture and hay crops. Response of crops to fertilizer and lime is good. The hazard of erosion is very severe, and measures for controlling erosion are needed if cultivated crops are grown. Contour tillage, stripcropping, minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help in controlling erosion and maintaining organic matter content.

This soil is suited to pasture and hay plants commonly grown in the area and produces moderate yields if properly managed. Plant species that produce adequate forage and provide satisfactory ground cover are needed. Pasture renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the management needs.

This soil is suited to trees, and a small acreage is wooded. Potential productivity is high. The hazard of erosion, equipment limitations, and plant competition are management concerns.

This soil is limited for most urban uses by moderately steep slopes. Areas disturbed during home construction are subject to erosion, and plant cover should be established quickly in denuded areas. Capability subclass IVe; woodland ordination 2r.

As—Ashton silt loam (0 to 2 percent slopes). This deep, well drained soil is on low terraces or second bottoms. Areas range from 15 to 100 acres in size. They generally are narrow to fairly broad and are between areas of Huntington and Elk soils.

In a representative profile the surface layer is dark brown silt loam about 8 inches thick. The subsoil, about 33 inches thick, is dark brown or brown silt loam or light silty clay loam. The upper 21 inches of the substratum is brown silt loam, and the lower part, to a depth of 72 inches, is brown fine sandy loam.

Included with this soil in mapping are small areas of Huntington, Elk, and Lindside soils.

The available water capacity of this soil is high, and permeability is moderate. Runoff is slow or medium. Natural fertility and organic matter content are high. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. In unlimed areas the surface layer ranges from

slightly acid to mildly alkaline, and the subsoil ranges from neutral to medium acid. The root zone extends to a depth of 40 to 60 inches.

This soil has good potential for farming, and most of the acreage is in cultivated crops. It is limited for most urban uses by flooding.

Corn and soybeans are well suited to this soil and are commonly grown. A small acreage is used for tobacco, hay, pasture, and small grain (fig. 4). Most areas of this soil are subject to occasional flooding in winter or early spring before crops are planted. This soil is productive and can be cropped intensively if it is properly fertilized and practices are used to help maintain organic matter content. Minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help in maintaining tilth and organic matter content.

All pasture and hay crops commonly grown in the area are suited to this soil. Some hay crops are damaged in places by flooding. The management needs are maintaining desired species, controlling weeds, using proper stocking rates and rotational grazing, and applying fertilizer.

This soil is suited to trees, and productivity potential is very high. Plant competition is a management concern.

This soil is limited for most urban uses by flooding. Capability class I; woodland ordination 1o.

BcF—Berks-Cranston channery silt loams, 30 to 60 percent slopes. The moderately deep, well drained Berks soils in this complex are mostly on upper convex side slopes and narrow ridges and make up about 45 percent of the complex. A few areas of Berks soils are on lower, steep breaks. The deep, well drained Cranston soils are on lower concave side slopes and in coves and make up about 35 percent of the complex. The areas range from 20 to several hundred acres. These soils are so intermingled that mapping them separately was not practical.

In a representative profile of a Berks soil in this complex, the surface layer is dark grayish brown channery silt loam about 5 inches thick. The subsoil is brown and yellowish brown channery silt loam about 25 inches thick. Siltstone bedrock is at a depth of 30 inches.

In a representative profile of a Cranston soil in this complex, the surface layer is dark grayish brown channery silt loam about 4 inches thick. The subsoil, about 48 inches thick, is yellowish brown or strong brown channery silt loam. The substratum to a depth of 65 inches is yellowish brown very channery silt loam.

Included with this complex in mapping are small areas of Latham, Shelocta, and Gilpin soils and a shallow soil on narrow ridges and steep breaks. Also included are a few small areas of soils that have slopes of 20 to 30 percent and small areas of soils where stones and rock outcrops cover 2 percent or more of the surface.

The Berks soils have low available water capacity and moderate to rapid permeability. Runoff is rapid, and natural fertility and organic matter content are low. Reaction of the unlimed soil is strongly acid to very strongly acid. The root zone and depth to bedrock range from 20 to 40 inches.

The Cranston soils have high available water capacity and moderately rapid permeability. Runoff is medium, natural fertility is medium, and organic matter content is low. Reaction of the unlimed soil ranges from strongly acid to extremely acid. The root zone extends to a depth of 40 to 60 inches.

Most of this complex is wooded, but a few areas on lower side slopes are used for pasture. This complex has poor potential for farming and for urban uses. It has better potential for trees and habitat for woodland wildlife.

These soils are not suited to cultivation because of the very steep slopes and the hazard of erosion. Some areas are used for pasture, but most areas are too steep for the use of modern machinery. Stands of pasture grasses are difficult to establish and maintain. If these soils are used for pasture, grasses and legumes that produce good plant cover and require the least amount of renovation are needed. Overgrazing reduces the stand of desirable grasses and legumes and results in excessive erosion.

This complex is suited to trees, and most of the acreage is wooded. Woodland productivity potential is moderately high for the Berks soils on north- and east-facing slopes and moderate on south- and west-facing slopes. The Cranston soils have high productivity potential on north- and east-facing slopes and moderately high potential on south- and west-facing slopes. The erosion hazard and equipment limitations are management concerns caused by the very steep slopes. Plant competition is a management concern for the Cranston soils on north- and east-facing slopes.

These soils are limited for urban uses by very steep slopes. Capability subclass VIIe; Berks part in woodland ordination 3f (north aspects) and 4f (south aspects); Cranston part in woodland ordination 2r (north aspects) and 3r (south aspects).

Bo—Bonnie silt loam (0 to 2 percent slopes). This nearly level and depressional, poorly drained to very poorly drained soil is on flood plains. Areas are long and narrow and range from 3 to 20 acres in size.

In a representative profile the surface layer is grayish brown silt loam about 8 inches thick. It has dark brown mottles. The subsoil is about 30 inches thick. It is olive gray silt loam with dark brown mottles in the upper 9 inches. The lower 21 inches is gray heavy silt loam with strong brown mottles. The substratum is mottled grayish brown, gray, and yellowish brown heavy silt loam to a depth of 62 inches.

Included with this soil in mapping are small areas of Stendal, Newark, and Morehead soils. Also included are small areas of a poorly drained soil with a fragipan and a small acreage of a soil that is 27 to 40 percent clay between depths of 24 and 40 inches. A few areas of soils that are similar to this Bonnie soil but that are medium acid are also included.

The available water capacity of this soil is high, and permeability is moderate. Runoff is slow to ponded. Natu-

ral fertility and organic matter content are low. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. In unlimed areas reaction is strongly acid or very strongly acid throughout. The root zone extends to a depth of 38 to 50 inches.

This soil has good potential for farming if artificially drained. It is limited for most urban uses by wetness and flooding.

This soil is subject to flooding and has a high water table at or near the surface. Unless this soil is artificially drained, it is poorly suited to most row crops. It can be cropped year after year if properly drained. Corn and soybeans are commonly grown on this soil, but crops are damaged by wetness in some years. This soil responds well to tile drainage but some areas lack suitable outlets.

If adequately drained, this soil is well suited to pasture and hay, but plant species that tolerate wetness are needed. In addition to drainage, other management needs are pasture renovation, weed control, application of lime and fertilizer, and use of proper stocking rates and rotational grazing.

This soil is suited to trees, but only a small acreage is wooded. Potential productivity is very high for wetland hardwoods. Equipment limitations, seeding mortality, and plant competition are management concerns.

Because of flooding and a seasonal high water table, this soil is limited for most urban uses. Capability subclass IIIw; woodland ordination 1w.

ChA—Chavies fine sandy loam, 0 to 6 percent slopes. This deep, well drained soil is on stream terraces in long, narrow to broad areas that range from 3 to 30 acres in size.

In a representative profile the surface layer is dark brown fine sandy loam about 10 inches thick. The subsoil, about 34 inches thick, is dark brown or brown fine sandy loam. The substratum is brown fine sandy loam and loamy sand to a depth of 65 inches.

Included with this soil in mapping are small areas of Elk, Lakin, Allegheny, and Pope soils.

The available water capacity of this soil is high, and permeability is moderately rapid. Runoff is medium. Natural fertility is medium, and organic matter content is moderate. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. In unlimed areas the surface layer and subsoil range from medium acid to very strongly acid. The root zone extends to a depth of 36 to 48 inches.

Most of this soil is used for cultivated crops, hay, and pasture. Some areas are used for homesites and gardens, and a few areas are used for truck crops. This soil has good potential for farming and is suited to most urban uses.

Crops commonly grown in the area, such as corn, tobacco, small grain, truck crops, and all pasture and hay crops, are suited to this soil. Response of crops to fertilizer and lime is good. The hazard of erosion is slight to moderate, and management that controls this hazard is needed in places on the longer slopes if cultivated crops are grown. Contour tillage, stripcropping, minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help in controlling erosion and maintaining organic matter content.

This soil is suited to pasture and hay plants commonly grown in the area, and production potential is high if the soil is properly managed. Plant species that produce adequate forage and provide satisfactory ground cover are needed. Pasture renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the chief management needs.

Although most of this soil is cleared, it has high productivity potential for woodland. Plant competition is a management concern.

This soil is suited to most urban uses. It is limited for sanitary landfills and sewage lagoons by seepage and by flooding in a few low areas. These flooded areas are limited for most urban uses. Capability subclass IIe; woodland ordination 2o.

Co—Cotaco loam (2 to 6 percent slopes). This deep, moderately well drained soil is on low terraces and alluvial fans. Most areas of this soil are in narrow valleys and range from 2 to 20 acres in size. The alluvial fans are generally smaller and more sloping than the terraces.

In a representative profile the surface layer is dark grayish brown loam about 10 inches thick. The subsoil is about 31 inches thick. It is yellowish brown sandy clay loam with brown and strong brown mottles in the upper 6 inches. The next 7 inches is yellowish brown sandy clay loam with light brownish gray and dark brown mottles. The lower 18 inches of the subsoil is mottled grayish brown, yellowish brown, and dark brown gravelly light clay loam. The upper 5 inches of the substratum is yellowish brown gravelly light clay loam with dark brown and light brownish gray mottles. The lower part of the substratum is mottled yellowish brown, gray, and dark brown sandy clay loam to a depth of 66 inches.

Included with this soil in mapping are small areas of Stokly soils on first bottoms and small areas of Morehead soils on low terraces. Also included are areas of soils that are similar to this Cotaco soil but that are less acid.

The available water capacity of this soil is high, and permeability is moderate. Runoff is medium. Natural fertility is medium, and organic matter content is low. In unlimed areas reaction in the the surface layer and subsoil ranges from strongly acid to extremely acid. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. It has a seasonal high water table at a depth of 1.5 to 3 feet. The root zone extends to a depth of 36 to 48 inches.

This soil has good potential for farming. It is used for hay and pasture and is commonly used for row crops if the soil is drained. It is limited for many urban uses by wetness.

If drained, this soil is suited to the cultivated crops commonly grown in the area, such as corn, tobacco, and small grain. Response of crops to fertilizer and lime is good. The hazard of erosion is slight to moderate, and measures to control erosion are needed on the more sloping areas if cultivated crops are grown. Contour tillage, stripcropping, minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help in controlling erosion and maintaining organic matter content. Tile drainage is generally better suited to this soil than are other drainage systems.

This soil is suited to pasture and hay plants, but species that tolerate some wetness are needed. Pasture renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, drainage, and control of undesirable vegetation are some of the chief management needs.

Although most of this soil has been cleared, it has high productivity potential for woodland. Plant competition is a management concern.

This soil is limited for many urban uses by a seasonal high water table. Capability subclass IIw; woodland ordination 2o.

Cu—Cuba silt loam (0 to 4 percent slopes). This nearly level, deep, well drained soil is on flood plains in the wider valleys. Areas are parallel to drainageways and range from 5 to 40 acres in size.

In a representative profile the surface layer is brown silt loam about 10 inches thick. The subsoil, about 28 inches thick, is brown or dark yellowish brown silt loam. The substratum is dark yellowish brown silt loam to a depth of 70 inches.

Included with this soil in mapping are small areas of Pope and Whitley soils and a few areas of a soil with low chroma mottles at a depth of less than 24 inches. Also included are areas of soils that are as much as 5 percent gravel in the surface layer and subsoil and a few small areas of soils that have slopes greater than 4 percent.

The available water capacity of this soil is high, and permeability is moderate. Runoff is slow or medium. Natural fertility is medium, and organic matter content is moderate. Reaction is strongly acid or very strongly acid unless the soil is limed. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. The root zone extends to a depth of 38 to 50 inches.

This soil has good potential for farming and is used for cultivated crops, hay, and pasture. It is limited for urban uses by flooding.

Corn and soybeans are well suited to this soil and are commonly grown. This soil is subject to flooding in winter and early spring and occasionally during the growing season. Response of crops to fertilizer and lime is good. Erosion is not a hazard. This soil can be cropped year after year if good management practices are used to maintain fertility and organic matter content.

All pasture and hay crops commonly grown in the area are suited to this soil, but some hay crops are damaged in places by flooding. The management needs are maintaining the desired species, controlling weeds, using proper stocking rates and rotational grazing, and applying lime and fertilizer.

This soil is suited to trees, and productivity potential is very high. Plant competition is a management concern.

This soil is limited for most urban uses by flooding. Capability class I; woodland ordination 1o.

EkA—Elk silt loam, 0 to 2 percent slopes. This deep, well drained soil is on stream terraces. Areas range from long and narrow to broad and from 5 to 100 acres in size.

In a representative profile the surface layer is dark brown silt loam about 9 inches thick. The subsoil, about 36 inches thick, is dark brown or brown silt loam or light silty clay loam. The substratum, to a depth of 73 inches, is dark yellowish brown or dark brown stratified, sandy loam and loam.

Included with this soil in mapping are small areas of Otwell, Ashton, and Chavies soils, a few long, narrow areas at a low elevation of a soil that is wetter than this Elk soil, and a few small areas of a soil containing more sand in the surface layer and subsoil than this Elk soil. Also included are some areas of soils around buildings and industrial sites that have been disturbed by cutting and filling and a few areas of Elk soils that have slopes of 2 to 12 percent.

The available water capacity of this soil is high, and permeability is moderate. Runoff is slow to moderate. Natural fertility is high, and organic matter content is moderate. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. In unlimed areas the surface layer and subsoil range from slightly acid to very strongly acid. The root zone extends to a depth of 40 to 60 inches.

This soil has good potential for farming and for most urban uses. It is used for cultivated crops, hay, and pasture and for homesites, gardens, and industrial sites.

This soil is suited to the cultivated crops grown in the area and is used extensively for corn and soybeans. A small acreage is in tobacco, small grain, hay, and pasture (fig. 5). Response of crops to fertilizer and lime is good. The erosion hazard is slight. This soil can be cropped year after year if good management practices are used to maintain fertility and organic matter content. Minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help in maintaining tilth and organic matter content.

All pasture and hay crops commonly grown in the area are suited to this soil. The management needs are maintaining desired species, controlling weeds, using proper stocking rates and rotational grazing, and applying lime and fertilizer.

This soil is suited to trees, and potential productivity is high. Plant competition is a management concern.

This soil is suited to most urban uses. It is limited for sewage lagoons by seepage and by flooding in a few low areas. These low flooded areas are limited for most urban uses. Capability class I; woodland ordination 2o.

GlC—Gilpin silt loam, 6 to 12 percent slopes. This moderately deep, well drained soil is on narrow ridgetops. Slopes are convex and less than 150 feet long. Areas are long and narrow and range from 3 to 15 acres in size.

In a representative profile the surface layer is brown silt loam about 7 inches thick. The subsoil, about 20 inches thick, is yellowish brown heavy silt loam in the upper 9 inches and yellowish brown shaly light silty clay loam in the lower 11 inches. Siltstone and shale are at a depth of 27 inches.

Included with this soil in mapping are small areas of Latham and Wernock soils. Also included are a few areas of soils that have slopes less than 6 percent.

The permeability and available water capacity of this soil are moderate. Runoff is medium. Natural fertility and organic matter content are low. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. In unlimed areas the surface layer and subsoil range from strongly acid to extremely acid. The root zone and depth to rippable bedrock range from 20 to 40 inches.

This soil has fair potential for farming, and most of the acreage is in hay, pasture, and woods. It is limited for many urban uses by bedrock at a depth of 20 to 40 inches.

Although this soil is suited to most cultivated crops, it is better suited to pasture and hay. Response of crops to fertilizer and lime is good. If this soil is cultivated, the hazard of erosion is severe and measures that control erosion and reduce runoff are needed. Contour tillage, stripcropping, minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help control erosion and maintain the organic matter content.

This soil is suited to pasture and hay, and production potential is moderate if the soil is properly managed. The root zone ranges from 20 to 40 inches in depth, and lack of moisture limits production potential during dry seasons. Plant species that produce adequate forage and provide satisfactory ground cover are needed. Pasture renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the chief management needs.

This soil is suited to trees, and about half of the acreage is wooded. Productivity potential is moderately high. Capability subclass IIIe; woodland ordination 3o.

GlD—Gilpin silt loam, 12 to 20 percent slopes. This moderately deep, well drained soil is on narrow ridgetops. Slopes are convex and are less than 200 feet long. Areas are long and narrow and range from 4 to 20 acres in size.

In a representative profile the surface layer is brown silt loam about 7 inches thick. The subsoil, about 20 inches thick, is yellowish brown heavy silt loam in the upper 9 inches and yellowish brown shaly light silty clay loam in the lower 11 inches. Siltstone and shale are at a depth of 27 inches.

Included with this soil in mapping are small areas of Latham and Wernock soils.

The available water capacity and permeability of this soil are moderate. Runoff is rapid. Natural fertility and organic matter content are low. This soil can be worked throughout a wide range of moisture content without clodding or crusting. In unlimed areas the surface layer and subsoil range from strongly acid to extremely acid. The root zone and depth to rippable bedrock range from 20 to 40 inches.

Most areas of this soil are in woods, hay, and pasture but a few areas are cultivated. This soil is limited for cultivated crops and many urban uses by slope. It is better suited to grasses and trees than to other uses.

Although this soil is suited to occasional cultivation, it is better suited to pasture and hay crops. If this soil is cultivated, the hazard of erosion is very severe and measures that control erosion and reduce runoff are needed. Contour tillage, stripcropping, minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system are needed to help control erosion and maintain the organic matter content.

This soil is suited to pasture and hay, and production potential is moderate if the soil is properly managed. The root zone ranges from 20 to 40 inches in depth, and lack of moisture limits production during dry seasons. Plant species should be selected to produce adequate forage and provide satisfactory ground cover. Renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the chief management needs.

This soil is suited to trees, and more than half of the acreage is wooded. Productivity potential is high on north- and east-facing slopes and moderately high on south- and west-facing slopes. Erosion hazard and equipment limitations are management concerns because of the moderately steep slopes.

This soil is limited for most urban uses by moderately steep slopes and by siltstone and shale at a depth of 20 to 40 inches, which hinder shallow excavations. Areas disturbed during home construction are subject to erosion, and plant cover should be established quickly in denuded areas. Capability subclass IVe; woodland ordination 2r (north aspect) and 3r (south aspect).

GlE—Gilpin silt loam, 20 to 30 percent slopes. This moderately deep, well drained soil is on upper parts of side slopes and on narrow ridgetops. Slopes are smooth and convex and are less than 200 feet long. The areas are long and narrow and range from 3 to 15 acres in size.

In a representative profile the surface layer is brown silt loam about 7 inches thick. The subsoil, to a depth of 30 inches, is yellowish brown heavy silt loam in the upper part and yellowish brown shaly light silty clay loam in the

lower part. Siltstone and shale bedrock is at a depth of 30 inches.

Included with this soil in mapping are small areas of Latham, Shelocta, and Steinsburg soils.

The available water capacity and permeability of this soil are moderate. Runoff is rapid. Natural fertility and organic matter content are moderate. This soil can be worked throughout a wide range of moisture content without clodding or crusting. In unlimed areas the surface layer and subsoil range from strongly acid to extremely acid. The root zone and depth to siltstone and shale bedrock ranges from 20 to 40 inches.

This soil is mostly wooded, but some areas are used for pasture and hay. It has poor potential for farming and for most urban uses. It is better suited to trees and grasses than to other uses.

The hazard of erosion is too severe for this soil to be used for cultivated crops. The soil is suitable for pasture and hay, but harvesting hay is difficult on the steep slopes. Because of the slope and erosion hazard, management of vegetation for ground cover and soil protection is important. Pasture mixtures that produce satisfactory forage, provide adequate ground cover, and require the least amount of renovation are needed. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the chief management needs.

This soil is mostly wooded. Potential productivity is high on north- and east-facing slopes and moderately high on south- and west-facing slopes. Erosion hazard and equipment limitations are management concerns because of the steep slopes.

This soil is limited for most urban uses by steep slopes. Capability subclass VIe; woodland ordination 2r (north aspect) and 3r (south aspect).

HsB—Hayter silt loam, 2 to 6 percent slopes. This deep, well drained soil is in narrow valleys. It is on small alluvial fans in long narrow areas that range from 4 to 15 acres in size.

In a representative profile the surface layer is dark brown silt loam about 8 inches thick. The subsoil, about 32 inches thick, is dark brown clay loam in the upper 7 inches. The lower 25 inches is brown or dark yellowish brown gravelly sandy clay loam. The substratum, to a depth of 60 inches, is brown very gravelly sandy clay loam.

Included with this soil in mapping are small areas of Lindside and Pope soils. A small acreage of a soil with a light silty clay loam subsoil is also included.

The available water capacity of this soil is high, and permeability is moderately rapid. Runoff is medium. Natural fertility is medium, and organic matter content is moderate. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. In unlimed areas the surface layer and subsoil range from slightly acid to strongly acid. The root zone extends to a depth of 40 to 60 inches.

This soil has good potential for farming, and most of the acreage is in cultivated crops, hay, and pasture. Some areas are used for homesites and gardens. This soil is limited for some urban uses by rapid permeability.

Crops commonly grown in the area, such as corn, tobacco, small grain, and all pasture and hay crops, are suited to this soil. Response of crops to fertilizer and lime is good. The erosion hazard is moderate, and control of erosion is needed if cultivated crops are grown. Contour tillage, stripcropping, minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help in controlling erosion and maintaining organic matter content.

This soil is suited to pasture and hay plants commonly grown in the area, and production potential is high if the soil is properly managed. Plant species that produce adequate forage and provide satisfactory ground cover are needed. Pasture renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the chief management needs.

Although most of this soil is cleared, it has high productivity potential for woodland. Plant competition is a management concern.

This soil is suited to many urban uses but is limited for sewage lagoons and sanitary landfills by seepage. Capability subclass IIe; woodland ordination 2o.

HsC—Hayter silt loam, 6 to 12 percent slopes. This deep, well drained soil is on alluvial fans and colluvial side slopes in narrow valleys. The areas consist of small fans and long narrow strips at the base of steeper slopes. They range from 3 to 15 acres in size.

In a representative profile the surface layer is dark brown silt loam, about 8 inches thick. The subsoil, about 32 inches thick, is dark brown clay loam in the upper 7 inches. The lower 25 inches is brown or dark yellowish brown gravelly sandy clay loam. The substratum, to a depth of 60 inches, is brown very gravelly sandy clay loam.

Included with this soil in mapping are small areas of Vandalia soils and a small acreage of a soil with a light silty clay loam subsoil. Also included are a few areas of soils that have slopes of 12 to 20 percent.

The available water capacity of this soil is high, and permeability is moderately rapid. Runoff is medium. Natural fertility is medium, and organic matter content is moderate. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. In unlimed areas the surface layer and subsoil range from slightly acid to strongly acid. The root zone extends to a depth of 40 to 60 inches.

Most areas of this soil have been cleared and are used for cultivated crops, hay, and pasture. A few areas are used for homesites and gardens. This soil has fair potential for farming. It is limited for some urban uses by rapid permeability.

Although this soil is suited to most cultivated crops, it is better suited to pasture and hay crops. Response of crops to fertilizer and lime is good. The hazard of erosion is severe, and measures that control erosion are needed if cultivated crops are grown. Contour tillage, stripcropping, minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help in controlling erosion and maintaining organic matter content.

This soil is suited to pasture and hay plants commonly grown in the area, and production potential is high if the soil is properly managed. Plant species that produce adequate forage and provide satisfactory ground cover are needed. Pasture renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the management needs.

Although most of this soil is cleared, it has high productivity potential for woodland. Plant competition is a management concern.

This soil is suited to most urban uses. It is limited for sewage lagoons and sanitary landfills by seepage. Capability subclass IIIe; woodland ordination 2o.

HtE—Hayter loam, 20 to 30 percent slopes. This deep, well drained soil is on colluvial side slopes. Areas range from 5 to 20 acres in size. Areas that are long and narrow are on benches and lower, smooth side slopes. Other areas are on lower concave and convex side slopes.

In a representative profile the surface layer is dark brown loam about 7 inches thick. The subsoil, about 35 inches thick, is strong brown sandy clay loam or light clay loam with a few pebbles throughout. The substratum, to a depth of 64 inches, is strong brown or yellowish brown gravelly sandy clay loam.

Included with this soil in mapping are small areas of Shelocta and Vandalia soils. Also included are a few areas of soils where stones and boulders cover as much as 2 percent of the surface.

The available water capacity of this soil is high, and permeability is moderately rapid. Runoff is medium. Natural fertility is medium, and organic matter content is moderate. This soil can be worked throughout a wide range of moisture content without clodding or crusting. In unlimed areas the surface layer and subsoil range from slightly acid to strongly acid. The root zone extends to a depth of 40 to 60 inches.

This soil has poor potential for farming and for most urban uses. Most of the acreage is in pasture or is wooded.

The hazard of erosion is too severe for this soil to be used for cultivated crops. This soil is suitable for pasture and hay, but harvesting of hay is difficult on the steep slopes. Because of the slope and erosion hazard, management of vegetation for ground cover and soil protection is important. Pasture mixtures that produce satisfactory forage, provide adequate ground cover, and require the least amount of renovation are needed. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the chief management needs.

This soil has high productivity potential for woodland. The hazard of erosion, equipment limitations, and plant competition are management concerns.

This soil is limited for most urban uses by steep slopes. Capability subclass VIe; woodland ordination 2r.

Hu—Huntington silt loam, (0 to 2 percent slopes). This deep, well drained soil is on first bottoms in wide valleys. Areas are long and narrow to fairly wide and range from 10 to 50 acres or more in size.

In a representative profile the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsoil, about 38 inches thick, is dark brown silt loam. The substratum, to a depth of 72 inches, is dark brown silt loam.

Included with this soil in mapping are small areas of Ashton and Lindside soils. Also included are a few narrow areas adjacent to the Ohio River of soils that are more sandy throughout than this Huntington soil and a few areas of soils that have slopes greater than 2 percent.

The available water capacity of this soil is high, and permeability is moderate. Runoff is medium. Natural fertility and organic matter content are high. In unlimed areas the surface layer and subsoil range from medium acid to mildly alkaline. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. The root zone extends to a depth of 48 to 60 inches.

This soil has good potential for farming, and most of the acreage is in cultivated crops. It is limited for most urban uses by flooding.

Corn and soybeans are well suited to this soil and are the crops most commonly grown. A small acreage is used for hay, pasture, and small grain. This soil is subject to occasional flooding in winter or early spring before crops are planted. Small grain and hay crops are sometimes damaged by flooding. Productivity potential is high, and this soil can be cropped intensively if it is properly fertilized and managed to help maintain the organic matter content. Minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help in maintaining tilth and organic matter content.

All pasture and hay crops commonly grown in the area are suited to this soil. The management needs are maintaining desired species, controlling weeds, using proper stocking rates and rotational grazing, and applying fertilizer.

This soil is suited to trees, and potential productivity is very high. Plant competition is a management concern.

This soil is limited for most urban uses by flooding. Capability class I; woodland ordination 1o.

LkB—Lakin loamy fine sand, 2 to 12 percent slopes. This deep, excessively drained soil is nearly level on terraces and sloping on dunelike hills in broad valleys. Slopes are mostly complex. Areas range from 10 to 40 acres or more in size.

In a representative profile the surface layer is brown loamy fine sand about 12 inches thick. The subsurface layer, about 4 inches thick, is dark yellowish brown loamy fine sand. The next layer, about 44 inches thick, is yellowish brown, loose loamy fine sand with thin bands of darker and finer textured material. The substratum, to a depth of 74 inches, is yellowish brown, loose loamy fine sand with light yellowish brown mottles.

Included with this soil in mapping are small areas of Chavies soils. Also included are some areas of soils at lower elevations that have less than 2 percent slope and have a coarse loamy sand subsoil without bands of finer material. Some small areas of soils that have short slopes greater than 12 percent are also included.

The available water capacity of this soil is low, and permeability is rapid. Runoff is slow to medium. Natural fertility and organic matter content are low. In unlimed areas the reaction ranges from medium acid to very strongly acid. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. The root zone extends to a depth of 50 to 65 inches.

This soil is used mostly for hay, pasture, and truck crops. Some areas are used for homesites and gardens, and some areas are idle. This soil has fair to poor potential for farming and is limited for urban uses by rapid permeability.

The sloping areas of this soil are better suited to pasture and hay crops than to other uses. The more gently sloping areas are suited to cultivated crops and truck crops, including sweet corn, tomatoes, and melons. The main limitations in the use of this soil are droughtiness, low fertility, and the erosion hazard on the steeper slopes. The erosion hazard is moderate to severe in areas lacking vegetative cover, and measures that control erosion are needed if cultivated crops are grown. Contour tillage, stripcropping, minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help in controlling erosion and maintaining organic matter content.

This soil is suited to most pasture and hay crops, but it is better suited to those plants that are least affected by droughtiness. About half of the acreage is used for pasture and hay. Plant species that provide adequate ground cover are needed. Pasture renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the management needs.

Although most of this soil is cleared, production potential is moderate for woodland. Seedling mortality and equipment limitations are management concerns.

This soil is suited to many urban uses but is limited for sanitary facilities by seepage. Capability subclass IIIs; woodland ordination 4s.

LmC—Latham silt loam, 6 to 12 percent slopes. This moderately deep, moderately well drained soil is on narrow ridgetops. Slopes are smooth and convex and are less than 150 feet long. The areas are oval or long and narrow and range from 3 to 30 acres in size.

In a representative profile the surface layer is brown silt loam about 5 inches thick. The subsoil is about 33 inches thick. It is strong brown light silty clay loam in the upper part. The lower part of the subsoil is strong brown and light olive brown heavy silty clay loam or silty clay with light olive gray mottles. Light olive brown acid shale is at a depth of 38 inches.

Included with this soil in mapping are small areas of Gilpin, Wernock, and Upshur soils. Also included are areas of soils that are similar to this Latham soil but that have a silt mantle 12 to 15 inches thick.

The available water capacity of this soil is moderate, and permeability is slow or very slow. Runoff is rapid. Natural fertility and organic matter content are low. This soil is easy to till and can be worked throughout a fairly wide range of moisture content without clodding or crusting. In unlimed areas the surface layer and the subsoil range from strongly acid to extremely acid. The root zone and depth to shale bedrock range from 20 to 40 inches.

This soil has fair potential for farming, and most of the acreage is in hay, pasture, and woods. It is limited for many urban uses by the clayey, slowly permeable subsoil and by bedrock at a depth of 20 to 40 inches.

Although this soil is suited to most cultivated crops, it is better suited to pasture and hay crops. If this soil is cultivated, the hazard of erosion is severe and measures that control erosion and reduce runoff are needed. Contour tillage, stripcropping, minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help control erosion and maintain the organic matter content.

This soil is suited to pasture and hay, and production potential is moderate if the soil is properly managed. Lack of moisture limits production potential during dry seasons. Plant species that produce adequate forage and provide satisfactory ground cover are needed. Pasture renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the chief management needs.

This soil is suited to trees, and about half of the acreage is wooded. Potential productivity is moderate. The erosion hazard and equipment limitations are management concerns.

Shale bedrock at a depth of 20 to 40 inches hinders excavations, and slow permeability is a limitation for septic tank absorption fields. Capability subclass IIIe; woodland ordination 4c.

LmD—Latham silt loam, 12 to 20 percent slopes. This moderately deep, moderately well drained soil is on narrow ridgetops and upper parts of side slopes. Slopes are smooth and convex and are less than 150 feet long. The areas are long and narrow and range from 3 to 25 acres in size.

In a representative profile the surface layer is brown silt loam about 5 inches thick. The subsoil is about 33 inches thick. It is strong brown light silty clay loam in the upper part. The lower part of the subsoil is strong brown and light olive brown heavy silty clay loam or silty clay with light olive gray mottles. Light olive brown, acid shale is at a depth of 38 inches.

Included with this soil in mapping are small areas of Gilpin and Upshur soils. Also included are a few areas of eroded soils.

The available water capacity of this soil is moderate, and permeability is slow or very slow. Runoff is rapid. Natural fertility and organic matter content are low. This soil can be worked throughout a fairly wide range of moisture content without clodding or crusting. In unlimed areas the surface layer and subsoil range from strongly acid to extremely acid. The root zone and depth to shale bedrock range from 20 to 40 inches.

Most areas of this soil are in woods, hay, and pasture, but a few areas are cultivated. This soil is limited for cultivated crops and for many urban uses. It is better suited to grasses and trees than to other uses.

Although this soil is suited to occasional cultivation, it is better suited to pasture and hay crops. If this soil is cultivated, the hazard of erosion is very severe, and measures that control erosion and reduce runoff are needed. Contour tillage, stripcropping, minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping systems are needed to help control erosion and maintain the organic matter content.

This soil is suited to pasture and hay, and production potential is moderate if the soil is properly managed. Lack of moisture limits production potential during dry seasons. Plant species that produce adequate forage and provide satisfactory ground cover are needed. Renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the chief management needs.

This soil is suited to trees, and more than half of the acreage is wooded. Potential productivity is moderately high on north- and east-facing slopes and moderate on south- and west-facing slopes. Erosion hazard and equipment limitations are management concerns because of the moderately steep slopes and clayey subsoil.

This soil is limited for most urban uses by moderately steep slopes and slow permeability. Shale bedrock at a depth of 20 to 40 inches hinders shallow excavations. Areas disturbed during home construction are subject to erosion, and plant cover should be established quickly in denuded areas. Capability subclass IVe; woodland ordination 3c (north aspect) and 4c (south aspect).

LsE—Latham-Shelocta silt loams, 20 to 30 percent slopes. Moderately deep, moderately well drained Latham soils on upper convex side slopes make up about 45 percent of this complex. Deep, well drained Shelocta soils on smooth lower side slopes and in coves make up about 35 percent of the complex. The areas range from 5 to 30 acres or more. In some places they are long and narrow, and in other places they extend the length of the hillside. These soils are so intermingled that mapping them separately was not practical.

In a representative profile of a Latham soil in this complex, the surface layer is brown silt loam about 5 inches thick. The subsoil is about 33 inches thick. It is strong brown light silty clay loam in the upper part. The lower part is strong brown and light olive brown heavy silty clay loam or silty clay that has light olive gray mottles. Light olive brown shale is at a depth of 38 inches.

In a representative profile of a Shelocta soil in this complex, the surface layer is dark grayish brown silt loam about 5 inches thick. The subsoil, about 48 inches thick, is strong brown silt loam or light silty clay loam in the upper part and yellowish brown light silty clay loam or gravelly silt loam in the lower part. The substratum, to a depth of 74 inches, is yellowish brown gravelly silt loam.

Included with this complex in mapping are small areas of Gilpin, Berks, and Cranston soils and areas on steep breaks of a soil that is shallower than the Latham soil in this complex. Also included are small areas of a deep, sandy soil on colluvial side slopes, a small acreage of Vandalia soils, and small areas where stones cover 2 percent or more of the surface.

The Latham soils have moderate available water capacity and slow or very slow permeability. Runoff is rapid. Natural fertility and organic matter content are low. Reaction of the unlimed soil ranges from strongly acid to extremely acid. The root zone and depth to shale bedrock range from 20 to 40 inches.

The Shelocta soils have high available water capacity and moderate permeability. Runoff is rapid. Natural fertility is medium, and organic matter content is moderate. Reaction of the unlimed soil ranges from strongly acid to extremely acid. The root zone extends to a depth of 40 to 60 inches.

These soils are mostly wooded, but some areas are used for pasture and hay. They have poor potential for farming and most urban uses. They have better potential for trees and grasses.

The hazard of erosion is too severe for these soils to be used for cultivated crops. The soils are suitable for pasture and hay, but harvesting of hay is difficult on the steep slopes. Because of the slope and erosion hazard, management of vegetation for ground cover and soil protection is important. Pasture mixtures that produce satisfactory forage, provide adequate ground cover, and require the least amount of renovation are needed. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the chief management needs. The Shelocta soils have a deeper root zone and support a more vigorous stand of pasture plants than the Latham soils.

Woodland productivity potential is moderately high for the Latham soils on north- and east-facing slopes and

moderate on south- and west-facing slopes. The Shelocta soils have high productivity potential on north- and east-facing slopes and moderately high potential on south- and west-facing slopes. The erosion hazard and equipment limitations are management concerns caused by slope and a clayey subsoil. Plant competition is also a management concern for conifers on north- and east-facing slopes.

These soils are limited for most urban uses by the steep slopes. In some places these soils are used for homesites, and the cut and fill areas are subject to slips and erosion. Capability subclass VIe; Latham part in woodland ordination 3c (north aspect) and 4c (south aspect); Shelocta part in woodland ordination 2r (north aspect) and 3r (south aspect).

LsF—Latham-Shelocta silt loams, 30 to 50 percent slopes. These very steep soils are on side slopes. Some areas are long and narrow and are above areas of Berks and Cranston soils. Other areas extend the length of the hillside. The moderately deep, moderately well drained Latham soils are on upper convex side slopes and make up about 45 percent of the complex. The deep, well drained Shelocta soils, which make up about 30 percent of the complex, are on smooth lower side slopes and in coves. The areas of this complex range from 20 to several hundred acres. These soils are so intermingled that mapping them separately was not practical.

In a representative profile of a Latham soil in this complex, the surface layer is brown silt loam about 5 inches thick. The subsoil is about 33 inches thick. It is strong brown light silty clay loam in the upper part. The lower part is strong brown and light olive brown heavy silty clay loam or silty clay with light olive gray mottles. Light olive brown shale is at a depth of 38 inches.

In a representative profile of a Shelocta soil in this complex, the surface layer is dark grayish brown silt loam about 5 inches thick. The subsoil is about 48 inches thick. It is strong brown silt loam or light silty clay loam in the upper part and yellowish brown light silty clay loam or gravelly silt loam in the lower part. The substratum, to a depth of 74 inches, is yellowish brown gravelly silt loam.

Included with this complex in mapping are small areas of Gilpin, Berks, and Cranston soils and small areas on steep breaks of a soil that is shallower than the Latham soil in this complex. Also included are small areas of a deep, sandy colluvial soil, a small acreage of Vandalia soils, and small areas where stones cover 2 percent or more of the surface.

The Latham soils have moderate available water capacity and slow or very slow permeability. Runoff is rapid. Natural fertility and organic matter content are low. Reaction of the unlimed soil ranges from strongly acid to extremely acid. The root zone and depth to shale bedrock range from 20 to 40 inches.

The Shelocta soils have high available water capacity and moderate permeability. Runoff is rapid. Natural fertility is medium, and organic matter content is moderate. Reaction of the unlimed soil ranges from strongly acid to extremely acid. The root zone extends to a depth of 40 to 60 inches.

Most of this complex is wooded, but some areas are used for pasture. This complex has poor potential for farming and most urban uses. It is better suited to trees and woodland wildlife habitat.

These soils are not suited to cultivation because of the very steep slopes and the hazard of erosion. Some areas are used for pasture, but most are too steep for the use of modern machinery. Stands of pasture grasses are difficult to establish and maintain. If these soils are used for pasture, grasses and legumes that produce good plant cover and require the least amount of renovation are needed. Overgrazing reduces the stand of desirable grasses and legumes and results in excessive erosion.

This complex is suited to trees, and most of the acreage is wooded. Woodland productivity potential is moderately high for the Latham soils on north- and east-facing slopes and moderate on south- and west-facing slopes. Shelocta soils have high productivity potential on north- and east-facing slopes and moderately high potential on south- and west-facing slopes. The erosion hazard and equipment limitations are management concerns caused by the very steep slopes and a clayey subsoil. Plant competition is a management concern for Shelocta soils on north- and east-facing slopes.

These soils are limited for most urban uses by very steep slopes. Capability subclass VIIe; Latham part in woodland ordination 3c (north aspect) and 4c (south aspect); Shelocta part in woodland ordination 2r (north aspect) and 3r (south aspect).

LtA—Licking silt loam, 0 to 2 percent slopes. This deep, moderately well drained soil is on broad stream terraces in areas that range from 10 to 40 acres in size.

In a representative profile the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil is about 35 inches thick. It is yellowish brown silt loam or light silty clay loam in the upper part. The lower part of the subsoil is yellowish brown silty clay with gray mottles. The substratum, to a depth of 68 inches, is light olive brown, stratified silty clay and silty clay loam with yellowish brown and light gray mottles.

Included with this soil in mapping are small areas of McGary, Markland, and Tilsit soils. Also included are areas of a soil that is similar to this Licking soil but that is very strongly acid to a depth of 40 inches and has a thicker silt mantle and a few areas of soil that have slopes of 2 to 6 percent.

The available water capacity of this soil is moderate, and permeability is moderately slow in the upper part and very slow in the lower part. Runoff is medium. Natural fertility is medium, and organic matter content is moderate. This soil is easy to till and can be worked throughout a fairly wide range of moisture content without clodding or crusting. In unlimed areas the surface layer ranges from medium acid to very strongly acid. The lower part of the subsoil ranges from medium acid to neutral. The root zone extends to a depth of 40 to 60 inches.

This soil has good potential for farming, and most of the acreage is used for cultivated crops, hay, and pasture. It is limited for many urban uses by wetness and a slowly permeable subsoil.

Wetness, which is caused by slow runoff, and slow permeability are the main limitations in the use of this soil. The hazard of erosion is slight. The response of crops to fertilizer and lime is good. Corn and soybeans are suited to this soil if it is properly drained. Open-ditch drainage in combination with grassed waterways is generally better suited to this soil than are other systems. Tobacco is seldom grown on this soil. Minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help in maintaining tilth and organic matter content.

This soil is suited to pasture and hay, and production potential is good if the soil is properly managed. Pasture and hay plants that tolerate some wetness are needed. Pasture renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the chief management needs.

Although most of this soil is cleared, it has high productivity potential for quality hardwoods. Plant competition from undesirable grasses, weeds, and woody plants is a management concern. Capability subclass IIw; woodland ordination 2o.

Lu—Lindside silt loam (0 to 4 percent slopes). This deep, moderately well drained soil is on flood plains and alluvial fans. Areas are oval or long and narrow and range from 3 to 20 acres.

In a representative profile the surface layer is dark brown silt loam about 9 inches thick. The subsoil, about 32 inches thick, is dark brown silt loam or light silty clay loam with grayish brown mottles in the lower 20 inches. The substratum, to a depth of 64 inches, is brown silt loam with grayish brown and yellowish brown mottles.

Included with this soil in mapping are small areas of Newark and Huntington soils.

The available water capacity of this soil is high, and permeability is moderate. Runoff is medium. Natural fertility is high, and organic matter content is moderate. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. Reaction ranges from medium acid to slightly acid in the upper part of the profile and from medium acid to neutral in the lower part. The root zone extends to a depth of 40 to 55 inches.

This soil has good potential for farming and is used for cultivated crops, hay, and pasture. It is limited for many urban uses by flooding and a seasonal high water table.

This soil is suited to most cultivated crops grown in the area, such as corn, soybeans, small grain, hay, and pasture. Response of crops to fertilizer and lime is good. Flooding and a seasonal high water table at a depth of 1.5 to 3 feet are the main limitations in the use of this soil. Flooding usually occurs in late winter and early spring before crops are planted. Artificial drainage may be beneficial for some crops. This soil can be cropped year after year if it is properly fertilized and managed to help maintain the organic matter content. Minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help in maintaining tilth and organic matter content.

This soil is suited to most pasture and hay plants, but species should be selected that will tolerate some wetness. Some hay plants are damaged by flooding. Pasture renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the management needs.

Although most of this soil is cleared, it has very high productivity potential for woodland. Plant competition is a management concern. Capability class I; woodland ordination 1o.

MkB—Markland silt loam, 2 to 6 percent slopes. This deep, well drained to moderately well drained soil is on terraces in broad valleys. Slopes are slightly convex. Areas are long and narrow to oval and range from 3 to 40 acres in size.

In a representative profile the surface layer is dark grayish brown heavy silt loam about 7 inches thick. The subsoil, about 33 inches thick, is yellowish brown silty clay and has gray mottles in the lower part. The substratum, to a depth of 74 inches, is light olive brown. It is silty clay in the upper part and silt loam in the lower part.

Included with this soil in mapping are small areas of Licking and McGary soils.

The available water capacity of this soil is moderate, and permeability is slow. Runoff is medium. Natural fertility and organic matter content are low. This soil is somewhat difficult to till. The subsoil is plastic and has a high shrink-swell potential. Reaction ranges from slightly acid to very strongly acid in the surface layer and subsoil and from slightly acid to moderately alkaline in the substratum. The root zone extends to a depth of 36 to 44 inches.

This soil has fair potential for farming. Most of the acreage is in hay and pasture, and a small acreage is in corn, soybeans, and tobacco. The soil is limited for many urban uses by the clayey, slowly permeable subsoil.

Although this soil is suited to cultivated crops, it is better suited to pasture and hay. It is somewhat difficult to till because of the silty clay subsoil. The response of crops to fertilizer and lime is fair. The erosion hazard is moderate, and measures that control erosion are needed if cultivated crops are grown. Contour tillage, stripcropping, minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help in controlling erosion and maintaining organic matter content.

This soil is suited to pasture and hay, and production potential is moderate if the soil is properly managed.

Plant species that produce adequate forage and provide satisfactory ground cover are needed. Pasture renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the chief management needs.

This soil is suited to trees, and productivity potential is high. Plant competition is a management concern. Capability subclass IIIe; woodland ordination 2c.

MlC—Markland soils, 6 to 12 percent slopes. This deep, well drained to moderately well drained soil is on stream terraces. It is in long, narrow areas adjacent to small drainageways. Slopes are short and smooth, and areas range from 4 to 15 acres in size.

In a representative profile the surface layer is dark yellowish brown light silty clay loam about 7 inches thick. The subsoil, about 30 inches thick, is yellowish brown silty clay and has gray mottles in the lower part. The substratum, to a depth of 74 inches, is light olive brown. It consists of silty clay in the upper part and silt loam in the lower part.

Included with this soil in mapping are small areas of Licking soils and small areas of uneroded and severely eroded soils. Also included are a few areas that have a few deep gullies.

The available water capacity of this soil is moderate, and permeability is slow. Runoff is rapid. Natural fertility and organic matter content are low. This soil is difficult to till. The subsoil is plastic and sticky and has a high shrink-swell potential. Reaction ranges from slightly acid to very strongly acid in the surface layer and subsoil and from slightly acid to moderately alkaline in the substratum. The root zone extends to a depth of 32 to 40 inches.

The soil has poor potential for farming, and most of the acreage is in pasture and hay. It is limited for most urban uses by the clayey, slowly permeable subsoil.

Although this soil is suited to occasional cultivation, it is better suited to pasture and hay. Response of crops to fertilizer and lime is fair. This soil is difficult to till because of the silty clay loam surface layer. The hazard of erosion is severe, and measures that control erosion are needed if cultivated crops are grown. Contour tillage, stripcropping, minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help in controlling erosion and maintaining organic matter content.

This soil is suited to pasture and hay, and production potential is moderate if the soil is properly managed. Plant species that provide satisfactory ground cover to prevent further erosion are needed. Pasture renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the chief management needs.

Although most of this soil is cleared, it has high productivity potential for woodland. The erosion hazard, equipment limitation, and plant competition are management concerns. Capability subclass IVe; woodland ordination 2c.

MlD—Markland soils, 12 to 30 percent slopes. This deep, well drained to moderately well drained soil is on stream terraces. Slopes are irregular and less than 100 feet long. Areas are long narrow and along drainageways. They range from 5 to 15 acres in size.

In a representative profile the surface layer is dark yellowish brown light silty clay loam about 5 inches thick. The subsoil, about 30 inches thick, is yellowish brown silty clay and has gray mottles in the lower part. The substratum, to a depth of 74 inches, is light olive brown silty clay in the upper part and silt loam in the lower part.

Included with this soil in mapping are areas of uneroded and severely eroded soils with a few deep gullies. Also included are long, narrow areas of sandy loam to silty clay soils on short, steep breaks between terraces and flood plains.

The available water capacity of this soil is moderate, and permeability is slow. Runoff is rapid or very rapid. Natural fertility and organic matter content are low. This soil is difficult to till and has a plastic and sticky subsoil with a high shrink-swell potential. Reaction ranges from slightly acid to very strongly acid in the surface layer and subsoil and from slightly acid to moderately alkaline in the substratum. The root zone extends from 30 to 40 inches.

This soil has poor potential for farming, and most of the acreage is in pasture or woods. Some areas are idle. The soil is limited for urban uses by the steep slopes and clayey subsoil.

The hazard of erosion is too severe for this soil to be used for cultivated crops. The soil is suitable for pasture and hay, but the steep slopes and gullies in some places hinder the use of farm machinery. Because of the slope and erosion hazard, management of vegetation for ground cover and soil protection is important. Pasture mixtures that produce satisfactory forage, provide adequate ground cover, and require the least amount of renovation are needed. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the chief management needs.

This soil has high productivity potential for woodland. Equipment limitations, erosion hazard, seedling mortality, and plant competition are the management concerns. Capability subclass VIe; woodland ordination 2c.

Mm—McGary silt loam (0 to 2 percent slopes). This deep, somewhat poorly drained soil is on broad stream terraces. Areas range from 5 to 30 acres in size.

In a representative profile the surface layer is grayish brown heavy silt loam about 6 inches thick. The subsoil, about 30 inches thick, is yellowish brown silty clay loam in the upper part and dark yellowish brown and light brownish gray silty clay in the lower part. The substratum, to a depth of 72 inches, is mottled yellowish brown and gray silty clay loam.

Included with this soil in mapping are small areas of Markland and Licking soils.

The available water capacity of this soil is moderate, and permeability is slow or very slow. Runoff is slow. Natural fertility and organic matter content are low. This soil is somewhat difficult to till. The subsoil is plastic and sticky and has a high shrink-swell potential. A seasonal high water table is at a depth of 1 to 3 feet. Reaction ranges from slightly acid to very strongly acid in the surface layer and subsoil and from slightly acid to mildly alkaline in the substratum. The root zone extends to a depth of 36 to 50 inches.

This soil has fair potential for farming, and most of the acreage is in hay and pasture. A smaller acreage is used for corn and soybeans. This soil is limited for most urban uses by wetness and a slowly permeable subsoil.

Wetness, which is caused by slow runoff, and slow permeability are the main limitations in the use of this soil for cultivated crops. When properly drained, this soil is commonly used for corn and soybeans, but crops are damaged by wetness in some years. Tobacco is seldom grown on this soil. Response of crops to fertilizer and lime is fair. The hazard of erosion is slight. Open-ditch drainage, in combination with grassed waterways, is generally better suited to this soil than are other systems. Minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help in maintaining desirable soil structure and organic matter content.

This soil is suited to pasture and hay plants that will tolerate some wetness. Production potential is moderate if the soil is properly managed. Pasture renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, drainage, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the chief management needs.

Although most of this soil is cleared, it has moderately high productivity potential for woodland. The management concerns are equipment limitations caused by the seasonal high water table and plant competition. Capability subclass IIIw; woodland ordination 3w.

MnB—Monongahela silt loam, 2 to 6 percent slopes. This deep, moderately well drained soil is on high stream terraces. Areas are on long convex ridges and broad flats ranging from 10 to 100 acres in size.

In a representative profile the surface layer is brown silt loam about 6 inches thick. The subsoil, about 45 inches thick, is brown, strong brown, and yellowish brown silt loam in the upper 24 inches. The lower 21 inches is a firm, brittle and compact fragipan of yellowish brown, strong brown, and light gray fine sandy loam. The substratum, to a depth of 65 inches, is yellowish brown sandy loam.

Included with this soil in mapping are small areas of Allegheny and Riney soils. Also included are areas of soils that are similar to this Monongahela soil but that have a reddish subsoil.

The available water capacity of this soil is moderate, and permeability is moderate above the fragipan and moderately slow or slow in the fragipan. Runoff is medium. Natural fertility and organic matter content are low. This soil is easy to till and can be worked throughout a fairly wide range of moisture content without clodding or crusting. In unlimed areas the surface layer and subsoil range from strongly acid to very strongly acid. The root zone and depth to fragipan range from 24 to 30 inches.

This soil is used mostly for homesites and gardens, and a few areas are in pasture and hay. It is limited for urban uses by the fragipan at a depth of 24 to 30 inches.

Although most of this soil is in urban uses, it is suited to cultivated crops. If this soil is cultivated, the hazard of erosion is moderate and measures that control erosion and reduce runoff are needed. Contour tillage, stripcropping, minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help control erosion and maintain the organic matter content.

This soil is suited to most pasture and hay plants, and production potential is moderate if the soil is properly managed. The fragipan at a depth of 24 to 30 inches restricts rooting depth and limits production potential during dry seasons. Plant species that produce adequate forage and provide satisfactory ground cover are needed. Pasture renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the chief management needs.

Although most of this soil is cleared, it has moderately high productivity potential for woodland.

This soil is limited for most urban uses by a seasonal high water table at a depth of 1.5 to 3 feet and slow permeability. Capability subclass IIe; woodland ordination 3o.

MnC—Monongahela silt loam, 6 to 12 percent slopes. This deep, moderately well drained soil is on high stream terraces. Areas are on long convex ridges and range from 5 to 20 acres in size.

In a representative profile the surface layer is brown silt loam about 6 inches thick. The subsoil, about 45 inches thick, is brown, strong brown, and yellowish brown silt loam in the upper 24 inches. The lower 21 inches is a firm, brittle and compact fragipan of yellowish brown, strong brown, and light gray fine sandy loam. The substratum, to a depth of 65 inches, is yellowish brown sandy loam.

Included with this soil in mapping are small areas of Allegheny and Riney soils and a few areas of eroded soils that have a fragipan at a depth of 24 to 26 inches. Also included are some areas of soils that are similar to this Monongahela soil but that have a reddish subsoil.

The available water capacity of this soil is moderate, and permeability is moderate above the fragipan and moderately slow or slow in the fragipan. Runoff is medium. Natural fertility and organic matter content are low. This soil is easy to till and can be worked throughout a

fairly wide range of moisture content without clodding or crusting. In unlimed areas, the surface layer and subsoil range from strongly acid to very strongly acid. The root zone and depth to fragipan range from 24 to 30 inches.

This soil is used mostly for homesites and gardens. A few areas are wooded or are idle, and a few areas are used for pasture and hay. This soil is limited for some urban uses by the fragipan at a depth of 24 to 30 inches.

Although most of this soil is in urban areas, it is suited to cultivated crops. The response of crops to fertilizer and lime is fair. The fragipan at a depth of about 30 inches restricts soil drainage and rooting depth. If this soil is cultivated, the hazard of erosion is severe and measures that control erosion and reduce runoff are needed. Contour tillage, stripcropping, minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help control erosion and maintain the organic matter content.

This soil is suited to most pasture and hay plants, and production potential is moderate if the soil is properly managed. The fragipan restricts rooting depth and limits production potential during dry seasons. Plant species that produce adequate forage and provide satisfactory ground cover are needed. Pasture renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the chief management needs.

Although most of this soil is cleared, it has moderately high productivity potential for woodland.

This soil is limited for most urban uses by slope and a seasonal high water table at a depth of 1.5 to 3 feet. Capability subclass IIIe; woodland ordination 3o.

Mo—Morehead silt loam (0 to 4 percent slopes). This deep, somewhat poorly drained to moderately well drained soil is on low terraces and alluvial fans. Slopes are uniform to slightly concave. Areas are mostly long and narrow and range from 5 to 30 acres in size.

In a representative profile the surface layer is dark grayish brown silt loam about 7 inches thick. The subsoil, about 43 inches thick, is yellowish brown silt loam or light silty clay loam and has grayish brown and light brownish gray mottles below a depth of 14 inches. The substratum, to a depth of 72 inches, is yellowish brown and gray light silty clay loam.

Included with this soil in mapping are small areas of Cotaco and Stendal soils. Also included are small areas of somewhat poorly drained soils with a fragipan.

The available water capacity of this soil is high, and permeability is moderate. Runoff is slow. Natural fertility is medium, and organic matter content is low. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. In unlimed areas the surface layer and the subsoil range from strongly acid to very strongly acid. The root zone extends to a depth of 40 to 55 inches.

This soil has good potential for farming when drained. Most of the acreage is in cultivated crops, hay, and pasture. This soil is limited for most urban uses by a seasonal high water table at a depth of 1 to 2 feet.

This soil is suited to most cultivated crops when drained. Unless drained, it is poorly suited to most row crops and to many hay and pasture plants. Where drained, this soil is commonly used for corn, soybeans, and pasture and hay plants that will tolerate some wetness. Response of crops to fertilizer and lime is good. The hazard of erosion is slight. Tile drainage is the system generally used. Minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help in maintaining tilth and organic matter content.

If this soil is properly managed, production potential is high for pasture and hay plants that will tolerate some wetness. Pasture renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, drainage, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the chief management needs.

Although most of this soil is cleared, it has high productivity potential for woodland. The management concerns are plant competition and equipment limitations caused by the seasonal high water table.

This soil is limited for most urban uses by a seasonal high water table at a depth of 1 to 2 feet. Capability subclass IIw; woodland ordination 2w.

Nk—Newark silt loam (0 to 4 percent slopes). This deep, somewhat poorly drained soil is on flood plains and alluvial fans. Slopes are uniform to slightly concave. Areas are mostly long and narrow and range from 4 to 30 acres in size.

In a representative profile the surface layer is grayish brown silt loam about 7 inches thick. The subsoil, about 27 inches thick, is brown and grayish brown silt loam. The substratum, to a depth of 72 inches, is gray and light olive brown light silty clay loam.

Included with this soil in mapping are small areas of Lindside and Bonnie soils.

The available water capacity of this soil is high, and permeability is moderate. Runoff is very slow. Natural fertility is high, and organic matter content is moderate. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. The surface layer and subsoil range from medium acid to neutral. The root zone extends to a depth of 40 to 60 inches.

This soil has good potential for farming when drained, and most of the acreage is in row crops, hay, and pasture. It is limited for most urban uses by flooding and a seasonal high water table.

This soil is suited to corn and soybeans when drained. Tobacco is seldom grown on this soil. Flooding and a seasonal high water table at a depth of 1/2 to 1 1/2 feet are the main limitations in the use of this soil for crops. Flooding usually occurs in late winter and early spring before crops are planted. Tile drainage is more commonly used on this soil than are other systems. This soil can be

cropped year after year if it is properly fertilized and managed to help maintain the organic matter content. Minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help in maintaining tilth and organic matter content.

This soil is suited to pasture and hay plants that will tolerate some wetness. Some hay plants are damaged by flooding. Pasture renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, drainage, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the management needs.

Although most of this soil is cleared, it has very high productivity potential for woodland. The management concerns are plant competition and equipment limitations caused by the seasonal high water table. Capability subclass IIw; woodland ordination 1w.

No—Nolin silt loam (0 to 4 percent slopes). This deep, well drained soil is on flood plains in narrow to fairly wide valleys. Slopes are mostly uniform. Areas range from 6 to 50 acres or more in size.

In a representative profile the surface layer is dark brown silt loam about 9 inches thick. The subsoil, about 31 inches thick, is dark brown or dark yellowish brown silt loam with light brownish gray and dark brown mottles. The substratum, to a depth of 70 inches, is dark yellowish brown silt loam with light brownish gray and dark brown mottles.

Included with this soil in mapping are small areas of Lindside and Cuba soils and a few small areas of soils that have short slopes of greater than 4 percent.

The available water capacity of this soil is high, and permeability is moderate. Runoff is slow. Natural fertility is high, and organic matter content is moderate. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. In unlimed areas the surface layer and subsoil range from medium acid to neutral. The root zone extends to a depth of 40 to 60 inches.

This soil has high potential for farming, and most of the acreage is in cultivated crops. It is limited for most urban uses by flooding.

Corn and soybeans are well suited to this soil and are commonly grown. A small acreage is used for hay, pasture, or small grain. This soil is subject to flooding in winter or early spring before crops are planted. Tobacco is seldom grown on this soil, and small grain and hay crops are sometimes damaged by flooding. This soil is productive and can be cropped intensively if properly fertilized and managed to help maintain the organic matter content. Minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help in maintaining tilth and the organic matter content.

All pasture and hay crops commonly grown in the area are suited to this soil, but some hay crops are damaged in places by flooding. The management needs are maintaining the desired species, controlling weeds, using proper stocking rates and rotational grazing, and applying fertilizer.

This soil is suited to trees, and productivity potential is very high. Plant competition is a management concern. Capability class I; woodland ordination 1o.

OtA—Otwell silt loam, 0 to 2 percent slopes. This deep, moderately well drained soil is on terraces in broad valleys. Slopes are uniform to slightly convex. Areas are long and parallel to drainageways and range from 10 to 30 acres in size.

In a representative profile the surface layer is dark brown silt loam about 10 inches thick. The subsoil is strong brown and brown light silty clay loam in the upper 15 inches. The lower 31 inches is a firm, brittle and compact fragipan of brown heavy silt loam with light brownish gray mottles. The substratum, to a depth of 74 inches, is brown heavy silt loam with light brownish gray mottles.

Included with this soil in mapping are small areas of Weinbach and Elk soils and areas of a Newark soil in long, narrow depressions.

The available water capacity of this soil is moderate, and permeability is moderate above the fragipan and very slow in the fragipan. Runoff is medium. Natural fertility is medium, and organic matter content is moderate. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. In unlimed areas the surface layer and subsoil range from very strongly acid through medium acid. The root zone and depth to fragipan range from 20 to 30 inches.

This soil has good potential for farming and is used for cultivated crops, hay, and pasture. It is limited for some urban uses by the slowly permeable fragipan at a depth of 20 to 30 inches.

This soil is suited to cultivated crops commonly grown in the area, such as corn, soybeans, tobacco, and small grain. Tobacco is sometimes damaged by flooding. The response of crops to fertilizer and lime is good, and the hazard of erosion is slight. The fragipan restricts soil drainage and rooting depth. This soil can be cropped intensively if it is properly fertilized and managed to help maintain the organic matter content. Minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help in maintaining tilth and organic matter content.

This soil is suited to most pasture and hay plants, and production potential is good if the soil is properly managed. The fragipan restricts rooting depth and limits production potential during dry seasons. Alfalfa is seldom grown on this soil. Plant species that produce adequate forage and provide satisfactory ground cover are needed. Pasture renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the chief management needs.

Although most of this soil is cleared, it has moderately high productivity potential for woodland.

This soil is limited for many urban uses by a seasonal high water table at a depth of 20 to 30 inches. Capability subclass IIw; woodland ordination 3o.

Pf—Pope fine sandy loam (0 to 4 percent slopes). This deep, well drained soil is on flood plains in narrow to fairly wide valleys. Most areas are long and narrow and occur near the stream channel. Areas range from 3 to 30 acres or more in size.

In a representative profile the surface layer is brown fine sandy loam about 8 inches thick. The subsoil, about 30 inches thick, is dark yellowish brown fine sandy loam. The substratum, to a depth of 65 inches, is yellowish brown loamy sand.

Included with this soil in mapping are small areas of Cuba soils. Also included are a small acreage of a soil that is more sandy throughout than this Pope soil and a few areas of a soil that is less acid.

The available water capacity of this soil is moderate, and permeability is moderately rapid. Runoff is slow. Natural fertility and organic matter content are low. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. In unlimed areas the surface layer and subsoil range from strongly acid to extremely acid. The root zone extends to a depth of 30 to 48 inches.

This soil has good potential for farming and is used for cultivated crops, hay, and pasture. It is limited for urban uses by flooding.

This soil is suited to corn and soybeans. It is subject to flooding in winter and early spring and occasionally during the growing season. Tobacco is seldom grown on this soil. Response of crops to fertilizer and lime is good. The hazard of erosion is slight, but a few areas near stream channels are subject to scouring during ovrflow. This soil can be cropped year after year if it is managed to maintain fertility and organic matter content. Minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help in maintaining tilth and organic matter content.

All pasture and hay crops commonly grown in the area are suited to this soil, but some hay crops are damaged in places by flooding. The management needs are maintaining the desired species, controlling weeds, using proper stocking rates and rotational grazing, and applying lime and fertilizer.

This soil is suited to trees, and productivity potential is very high. Plant competition is a management concern. Capability class I; woodland ordination 1o.

Pg—Pope gravelly silt loam (0 to 4 percent slopes). This deep, well drained soil is on first bottoms and alluvial fans in narrow to fairly wide valleys. Areas are variable in size and shape. In some places they are long and narrow and are near the stream channels, and in other places they extend the width of the valleys. Areas range from 10 to 100 acres in size.

In a representative profile the surface layer is dark brown gravelly silt loam about 7 inches thick. The subsoil, about 20 inches thick, is dark brown silt loam. The substratum, to a depth of 60 inches, is brown very gravelly loam.

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

The available water capacity of this soil is moderate, and permeability is moderately rapid. Runoff is slow. Natural fertility and organic matter content are low. In some areas this soil is difficult to till because of the gravel content in the surface layer. This soil can be tilled throughout a wide range of moisture content without clodding or crusting. In unlimed areas the surface layer and subsoil range from strongly acid to extremely acid. The root zone extends to a depth of 30 to 40 inches.

This soil has fair potential for farming and is used for cultivated crops, hay, and pasture. It is limited for urban uses by flooding.

This soil is suited to corn, soybeans, and tobacco. Most areas of this soil are susceptible to flooding. This soil is droughty, and potential productivity is often reduced by lack of moisture. Response of crops to fertilizer and lime is good. The hazard of erosion is slight, but some areas near stream channels are subject to scouring during overflow. This soil can be cropped intensively if good management is used to maintain tilth and organic matter content. Minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help in maintaining tilth and organic matter content.

All pasture and hay crops commonly grown in the area are suited to this soil, but some hay crops are damaged in places by flooding. The management needs are maintaining the desired species, controlling weeds, using proper stocking rates and rotational grazing, and applying lime and fertilizer.

This soil is suited to trees, and productivity potential is very high. Plant competition is a management concern. Capability subclass IIs; woodland ordination 1o.

RnC—Riney loam, 6 to 12 percent slopes. This deep, well drained soil is on high stream terraces. Slopes are convex. Areas are on narrow to broad ridges and range from 5 to 100 acres in size.

In a representative profile the surface layer is dark grayish brown loam about 6 inches thick. The subsurface layer is yellowish brown loam about 7 inches thick. The subsoil, to a depth of 76 inches, is strong brown, yellowish red, and red sandy clay loam and clay loam.

Included with this soil in mapping are small areas of Allegheny and Monongahela soils and a few areas of soils that have slopes of 2 to 6 percent. Also included are small areas of a soil that is similar to this Riney soil but that has more silt in the upper 24 inches.

The available water capacity of this soil is high, and permeability is moderately rapid. Runoff is medium. Natural fertility and organic matter content are low. In unlimed areas the surface layer and subsoil range from strongly acid to extremely acid. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. The root zone extends to a depth of 50 to 60 inches.

Most areas of this soil are used for homesites. Some are used for pasture and hay, and a few areas are idle. This soil has fair potential for farming and is suited to most urban uses.

Although this soil is suited to most cultivated crops, it is better suited to pasture and hay crops. Response of crops to fertilizer and lime is good. The hazard of erosion is severe, and measures that control erosion are needed if cultivated crops are grown. Contour tillage, stripcropping, minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help in controlling erosion and maintaining organic matter content.

This soil is suited to pasture and hay plants commonly grown in the area, and production potential is good if the soil is properly managed. Plant species that produce adequate forage and provide satisfactory ground cover are needed. Pasture renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the management needs.

Although most of this soil is cleared, it has high productivity potential for woodland. Plant competition is a management concern.

This soil is limited for sewage lagoons and sanitary landfills by seepage. Capability subclass IIIe; woodland ordination 2o.

ScB—Shelocta gravelly silt loam, 2 to 6 percent slopes. This deep, well drained soil is in narrow valleys. It is on small alluvial fans and in long, narrow areas that range from 3 to 20 acres in size.

In a representative profile the surface layer is dark brown gravelly silt loam about 7 inches thick. The subsoil, about 35 inches thick, is strong brown gravelly silt loam or light silty clay loam. The substratum, to a depth of 60 inches, is strong brown or yellowish brown gravelly silt loam or light silty clay loam.

Included with this soil in mapping are small areas of Pope gravelly silt loam. Also included are a small acreage of a soil that contains more sand throughout than this Shelocta soil and a few areas of soils that have a darker surface layer.

The available water capacity of this soil is high, and permeability is moderate. Runoff is medium. Natural fertility is medium, and organic matter content is moderate. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. In unlimed areas the surface layer and subsoil range from strongly acid to extremely acid. The root zone extends to a depth of 42 to 60 inches.

This soil has good potential for farming, and most of the acreage is in cultivated crops, hay, and pasture. Some areas are used for homesites and gardens. This soil is suited to most urban uses.

Crops commonly grown in the area, such as corn, tobacco, and small grain, are suited to this soil. Response of crops to fertilizer and lime is good. The erosion hazard is moderate, and measures that control erosion are needed if cultivated crops are grown. Contour tillage, stripcropping, minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system, help in maintaining organic matter content.

This soil is suited to pasture and hay plants commonly grown in the area, and production potential is high if the soil is properly managed. Plant species that produce adequate forage and provide satisfactory ground cover are needed. Pasture renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the chief management needs.

Although most of this soil is cleared, it has very high productivity potential for woodland. Plant competition is a management concern.

This soil is limited for sewage lagoons by seepage. Capability subclass IIe; woodland ordination 2o.

ScC—Shelocta gravelly silt loam, 6 to 12 percent slopes. This deep, well drained soil is on alluvial fans and colluvial side slopes in narrow valleys. The areas consist of small fans and long, narrow strips at the base of steeper slopes and range from 2 to 15 acres in size.

In a representative profile the surface layer is dark brown gravelly silt loam about 7 inches thick. The subsoil, about 35 inches thick, is strong brown gravelly silt loam or light silty clay loam. The substratum, to a depth of 60 inches, is strong brown or yellowish brown gravelly silt loam or light silty clay loam.

Included with this soil in mapping are small areas of Allegheny soils and small areas of a soil with a darker surface layer than this Shelocta soil. Also included are areas of soils that have little or no gravel in the surface layer.

The available water capacity of this soil is high, and permeability is moderate. Runoff is medium. Natural fertility is medium, and organic matter content is moderate. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. In unlimed areas the surface layer and subsoil range from strongly acid to extremely acid. The root zone extends to a depth of 42 to 60 inches.

Most of the soil has been cleared and is used for cultivated crops, hay, and pasture. A few areas are used for homesites and gardens. This soil has fair potential for farming and is suited to most urban uses.

Although this soil is suited to most cultivated crops, it is better suited to pasture and hay crops. Response of crops to fertilizer and lime is good. The hazard of erosion is severe, and measures that control erosion are needed if cultivated crops are grown. Contour tillage, stripcropping, minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help in controlling erosion and maintaining organic matter content.

This soil is suited to pasture and hay plants commonly grown in the area, and production potential is high if the soil is properly managed. Plant species that produce adequate forage and provide satisfactory ground cover are needed. Pasture renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the management needs.

Although most of this soil is cleared, it has very high productivity potential for woodland. Plant competition is a management concern.

This soil is limited for sewage lagoons by slope and seepage. Capability unit IIIe; woodland ordination 2o.

ScD—Shelocta gravelly silt loam, 12 to 20 percent slopes. This deep, well drained soil is on lower colluvial side slopes. Slopes are slightly concave and are less than 200 feet in length. The areas are long, narrow strips at the base of steeper slopes and range from 3 to 30 acres in size.

In a representative profile the surface layer is dark brown gravelly silt loam about 7 inches thick. The subsoil, about 35 inches thick, is strong brown gravelly silt loam or light silty clay loam. The substratum, to a depth of 60 inches, is strong brown or yellowish brown gravelly silt loam or light silty clay loam.

Included with this soil in mapping are small areas of Wernock soils and small areas of soils that do not have gravel in the surface layer. Also included is a soil that is similar to this Shelocta soil but contains more sand throughout.

The available water capacity of this soil is high, and permeability is moderate. Runoff is medium. Natural fertility is medium, and organic matter content is moderate. This soil can be worked throughout a wide range of moisture content without clodding or crusting. In unlimed areas the surface layer and subsoil ranges from strongly acid to extremely acid. The root zone extends to a depth of 42 to 60 inches.

Most areas of this soil are in hay and pasture, but a few areas are used for cultivated crops. This soil is limited for cultivated crops and for many urban uses. It is better suited to grasses and trees.

Although this soil is suited to occasional cultivation, it is better suited to pasture and hay crops. If this soil is cultivated, the hazard of erosion is very severe, and measures that control erosion and reduce runoff are needed. Contour tillage, stripcropping, minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help control erosion and maintain organic matter content.

This soil is suited to all pasture and hay plants grown in the area, and production potential is high if the soil is properly managed. Plant species that produce adequate forage and provide satisfactory ground cover are needed. Renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the chief management needs.

Although most of this soil is cleared, it is well suited to trees. Productivity potential is high on north- and east-facing slopes and moderately high on south- and west-facing slopes. Plant competition and equipment limitations are management concerns.

This soil is limited for most urban uses by moderately steep slopes. Capability subclass IVe; woodland ordination 2r (north aspect) and 3r (south aspect).

SgD—Steinsburg sandy loam, 6 to 20 percent slopes. This moderately deep, well drained soil is on narrow ridgetops. Slopes are convex and are less than 150 feet long. Areas are long and narrow and range from 3 to 20 acres in size.

In a representative profile the surface layer is dark grayish brown sandy loam about 3 inches thick. The subsoil, about 18 inches thick, is yellowish brown sandy loam with many sandstone fragments in the lower part. The substratum, to a depth of 29 inches, is yellowish brown channery sandy loam underlain by soft, rippable sandstone.

Included with this soil in mapping are small areas of Gilpin soils and a small acreage of a soil that is similar to this Steinsburg soil but that is shallower. Also included are soils with a clay loam subsoil.

The available water capacity of the soil is low, and permeability is moderately rapid. Runoff is medium. Natural fertility and organic matter content are low. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. In unlimed areas the surface layer and subsoil range from strongly acid to extremely acid. The root zone and depth to bedrock range from 20 to 40 inches.

Most areas of this soil are wooded, but a few are used for pasture and hay. This soil is very limited for cultivated crops and for many urban uses. It is better suited to grasses and trees.

Although this soil is suited to occasional cultivation, it is better suited to pasture and hay crops. If this soil is cultivated, the hazard of erosion is very severe and measures that control erosion and reduce runoff are needed. Contour tillage, stripcropping, minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system are needed to help control erosion and maintain the organic matter content.

This soil is suited to pasture and hay, and production potential is moderate if the soil is properly managed. The root zone ranges from 20 to 40 inches in depth, and lack of moisture limits production potential during dry seasons. Plant species that produce adequate forage and provide satisfactory ground cover are needed. Renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the chief management needs.

This soil is suited to trees, and most of the acreage is wooded. Productivity potential is moderately high. Equipment limitations are a management concern.

This soil is limited for most urban uses by slope and depth to rock. Capability subclass IVe; woodland ordination 3r.

ShF—Steinsburg stony sandy loam, 20 to 50 percent slopes. This moderately deep, well drained soil is mostly on ridges and upper side slopes. Slopes are convex and less than 300 feet long. The areas are long and narrow and range from 5 to 50 acres in size.

In a representative profile the surface layer is dark grayish brown sandy loam about 3 inches thick. The subsoil, about 18 inches thick, is yellowish brown sandy loam with many sandstone fragments in the lower part. The substratum, to a depth of 29 inches, is yellowish brown channery sandy loam underlain by soft, rippable sandstone. Stones and rock outcrops cover from less than 1 to 10 percent of the surface.

Included with this soil in mapping are small areas of Gilpin and Latham soils. Also included are small areas of a deep, sandy soil on narrow benches, and a small acreage of a soil on ridgetops that is shallower than this Steinsburg soil.

The available water capacity of this soil is low and permeability is moderately rapid. Runoff is medium. Natural fertility and organic matter content are low. Reaction of the unlimed soil ranges from strongly acid to extremely acid. The root zone and depth to bedrock range from 20 to 40 inches.

Most of this soil is wooded, but some of the smoother slopes are used for pasture. This soil has poor potential for farming and for most urban uses. It is better suited to trees and woodland wildlife habitat.

This soil is not suited to cultivation because of the steep slopes and hazard of erosion. Some areas are used for pasture, but most are too steep and stony for the use of modern machinery. Stands of grasses are difficult to establish and maintain. The root zone ranges from 20 to 40 inches in depth, and lack of moisture limits production potential during dry seasons. If these soils are used for pasture, grasses and legumes that produce good plant cover and require the least amount of renovation are needed. Overgrazing reduces the stand of desirable grasses and legumes and results in excessive erosion.

This soil is suited to trees, and most of the acreage is wooded. Productivity potential is moderately high. The erosion hazard and equipment limitations are management concerns caused by the very steep slopes.

These soils are limited for most urban uses by very steep slopes. Capability subclass VIIs; woodland ordination 3r.

Sm—Stendal silt loam (0 to 2 percent slopes). This deep, somewhat poorly drained soil is on flood plains. Slopes are smooth to slightly concave. Areas range from long and narrow to fairly wide. They are 5 to 30 acres in size.

In a representative profile the surface layer is dark grayish brown silt loam about 10 inches thick. The subsoil, about 14 inches thick, is grayish brown silt loam with strong brown mottles. The substratum, to a depth of 68 inches, is gray light silty clay loam with brown and yellowish brown mottles.

Included with this soil in mapping are small areas of Morehead and Cotaco soils on low stream terraces and small areas of Bonnie soils in depressions.

The available water capacity of this soil is high, and permeability is moderate. Runoff is very slow. Natural fertility and organic matter content are low. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. In unlimed areas the surface layer and subsoil range from strongly acid to very strongly acid. The root zone extends to a depth of 40 to 50 inches.

This soil has good potential for farming when drained, and most of the acreage is in cultivated crops, hay, and pasture. It is limited for most urban uses by flooding and a seasonal high water table.

This soil is suited to corn and soybeans when drained. Tobacco is seldom grown on this soil. Flooding and a seasonal high water table at a depth of 1/2 to 1 1/2 feet are the main limitations in the use of this soil for cultivated crops (fig. 6). Flooding usually occurs in late winter and early spring before crops are planted. Tile drainage is generally used on this soil. When drained, this soil can be cropped year after year if it is properly fertilized and managed to help maintain the organic matter content. Minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help in maintaining tilth and organic matter content.

This soil is suited to pasture and hay plants that will tolerate some wetness. Some hay plants are damaged by flooding. Pasture renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, drainage, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the management needs.

Although most of this soil is cleared, it has high productivity potential for woodland. The management concerns are plant competition and equipment limitations caused by the seasonal high water table. Capability subclass IIw; woodland ordination 2w.

Sn—Stokly fine sandy loam (0 to 2 percent slopes). This deep, somewhat poorly drained soil is on flood plains of small streams. Areas are long and narrow and range from 3 to 20 acres in size.

In a representative profile the surface layer is dark grayish brown fine sandy loam about 8 inches thick. The upper 11 inches of subsoil is brown fine sandy loam with olive gray and brown mottles. The lower 15 inches is dark gray fine sandy loam with brown mottles. The substratum, to a depth of 76 inches, is olive gray gravelly sandy loam with brown or strong brown mottles.

Included with this soil in mapping are small areas of Pope, Cotaco, and Bonnie soils. Also included are soils that are less acid than this Stokly soil.

The available water capacity of this soil is moderate, and permeability is moderately rapid. Runoff is slow. Natural fertility and organic matter content are low. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. In unlimed areas the surface layer and subsoil range from strongly acid to extremely acid. The root zone extends to a depth of 36 to 50 inches.

This soil has fair potential for farming when it is drained. Most of the acreage is in hay, pasture, and cultivated crops, but some areas are idle. This soil is limited for most urban uses by flooding and a seasonal high water table.

Although this soil is suited to most cultivated crops when drained, it is better suited to pasture and hay. Tobacco is seldom grown on this soil. Response of crops to fertilizer and lime is fair. Flooding and a seasonal high water table at a depth of 1/2 to 1 foot are the main limitations in the use of this soil for cultivated crops. Flooding sometimes occurs during the growing season. Tile is generally used to drain this soil. When drained, the soil can be cropped year after year if it is properly fertilized and managed to help maintain the organic matter content. Minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help in maintaining tilth and organic matter content.

This soil is suited to pasture and hay plants that will tolerate some wetness. Some hay plants are damaged by flooding. Pasture renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, drainage, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the management needs.

Although most of this soil is cleared, it has high productivity potential for woodland. The management concerns are plant competition and equipment limitations caused by the seasonal high water table. Capability subclass IIw; woodland ordination 2w.

St—Strip mines. Strip mines consists of areas where the material above a coal seam has been removed to allow open-pit mining. They are long, winding areas on hillsides and range from 150 to 1,000 feet in width and range from 10 to 100 acres or more in size. These areas consist of a high wall, a trench, and a spoil bank. The trench contains water or in some places consists of seep or wet areas. The high wall is a vertical or nearly vertical face of the strip mine on the uphill side of the mining pit above the coal seam. The spoil bank, which has been dumped on the downhill side, is the overburden that was removed to expose coal. Spoil banks are steep and dominantly have slopes of 45 to 65 percent. They consist of soil, shale, sandstone, and coal waste material. Large rocks and boulders are commonly on the surface and make up as much as 35 percent of the spoil. Reaction of the spoil material ranges from extremely acid to mildly alkaline.

Included with this unit in mapping are some areas in valleys that were used for coal tipples. Also included are spoil areas from two limestone quarries.

Most of the older areas of Strip mines have fair to good cover, consisting of an overstory of sumac, sassafras, sycamore, and willows. The understory consists of briars, weeds, sericea lespedeza, annual lespedeza, and sweet clover on the less acid spoil. The most recent areas of Strip mines have been graded and seeded to grasses, legumes, and trees (fig. 7). Good cover can generally be established on the less sloping parts, but the steep spoil banks are unstable and are difficult to establish and maintain in vegetation.

Because of variability of the materials and physical characteristics of these areas, no interpretations are given. Capability subclass not assigned; woodland ordination not assigned.

TlB—Tilsit silt loam, 2 to 6 percent slopes. This deep, moderately well drained soil is mostly on slightly convex upland ridges and high stream terraces. The areas on ridges are oval shape and range from 5 to 20 acres in size. The areas on terraces are on broad flats and range from 10 to 60 acres.

In a representative profile the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil is yellowish brown silt loam in the upper 17 inches. Next is a firm, brittle, and compact fragipan about 33 inches thick of yellowish brown loam with gray mottles. The subsoil below the fragipan, to a depth of 72 inches, is strong brown silty clay loam with light brownish gray and yellowish brown mottles.

Included with this soil in mapping are small areas of Monongahela, Wernock, and Whitley soils. Also included are a few areas of soils that have slopes of less than 2 percent.

The available water capacity of this soil is moderate, and permeability is moderate above the fragipan and slow or very slow in the fragipan. Runoff is slow to medium. Natural fertility and organic matter content are low. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. In unlimed areas, the surface layer and subsoil range from strongly acid to extremely acid. The root zone and depth to fragipan range from 20 to 28 inches.

This soil is used for cultivated crops, hay, pasture, homesites, and gardens, and some areas are wooded. This soil has fair potential for farming. It is limited for some urban uses by wetness and the fragipan at a depth of 20 to 28 inches.

This soil is suited to most cultivated crops and is commonly used for corn and tobacco. The response of crops to fertilizer and lime is fair. If the soil is cultivated the hazard of erosion is moderate and measures that control erosion and reduce runoff are needed. Contour tillage, stripcropping, minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help to control erosion and maintain the organic matter content.

This soil is suited to most pasture and hay plants and production potential is moderate if the soil is properly managed. The fragipan at a depth of 20 to 28 inches restricts rooting depth and limits production potential during dry seasons. Plants that produce adequate forage and provide satisfactory ground cover are needed. Pasture renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the chief management needs.

Although most of this soil is cleared, it has moderately high productivity potential for woodland.

This soil is limited for most urban uses by a seasonal high water table at a depth of 1.5 to 3 feet. Capability subclass IIe; woodland ordination 3o.

TlC—Tilsit silt loam, 6 to 12 percent slopes. This deep, moderately well drained soil is on convex upland ridges and in long narrow areas on stream terraces. Areas range from 5 to 20 acres in size.

In a representative profile the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil is yellowish brown silt loam in the upper 17 inches. Next is a firm, brittle, and compact fragipan about 33 inches thick of yellowish brown loam with gray mottles. The subsoil below the fragipan, to a depth of 72 inches, is strong brown silty clay loam with light brownish gray and yellowish brown mottles.

Included with this soil in mapping are small areas of Wernock, Monongahela, and Riney soils. Also included are a few small areas of eroded soils.

The available water capacity of this soil is moderate, and permeability is moderate above the fragipan and slow or very slow in the fragipan. Runoff is medium. Natural fertility and organic matter content are low. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. In unlimed areas, the surface layer and subsoil range from strongly acid to very strongly acid. The root zone and depth to fragipan range from 20 to 28 inches.

This soil is mostly wooded. A few areas are in hay, pasture, and cultivated crops. The soil has fair potential for farming. It is limited for some urban uses by wetness and the fragipan at a depth of 20 to 28 inches.

Although most of this soil is wooded, it is suited to most cultivated crops. Response of crops to fertilizer and lime is fair. The fragipan restricts soil drainage and rooting depth. If this soil is cultivated, the hazard of erosion is severe and measures that control erosion and reduce runoff are needed. Contour tillage, stripcropping, minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help control erosion and maintain the organic matter content.

This soil is suited to most pasture and hay crops, and production potential is moderate if the soil is properly managed. The fragipan restricts rooting depth and limits production potential during dry seasons. Plant species that produce adequate forage and provide satisfactory ground cover are needed. Pasture renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the chief management needs.

This soil is suited to trees, and more than half of the acreage is wooded. Productivity potential is moderately high.

This soil is limited for most urban uses by a seasonal high water table at a depth of 1.5 to 3 feet. Capability subclass IIIe; woodland ordination 3o.

UpC—Upshur silty clay loam, 6 to 12 percent slopes. This deep, well drained soil is on narrow ridgetops. Slopes are smooth and convex and are less than 150 feet long. The areas are oval or long and narrow and range from 5 to 20 acres in size.

In a representative profile the surface layer is reddish brown silty clay loam about 6 inches thick. The subsoil, about 33 inches thick, is dark reddish brown and reddish brown silty clay and clay. The substratum, to a depth of 49 inches, is reddish brown silty clay with gray mottles and is underlain by siltstone and shale.

Included with this soil in mapping are small areas of Latham and Gilpin soils. Also included are a few areas of soils that have slopes of less than 6 percent.

The available water capacity of this soil is moderate, and permeability is slow. Runoff is rapid. Natural fertility is medium, and organic matter content is low. This soil is difficult to till and tends to dry out slowly and to crack at the surface. The subsoil is plastic and has a high shrink-swell potential. In unlimed areas the surface layer and the subsoil are commonly very strongly acid. The root zone extends to a depth of 30 to 40 inches. Depth to shale or siltstone bedrock ranges from 42 to 60 inches.

This soil has fair potential for farming, and most of the acreage is in hay and pasture. A few areas are wooded. This soil is limited for many urban uses by the clayey, slowly permeable subsoil.

Although this soil is suited to cultivated crops, it is better suited to pasture and hay crops. In cultivated areas this soil is difficult to till and has a tendency to clod and crust. Incorporating some crop residue into the plow layer reduces clodding and crusting, and tilling within the proper range of moisture content reduces soil compaction and clodding. If this soil is cultivated, the hazard of erosion is very severe and measures that control erosion and runoff are needed. Contour tillage, stripcropping, minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help control erosion and maintain the organic matter content.

This soil is suited to pasture and hay, and production potential is moderate if the soil is properly managed. Overgrazing and grazing when the soil is wet are major concerns of management. Since the surface layer of this soil compacts easily when wet, grazing of pasture during wet periods results in increased runoff and excessive ero-

sion. Plant species that produce adequate forage and provide satisfactory ground cover are needed. Pasture renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, restriction of grazing during wet periods, and control of undesirable vegetation are some of the chief management needs.

Although most of this soil is cleared, it is suited to trees. Productivity potential is moderately high. The erosion hazard and equipment limitations are management concerns.

This soil is limited for most urban uses by a clayey subsoil, slow permeability, and a high shrink-swell potential. Capability subclass IVe; woodland ordination 3c.

UpD—Upshur silty clay loam, 12 to 30 percent slopes. This deep, well drained soil is on ridgetops, benches, and upper side slopes. Slopes are mostly convex and range from 150 to 300 feet in length. Most areas are long and winding and range from 5 to 25 acres or more in size.

In a representative profile the surface layer is reddish brown silty clay loam about 6 inches thick. The subsoil, about 33 inches thick, is dark reddish brown and reddish brown silty clay and clay. The substratum is reddish brown silty clay with gray mottles. Siltstone and shale are at a depth of 49 inches.

Included with this soil in mapping are small areas of Latham and Gilpin soils on ridges and small areas of Vandalia soils on benches. Also included are small areas of a soil with a light olive brown clay subsoil, a small acreage of a soil with a yellowish red subsoil over limestone and a few areas of limestone outcrop.

The available water capacity of this soil is moderate, and permeability is slow. Runoff is rapid. Natural fertility is medium, and organic matter content is low. This soil is difficult to till and tends to dry out slowly and to crack at the surface. The subsoil is plastic and has a high shrink-swell potential. The more sloping areas are subject to landslides. In unlimed areas, the surface layer and the subsoil are commonly very strongly acid. The root zone extends to a depth of 30 to 40 inches. Depth to shale or siltstone bedrock ranges from 42 to 60 inches.

This soil has poor potential for farming, and most of the acreage is in pasture and hay or is wooded. Some areas are idle. This soil is limited for urban uses by the steep slopes and clayey subsoil.

The hazard of erosion is too severe for this soil to be used for cultivated crops. This soil is suited to pasture and hay, and production potential is moderate if the soil is properly managed. The surface layer of this soil compacts easily when wet. Overgrazing and grazing of pasture when the soil is wet results in increased runoff and excessive erosion. Because of the slope and erosion hazard, management of vegetation for ground cover and soil protection is important. Pasture mixtures that produce satisfactory forage, provide adequate ground cover, and require little renovation are needed. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, restriction of grazing during wet periods, and control of undesirable vegetation are some of the chief management needs.

Although most of this soil is cleared, it is suited to trees. Productivity potential is moderately high on north- and east-facing slopes and moderate on south- and west-facing slopes. The erosion hazard and equipment limitations are management concerns caused by the steep slopes and clayey subsoil. Seedling mortality is also a management concern on south-facing slopes.

This soil is limited for most urban uses by slope, high shrink-swell potential, and a slowly permeable, clayey subsoil. Capability subclass VIe; woodland ordination 3c (north aspect) and 4c (south aspect).

VnD—Vandalia silt loam, 12 to 20 percent slopes. This deep, well drained, colluvial soil is on lower side slopes and benches. Slopes are smooth to slightly concave and range from 150 to 250 feet long. Areas are mostly long and narrow and range from 5 to 15 acres in size.

In a representative profile the surface layer is dark brown heavy silt loam about 5 inches thick. The subsoil, about 37 inches thick, is reddish brown heavy silty clay loam in the upper part and silty clay in the lower part. The substratum is olive brown, olive gray, and reddish brown clay and silty clay. Olive shale is at a depth of 65 inches.

Included with this soil in mapping are small areas of Hayter and Shelocta soils. Also included are small seep spots and small slips and a few areas of soils that have sandstone boulders on the surface.

The available water capacity of this soil is moderate, and permeability is moderately slow to slow. Runoff is medium. Natural fertility is medium, and organic matter content is moderate. This soil can be worked throughout a wide range of moisture content without clodding or crusting. Reaction ranges from medium acid to very strongly acid in the upper part of the profile and from medium acid to mildly alkaline in the lower part. The root zone extends to a depth of 36 to 50 inches. This soil has a high shrink-swell potential.

Most areas of this soil are in hay and pasture, but a few areas are used for cultivated crops. This soil is limited for cultivated crops and for many urban uses by excessive slope. It is better suited to grasses and trees.

Although this soil is suited to occasional cultivation, it is better suited to pasture and hay crops. If this soil is cultivated the hazard of erosion is very severe and measures that control erosion and reduce runoff are needed. Contour tillage, stripcropping, minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help control erosion and maintain organic matter content.

This soil is suited to all pasture and hay plants grown in the area, and production potential is high if the soil is properly managed. Plant species that produce adequate forage and provide satisfactory ground cover are needed. Renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, and con-

trol of undesirable vegetation are some of the chief management needs.

Although most of this soil is cleared, it has high productivity potential for woodland on north- and east-facing slopes and moderately high potential on south- and west-facing slopes. The erosion hazard and equipment limitations are management concerns. Plant competition is also a management concern on north-facing slopes.

This soil is limited for most urban uses by slope and slowly permeable subsoil. Capability subclass IVe; woodland ordination 2c (north aspect) and 3c (south aspect).

VnE—Vandalia silt loam, 20 to 30 percent slopes. This deep, well drained soil is on lower colluvial side slopes and benches. Slopes are smooth or slightly concave and range from 150 to 500 feet long. Areas range from long and narrow to wide and from 5 to 50 acres in size.

In a representative profile the surface layer is dark brown heavy silt loam about 5 inches thick. The subsoil, about 37 inches thick, is reddish brown heavy silty clay loam in the upper part and silty clay in the lower part. The substratum is olive brown, olive gray, and reddish brown clay and silty clay. Olive shale is at a depth of 65 inches.

Included with this soil in mapping are small areas of Upshur and Latham soils on upper side slopes and small areas of Hayter and Shelocta soils on lower side slopes. Also included is a small acreage of a soil with a strong brown or reddish brown clay loam subsoil that is underlain by clayey shale, common small seep spots and slips, and a few areas of soils that have sandstone boulders on the surface.

The available water capacity of this soil is moderate, and permeability is moderately slow to slow. Runoff is rapid. Natural fertility is medium, and organic matter content is moderate. Reaction ranges from medium acid to very strongly acid in the upper part of the profile and from medium acid to mildly alkaline in the lower part. The root zone extends to a depth of 36 to 50 inches. This soil has a high shrink-swell potential.

This soil is used mostly for pasture. A few areas are used for hay, and some areas are wooded. This soil has poor potential for farming and for most urban uses. It is better suited to trees and pasture.

The hazard of erosion, which is caused by the steep slopes, is too severe for this soil to be used for cultivated crops. This soil is suited to pasture and hay, but harvesting of hay is difficult on the steep slopes. Because of the slope and erosion hazard, management of vegetation for ground cover and soil protection is needed. Pasture mixtures that produce satisfactory forage, provide adequate ground cover, and require little renovation are needed. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the chief management needs.

This soil has high productivity potential for woodland on north- and east-facing slopes and moderately high productivity potential on south- and west-facing slopes. Erosion hazard and equipment limitations are management concerns. Plant competition is also a management concern on north-facing slopes.

This soil is limited for most urban uses by steep slopes and a clayey subsoil. Capability subclass VIe; woodland ordination 2c (north aspect) and 3c (south aspect).

VuF—Vandalia-Upshur complex, 30 to 60 percent slopes. These deep, well drained soils are on very steep side slopes. The areas are typically benched with alternating strata of shale, sandstone, and siltstone. Benches are several hundred feet long and range from 150 to 300 feet in width. The areas have an irregular surface and are cut by shallow drainageways or a few deep ravines 300 to 600 feet apart. The Vandalia soils are on colluvial lower side slopes, on benches, and in coves, and they make up about 40 percent of the complex. The Upshur soils are on ridges, benches, and breaks between benches, and they make up about 25 percent of the complex. Areas are generally several hundred acres in size. These soils are so intermingled that mapping them separately was not practical.

In a representative profile of a Vandalia soil in this complex, the surface layer is dark brown heavy silt loam about 5 inches thick. The subsoil, about 37 inches thick, is reddish brown heavy silty clay loam in the upper part and silty clay in the lower part. The substratum is olive brown, olive gray, and reddish brown clay and silty clay. Olive shale is at a depth of 65 inches.

In a representative profile of an Upshur soil in this complex, the surface layer is reddish brown silty clay loam about 6 inches thick. The subsoil, about 33 inches thick, is dark reddish brown and reddish brown silty clay and clay. The substratum is reddish brown silty clay with gray mottles. Siltstone and shale are at a depth of 49 inches.

Included with this complex in mapping are small areas of Latham, Shelocta, and Gilpin soils. Also included are a small acreage of a deep soil that has a yellowish brown or reddish brown clay loam subsoil underlain by clayey shale; a few areas of soils that have thin limestone outcrops, massive sandstone outcrops, and stones and boulders on the surface; areas of slips, which result in broken, irregular topography; many areas of severely eroded soils; and a few areas that have deep gullies.

The Vandalia soils have moderate available water capacity. Permeability is moderately slow to slow. Runoff is rapid. Natural fertility is medium, and organic matter content is moderate. Reaction ranges from medium acid to very strongly acid in the upper part of the profile and from medium acid to mildly alkaline in the lower part. The root zone extends to a depth of 36 to 50 inches. Shrink-swell potential is high.

The Upshur soils have moderate available water capacity and slow permeability. Runoff is rapid. Natural fertility is medium, and organic matter content is low. The subsoil is plastic and has a high shrink-swell potential. In unlimed areas the surface layer and the subsoil are com-

monly very strongly acid. The root zone extends to a depth of 30 to 40 inches. Depth to shale or siltstone bedrock ranges from 42 to 60 inches.

Some areas of this complex are wooded, but a large acreage has been cleared and is mostly in unimproved pasture or is idle. This complex has poor potential for farming and for most urban uses. It has better potential for trees and for providing habitat for woodland wildlife.

These soils are not suited to cultivation, because of the very steep slopes and the hazard of erosion. They have limited suitability for improved pasture because most slopes are too steep for the use of modern machinery (fig. 8). Areas are subject to landslides. Stands of pasture grasses are difficult to establish and maintain. If these soils are used for pasture, grasses and legumes that produce good plant cover and require little renovation are needed. Overgrazing and grazing of pasture when wet reduce the stand of desirable grasses and result in excessive runoff and erosion.

This complex is suited to trees. Woodland productivity potential is high for Vandalia soils on north- and east-facing slopes and moderately high on south- and west-facing slopes. The Upshur soils have moderately high productivity potential on north- and east-facing slopes and moderate productivity potential on south- and west-facing slopes. The erosion hazard and equipment limitations are management concerns caused by the very steep slopes and the clayey subsoil.

These soils are limited for most urban uses by the very steep slopes and the clayey subsoil. Capability subclass VIIe; Vandalia part in woodland ordination 2c (north aspect) and 3c (south aspect); Upshur part in woodland ordination 3c (north aspect) and 4c (south aspect).

Wb—Weinbach silt loam (0 to 2 percent slopes). This deep, somewhat poorly drained soil is on terraces in wide valleys. It is mostly in long, narrow areas along small drains between areas of Elk and Otwell soils. Areas range from 5 to 30 acres in size.

In a representative profile the surface layer is grayish brown silt loam about 10 inches thick. The subsoil is about 40 inches thick. It is brown silt loam in the upper 6 inches. The next 8 inches of the subsoil is light brownish gray light silty clay loam. The next 26 inches is a firm, brittle, and compact fragipan that is light brownish gray silt loam in the upper part and brown silt loam with gray mottles in the lower part. The substratum, to a depth of 70 inches, is brown silt loam with light brownish gray and strong brown mottles.

Included with this soil in mapping are small areas of Newark, Otwell, and Bonnie soils.

The available water capacity of this soil is moderate, and permeability is slow to very slow. Runoff is slow. Natural fertility is medium, and organic matter content is low. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. In unlimed areas the surface layer and subsoil range from medium acid to very strongly acid. The root zone and depth to fragipan range from 18 to 28 inches.

This soil has fair potential for farming and is used for cultivated crops, hay, and pasture. It is limited for many urban uses by wetness and the slowly permeable fragipan at a depth of 18 to 28 inches.

This soil is suited to corn and soybeans when it is properly drained, but crops are damaged by wetness in some years. This soil has a fragipan that restricts root growth and causes a perched water table at a depth of 1 to 2 feet. Open-ditch drainage, in combination with grass waterways, is generally suited to this soil. Tobacco is seldom grown on this soil. The response of crops to fertilizer and lime is fair. Erosion is not a hazard, and this soil can be cropped year after year if it is properly drained and managed to maintain fertility and organic matter content. Minimum tillage, returning crop residue to the soil, and using cover crops and grasses and legumes in the cropping system help in maintaining tilth and organic matter content.

This soil is better suited to pasture and hay plants that will tolerate some wetness, and production potential is high if the soil is properly managed. Pasture renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, drainage, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the chief management needs.

Although most of this soil is cleared, it has high productivity potential for quality hardwoods. The woodland management concerns are plant competition and equipment limitations caused by the seasonal high water table.

This soil is limited for most urban uses by the seasonal high water table. Capability subclass IIIw; woodland ordination 2w.

WcB—Wernock silt loam, 2 to 6 percent slopes. This moderately deep, well drained soil is on narrow to fairly broad convex ridges. Areas range from 4 to 50 acres in size.

In a representative profile the surface layer is dark grayish brown silt loam about 2 inches thick over a yellowish brown silt loam subsurface layer about 3 inches thick. The subsoil, about 26 inches thick, is yellowish brown and strong brown heavy silt loam in the upper part and channery clay loam in the lower part. The substratum, to a depth of 38 inches, is brownish and reddish, rippable sandstone and interbedded, grayish, soft clay shale.

Included with this soil in mapping are small areas of Tilsit, Gilpin, and Latham soils. Also included are areas of a soil that is 40 to 60 inches deep to bedrock.

The permeability and available water capacity of this soil are moderate. Runoff is medium. Natural fertility and organic matter content are low. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. In unlimed areas the surface layer and subsoil range from strongly acid to extremely acid. The root zone and depth to bedrock range from 30 to 40 inches.

This soil has good potential for farming. Most of the acreage is wooded, but cleared areas are used for corn, tobacco, hay, and pasture. The soil is limited for some urban uses by the depth to bedrock.

This soil is suited to most cultivated crops grown in the area. Response of crops to fertilizer and lime is good. If this soil is cultivated, the hazard of erosion is moderate and measures that control erosion and reduce runoff are needed. Contour tillage, stripcropping, minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help control erosion and maintain the organic matter content.

This soil is suited to pasture and hay, and production potential is high if the soil is properly managed. Plant species that produce adequate forage and provide satisfactory ground cover are needed. Pasture renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the chief management needs.

This soil is suited to trees, and more than half the acreage is wooded. Productivity potential is high. Plant competition is a management concern. Capability subclass IIe; woodland ordination 2o.

WcC—Wernock silt loam, 6 to 12 percent slopes. This moderately deep, well drained soil is on narrow to fairly broad ridges. Slopes range from uniform to convex and are 150 to 300 feet long. Areas range from 3 to more than 30 acres in size.

In a representative profile the surface layer is dark grayish brown silt loam about 2 inches thick over a yellowish brown silt loam subsurface layer about 3 inches thick. The subsoil, about 26 inches thick, is yellowish brown and strong brown heavy silt loam in the upper part, light silty clay loam in the middle part, and channery clay loam in the lower part. The substratum, to a depth of 38 inches, is brownish and reddish, rippable sandstone and interbedded grayish, soft clay shale.

Included with this soil in mapping are small areas of Tilsit, Latham, and Gilpin soils. Also included are areas of a soil that is 40 to 60 inches deep to bedrock.

The permeability and available water capacity of this soil are moderate. Runoff is medium. Natural fertility and organic matter content are low. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. In unlimed areas the surface layer and subsoil range from strongly acid to extremely acid. The root zone and depth to bedrock range from 30 to 40 inches.

More than half the acreage of this soil is wooded. Cleared areas are used for corn, tobacco, hay, and pasture. This soil has fair potential for farming and is limited for many urban uses by slope and depth to rock.

Although this soil is suited to most cultivated crops it is better suited to pasture and hay. Response of crops to fertilizer and lime is good. If this soil is cultivated, the hazard of erosion is severe and measures that control erosion and reduce runoff are needed. Contour tillage, stripcropping, minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help control erosion and maintain the organic matter content.

This soil is suited to pasture and hay, and production potential is high if the soil is properly managed. Plant species that produce adequate forage and provide satisfactory ground cover are needed. Pasture renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the chief management needs.

This soil is suited to trees. Productivity potential is high. Plant competition is a management concern. Capability subclass IIIe; woodland ordination 2o.

WcD—Wernock silt loam, 12 to 20 percent slopes. This moderately deep, well drained soil is on narrow ridgetops and upper side slopes. Slopes range from uniform to convex and are less than 200 feet long. Areas are long and narrow and range from 5 to 20 acres in size.

In a representative profile the surface layer is dark grayish brown silt loam about 2 inches thick over a yellowish brown silt loam subsurface layer about 3 inches thick. The subsoil, about 26 inches thick, is yellowish brown and strong brown heavy silt loam in the upper part, light silty clay loam in the middle part, and channery clay loam in the lower part. The substratum, to a depth of 38 inches, is brownish and reddish, rippable sandstone and interbedded grayish, soft clay shale.

Included with this soil in mapping are small areas of Latham, Gilpin, and Shelocta soils. Also included are a few small areas of Whitley soils on high stream terraces.

The permeability and available water capacity of this soil are moderate. Runoff is rapid. Natural fertility and organic matter content are low. This soil can be worked throughout a wide range of moisture content without clodding or crusting. In unlimed areas the surface layer and subsoil range from strongly acid to extremely acid. The root zone and depth to rock ranges from 30 to 40 inches.

Most areas of this soil are wooded or are in hay and pasture. Some areas are idle, and a few areas are used for cultivated crops. This soil is limited for cultivated crops and for many urban uses. It is better suited to grasses and trees.

Although this soil is suited to occasional cultivation, it is better suited to pasture and hay crops. If this soil is cultivated, the hazard of erosion is very severe and measures that control erosion and reduce runoff are needed. Contour tillage, stripcropping, minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help control erosion and maintain the organic matter content.

This soil is suited to pasture and hay, and production potential is moderate if the soil is properly managed. The root zone ranges from 30 to 40 inches in depth, and the

lack of moisture limits production potential during dry seasons. Plant species that produce adequate forage and provide satisfactory ground cover are needed. Renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the chief management needs.

This soil is suited to trees, and more than half the acreage is wooded. Productivity potential is high. Erosion hazard and plant competition are management concerns.

This soil is limited for most urban uses by moderately steep slopes and depth to rock. Capability unit IVe; woodland ordination 2r.

WhA—Whitley silt loam, 0 to 2 percent slopes. This deep, well drained soil is on low stream terraces in fairly wide valleys. Slopes are uniform, and areas range from 5 to 30 acres or more in size.

In a representative profile the surface layer is brown silt loam about 10 inches thick. The subsoil, about 64 inches thick, is brown or strong brown silt loam and light silty clay loam in the upper 30 inches and loam and fine sandy loam to a depth of 74 inches.

Included with this soil in mapping are small areas of Cuba and Morehead soils. Also included are a few areas of soils that have a darker surface layer than this Whitley soil.

The available water capacity of this soil is high, and permeability is moderate. Runoff is medium. Natural fertility is medium and organic matter content is moderate. In unlimed areas the surface layer and subsoil range from strongly acid to very strongly acid. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. The root zone extends to a depth of 40 to 60 inches.

Most of this soil has been cleared and is used for cultivated crops, hay, and pasture. Some areas are used for homesites and gardens. This soil has high potential for farming and is generally suited to most urban uses. A few low areas that are subject to flooding are limited for urban uses.

This soil is suited to cultivated crops commonly grown in the area, such as corn, tobacco, soybeans, and small grain. Response of crops to fertilizer and lime is good. The erosion hazard is slight, and this soil can be cropped year after year if good management is used to maintain fertility and organic matter content. Minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help maintain tilth and the organic matter content.

All pasture and hay crops grown in the area are suited to this soil, and production potential is high if the soil is properly managed. The management needs are maintaining the desired species, controlling weeds, using proper stocking rates and rotational grazing, and applying lime and fertilizer.

Although most of this soil is cleared, it has high productivity potential for woodland. Plant competition is a management concern.

This soil is suited to most urban uses. It is limited for sewage lagoons by seepage and by flooding in a few low areas. These flooded areas are limited for most urban uses. Capability class I; woodland ordination 2o.

WhB—Whitley silt loam, 2 to 6 percent slopes. This deep, well drained soil is on low and high stream terraces. Slopes are slightly convex and range from 150 to 300 feet long. Areas are long and narrow to oval or blocky and range from 3 to 20 acres in size.

In a representative profile the surface layer is brown silt loam about 10 inches thick. The subsoil is brown or strong brown silt loam and light silty clay loam in the upper 30 inches and loam and fine sandy loam in the lower part to a depth of 74 inches.

Included with this soil in mapping are small areas of Allegheny and Chavies soils.

The available water capacity of this soil is high, and permeability is moderate. Runoff is medium. Natural fertility is medium and organic matter content is moderate. In unlimed areas the surface layer and subsoil range from strongly acid to very strongly acid. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. The root zone extends to a depth of 40 to 60 inches.

Most of this soil has been cleared and is used for cultivated crops, hay, and pasture. Some areas are used for homesites and gardens. This soil has good potential for farming and is suited to most urban uses.

Crops commonly grown in the area, such as corn, tobacco, small grain, and all pasture and hay crops, are suited to this soil. Response of crops to fertilizer and lime is good. The erosion hazard is moderate, and measures that control erosion are needed if cultivated crops are grown. Contour tillage, stripcropping, minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help in controlling erosion and maintaining organic matter content.

This soil is suited to pasture and hay plants commonly grown in the area, and production potential is high if the soil is properly managed. Plant species that produce adequate forage and provide satisfactory ground cover are needed. Pasture renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the chief management needs.

Although most of this soil is cleared, it has high productivity potential for woodland. Plant competition is a management concern.

This soil is suited to most urban uses. It is limited for sewage lagoons by seepage. Capability subclass IIe; woodland ordination 2o.

WhC—Whitley silt loam, 6 to 12 percent slopes. This deep, well drained soil is on low and high stream terraces. Slopes are smooth and are less than 200 feet in length. Areas are long and narrow and range from 3 to 20 acres in size.

In a representative profile the surface layer is brown silt loam about 10 inches thick. The subsoil is brown or strong brown silt loam and light silty clay loam in the upper 30 inches and loam and fine sandy loam in the lower part to a depth of 74 inches.

Included with this soil in mapping are small areas of Tilsit, Monongahela, and Allegheny soils.

The available water capacity of this soil is high, and permeability is moderate. Runoff is medium. Natural fertility is medium, and organic matter content is moderate. In unlimed areas the surface layer and subsoil range from strongly acid to very strongly acid. The soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. The root zone extends to a depth of 40 to 60 inches.

Most of this soil has been cleared and is used for cultivated crops, hay, and pasture. Some areas are used for homesites and gardens, and a few areas are wooded. This soil has fair potential for farming and is suited for most urban uses.

Although this soil is suited to most cultivated crops, it is better suited to pasture and hay crops. Response of crops to fertilizer and lime is good. The hazard of erosion is severe, and measures that control erosion are needed if cultivated crops are grown. Contour tillage, stripcropping, minimum tillage, returning crop residue to the soil, using cover crops, and growing grasses and legumes in the cropping system help in controlling erosion and maintaining organic matter content.

This soil is suited to pasture and hay plants commonly grown in the area, and production potential is high if the soil is properly managed. Plant species that produce adequate forage and provide satisfactory ground cover are needed. Pasture renovation should be frequent enough to maintain the desired species. The application of lime and fertilizer, use of proper stocking rates and rotational grazing, and control of undesirable vegetation are some of the management needs.

Although most of this soil is cleared, it has high productivity potential for woodland. Plant competition is a management concern.

This soil is suited to most urban uses. It is limited for sewage lagoons by slope and seepage. Capability class IIIe; woodland ordination 2o.

Use and management of the soils

The soil survey is a detailed inventory and evaluation of the most basic resource of the survey area—the soil. It is useful in adjusting land use, including urbanization, to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in uses of the land.

While a soil survey is in progress, soil scientists, conservationists, engineers, and others keep extensive notes about the nature of the soils and about unique aspects of behavior of the soils. These notes include data on erosion, drought damage to specific crops, yield estimates, flooding, the functioning of septic tank disposal systems, and other factors affecting the productivity, potential, and limitations of the soils under various uses and management. In this way, field experience and measured data on soil properties and performance are used as a basis for predicting soil behavior.

Information in this section is useful in planning use and management of soils for crops and pasture, and woodland, as sites for buildings, highways and other transportation systems, sanitary facilities, and parks and other recreation facilities, and for wildlife habitat. From the data presented, the potential of each soil for specified land uses can be determined, soil limitations to these land uses can be identified, and costly failures in houses and other structures, caused by unfavorable soil properties, can be avoided. A site where soil properties are favorable can be selected, or practices that will overcome the soil limitations can be planned.

Planners and others using the soil survey can evaluate the impact of specific land uses on the overall productivity of the survey area or other broad planning area and on the environment. Productivity and the environment are closely related to the nature of the soil. Plans should maintain or create a land-use pattern in harmony with the natural soil.

Contractors can find information that is useful in locating sources of sand and gravel, roadfill, and topsoil. Other information indicates the presence of bedrock, wetness, or very firm soil horizons that cause difficulty in excavation.

Health officials, highway officials, engineers, and many other specialists also can find useful information in this soil survey. The safe disposal of wastes, for example, is closely related to properties of the soil. Pavements, sidewalks, campsites, playgrounds, lawns, and trees and shrubs are influenced by the nature of the soil.

Crops and pasture

ROSCOE ISAACS, assistant state resource conservationist, assisted in the preparation of this section.

The major management concerns in the use of the soils for crops and pasture are described in this section. In addition, the crops or pasture plants best suited to the soil, including some not commonly grown in the survey area, are discussed; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are presented for each soil.

This section provides information about the overall agricultural potential of the survey area and about the management practices that are needed. The information is useful to equipment dealers, land improvement contractors, fertilizer companies, processing companies, planners, conservationists, and others. For each kind of soil, information about management is presented in the section "Soil maps for detailed planning." Planners of management systems for individual fields or farms should also

consider the detailed information given in the description of each soil.

More than 87,000 acres were used for cropland and pasture in Boyd and Greenup Counties in 1970 according to the Kentucky Soil and Water Conservation Needs Inventory. Of this total, 53,000 acres were used for permanent pasture; 13,000 acres for row crops, mainly corn, soybeans, and tobacco; and 12,000 acres for hayland and rotation hay and pasture. The remaining acreage was idle cropland, orchards, and close-grown crops. The acreage of cropland and pasture has been gradually decreasing as more land is used for urban development, and some of the pasture is reverting to woodland.

Some principles of management are general enough to apply to all farms in the survey area, though the individual soil or groups of soils require different kinds and degrees of management. These general principles of management are discussed in the following paragraphs.

Soil fertility needs to be improved in most of the soils in the survey area through the addition of lime or fertilizer, or both. The amounts needed depend on the natural content of lime and the natural fertility level, on past cropping and management, on the needs of the crop, and on the yield level desired. Additions of lime and fertilizer on all soils should be based on the result of soil tests. The Kentucky Cooperative Extension Service provides assistance in determining the kinds and amounts of fertilizer and lime to apply.

Soil tilth and crop residue management are important factors in the germination of seeds, infiltration of water into the soil, and maintaining the organic matter supply.

Most of the soils of Boyd and Greenup Counties have light colored surface layers and are low in organic matter content. Increasing this content is not practical. However, it is important to maintain the organic matter content by adding farm manure, by leaving plant residue on the surface, and by using other practices that promote extensive root systems and vigorous growth. Tillage is often needed to prepare a seedbed and to control weeds, but it should be kept to a minimum because it tends to break down tilth.

Soil erosion is a management concern on about three-fourths of the soils used for cropland and pasture in Boyd and Greenup Counties. All sloping, cultivated soils are susceptible to erosion, and to a lesser extent sloping soils used for pasture are also susceptible, especially when good vegetative cover is not maintained.

The loss of soil by erosion causes lower productivity. Erosion causes a loss of organic matter and plant nutrients and reduces the depth of the rooting zone, which is especially important in soils that have limiting layers such as fragipans or bedrock. Erosion also results in sediment entering streams, thereby lowering water quality for municipal uses, for recreation, and for fish and wildlife.

Because most erosion occurs when the cultivated crop is growing or soon after the crop has been harvested, a cropping system should be selected that keeps the loss of soil and water to a minimum. A cropping system is more effective if it is used in combination with other erosion control practices, such as contour farming, terracing, contour stripcropping, use of diversions and grassed waterways, minimum or no tillage, effective crop residue management, seeding cover crops, and applying fertilizer and lime if needed.

Soil drainage is a management concern on about one-fifth of the soils used for cropland and pasture in Boyd and Greenup Counties. Some soils are so wet in their natural state that production of crops common to the area is not feasible. The Bonnie soils are an example of poorly drained soils in this category. Soils that are somewhat poorly drained are so wet that crops are damaged by wetness during most years, unless the soils are artificially drained. Some moderately well drained soils need artificial drainage in places for water-sensitive crops such as tobacco. Open ditches and tile drains are used to remove excess water. The design and the system used vary with the kind and use of the soil. Tile drains are more expensive to install, but they generally provide better drainage than open ditches. Soils that have a fragipan are difficult to drain, but they can be drained better by open ditches than by tile. For drainage by either tile or open ditches, suitable outlets are required.

The local office of the Soil Conservation Service can assist in selecting and planning suitable management practices.

Field crops suited to the soils and climate of Boyd and Greenup Counties include many that are not commonly grown. Row crops of corn, soybeans, and burley tobacco are commonly grown. A small acreage of small grain is grown, and the acreage could be expanded by double cropping, such as following small grain with soybeans, and by using no-till farming.

Specialty crops grown for commercial use include a small acreage of vegetables, orchards, and nursery plants. Deep soils with good natural drainage that warm up early in spring are especially well suited to vegetables. The soils most commonly used for vegetables are in the Chavies and Lakin series. Many deep, well drained soils have properties that make them suitable for orchards and nursery plants. Soils that are frequently subject to frost damage and have poor aeration, however, generally are poorly suited to early vegetables and orchards.

Latest information and suggestions for growing special crops can be obtained from the local offices of the Kentucky Cooperative Extension Service and the Soil Conservation Service.

Yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. Absence of an estimated yield indicates that the crop is not suited

to or not commonly grown on the soil or that a given crop is not commonly irrigated.

The estimated yields were based mainly on the experience and records of farmers, conservationists, and extension agents. Results of field trials and demonstrations and available yield data from nearby counties were also considered.

The yields were estimated assuming that the latest soil and crop management practices were used. Hay and pasture yields were estimated for the most productive varieties of grasses and legumes suited to the climate and the soil. A few farmers may be obtaining average yields higher than those shown in table 5.

The management needed to achieve the indicated yields of the various crops depends on the kind of soil and the crop. Such management provides drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate tillage practices, including time of tillage and seedbed preparation and tilling when soil moisture is favorable; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residues, barnyard manure, and green-manure crops; harvesting crops with the smallest possible loss; and timeliness of all fieldwork.

The estimated yields reflect the productive capacity of the soils for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not included because the acreage of these crops is small. The local offices of the Soil Conservation Service and the Cooperative Extension Service can provide information about the management concerns and productivity of the soils for these crops.

Capability classes and subclasses

Capability classes and subclasses show, in a general way, the suitability of soils for most kinds of field crops. The soils are classed according to their limitations when they are used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops that require special management. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for forest trees, or for engineering purposes.

In the capability system, all kinds of soil are grouped at three levels: capability class, subclass, and unit. These levels are defined in the following paragraphs. A survey area may not have soils of all classes.

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. The classes are 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, or that require special conservation practices, or both.

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

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and landforms have limitations that nearly preclude their use for commercial crop production.

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

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

The acreage of soils in each capability class and subclass is indicated in table 6. All soils in the survey area except those named at a level higher than the series are included. Some of the soils that are well suited to crops and pasture may be in low-intensity use, for example, soils in capability classes I and II. Data in this table can be used to determine the farming potential of such soils.

The capability subclass is also identified in the description of each soil map unit in the section "Soil maps for detailed planning."

Woodland management and productivity

CHARLES A. FOSTER, forester, Soil Conservation Service, assisted in the preparation of this section.

Kentucky is in the Deciduous Forest Formation of eastern North America and contains parts of two forest re-

gions, the Mixed Mesophytic in eastern Kentucky and the Western Mesophytic in the rest of the State.

Boyd and Greenup Counties are a part of the Mixed Mesophytic Forest Region. This region consists of deep, moist, well drained soils and is characterized by 20 to 25 tree species, among which are yellow-poplar, sugar maple, beech, red and white oaks, buckeye, and basswood.

The forest region can be subdivided into several forest types. Approximately four-fifths of the woodland in Boyd and Greenup Counties is classified as oak-hickory and central mixed hardwood types. These forest communities, or types, differ from one another in slope, exposure, and such soil characteristics as fertility, depth, texture, drainage, and available moisture (*3*, *4*, *5*, *6*, *7*).

Boyd County has 57,100 acres of commercial forest covering 56 percent of the county, and Greenup County has 154,900 acres of forest covering 69 percent of the county. Volume growth is 34 cubic feet of growing stock and 157 board feet of sawtimber per year (*11*). While volume growth is lower than its potential, it still exceeds timber harvest. Any increase in productivity of most forested areas is limited by poor stocking of good trees. About 44 percent of the total commercial woodland is considered well stocked.

Table 7 contains information useful to woodland owners or forest managers planning use of soils for wood crops. Map unit symbols for soils suitable for wood crops are listed, and the ordination (woodland suitability) symbol for each soil is given. All soils bearing the same ordination symbol require the same general kinds of woodland management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; and 4, moderate. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *w* indicates excessive water in or on the soil; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates insignificant limitations or restrictions. If a soil has more than one limitation, priority in placing the soil into a limitation class is in the following order: w, c, s, f, and r.

In table 7 the soils are also rated for a number of factors to be considered in management. *Slight*, *moderate*, and *severe* are used to indicate the degree of major soil limitations.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if some measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or equipment; *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree that the soil affects expected mortality of planted tree seedlings. Plant competition is not considered in the ratings. Seedlings from good planting stock that are properly planted during a period of sufficient rainfall are rated. A rating of *slight* indicates that the expected mortality of the planted seedlings is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *plant competition* indicate the degree to which undesirable plants are expected to invade or grow if openings are made in the tree canopy. The invading plants compete with native plants or planted seedlings by impeding or preventing their growth. A rating of *slight* indicates little or no competition from other plants; *moderate* indicates that plant competition is expected to hinder the development of a fully stocked stand of desirable trees; *severe* means that plant competition is expected to prevent the establishment of a desirable stand unless the site is intensively prepared, weeded, or otherwise managed for the control of undesirable plants.

The *potential productivity* of merchantable or *important trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. In this survey area the site index for cottonwoods is based on 30 years; for other species the site index is based on 50 years. The site index applies to fully stocked, even-aged, unmanaged stands. Important trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suitable for commercial wood production and that are suited to the soils.

Engineering

Jimmie C. Bickford, area engineer, Soil Conservation Service, assisted in the preparation of this section.

This section provides information about the use of soils for building sites, sanitary facilities, construction material, and water management. Among those who can benefit from this information are engineers, landowners, community planners, town and city managers, land developers, builders, contractors, and farmers and ranchers.

The ratings in the engineering tables are based on test data and estimated data in the "Soil properties" section. The ratings were determined jointly by soil scientists and engineers of the Soil Conservation Service using known relationships between the soil properties and the behavior of soils in various engineering uses.

Among the soil properties and site conditions identified by a soil survey and used in determining the ratings in this section were grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock that is within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure or aggregation, in-place soil density, and geologic origin of the soil material. Where pertinent, data about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of absorbed cations were also considered.

On the basis of information assembled about soil properties, ranges of values can be estimated for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, shear strength, compressibility, slope stability, and other factors of expected soil behavior in engineering uses. As appropriate, these values can be applied to each major horizon of each soil or to the entire profile.

These factors of soil behavior affect construction and maintenance of roads, airport runways, pipelines, foundations for small buildings, ponds and small dams, irrigation projects, drainage systems, sewage and refuse disposal systems, and other engineering works. The ranges of values can be used to (1) select potential residential, commercial, industrial, and recreational uses; (2) make preliminary estimates pertinent to construction in a particular area; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for location of sanitary landfills, onsite sewage disposal systems, and other waste disposal facilities; (5) plan detailed onsite investigations of soils and geology; (6) find sources of gravel, sand, clay, and topsoil; (7) plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; (8) relate performance of structures already built to the properties of the kinds of soil on which they are built so that performance of similar structures on the same or a similar soil in other locations can be predicted; and (9) predict the trafficability of soils for cross-country movement of vehicles and construction equipment.

Data presented in this section are useful for land-use planning and for choosing alternative practices or general designs that will overcome unfavorable soil properties and minimize soil-related failures. Limitations to the use of these data, however, should be well understood. First, the data are generally not presented for soil material below a depth of 5 or 6 feet. Also, because of the scale of the detailed map in this soil survey, small areas of soils that differ from the dominant soil may be included in mapping. Thus, these data do not eliminate the need for onsite investigations, testing, and analysis by personnel having expertise in the specific use contemplated.

The information is presented mainly in tables. Table 8 shows, for each kind of soil, the degree and kind of limitations for building site development; table 9, for sanitary facilities; and table 11, for water management. Table 10 shows the suitability of each kind of soil as a source of construction materials.

The information in the tables, along with the soil map, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations and to construct interpretive maps for specific uses of land.

Some of the terms used in this soil survey have a special meaning in soil science. Many of these terms are defined in the Glossary.

Building site development

The degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets are indicated in table 8. A *slight* limitation indicates that soil properties generally are favorable for the specified use; any limitation is minor and easily overcome. A *moderate* limitation indicates that soil properties and site features are unfavorable for the specified use, but the limitations can be overcome or minimized by special planning and design. A *severe* limitation indicates that one or more soil properties or site features are so unfavorable or difficult to overcome that a major increase in construction effort, special design, or intensive maintenance is required. For some soils rated severe, such costly measures may not be feasible.

Shallow excavations are made for pipelines, sewerlines, communications and power transmission lines, basements, open ditches, and cemetery plots. Such digging or trenching is influenced by soil wetness caused by a seasonal high water table; the texture and consistence of soils; the tendency of soils to cave in or slough; and the presence of very firm, dense soil layers, bedrock, or large stones. In addition, excavations are affected by slope of the soil and the probability of flooding. Ratings do not apply to soil horizons below a depth of 6 feet unless otherwise noted.

In the soil series descriptions, the consistence of each soil horizon is given, and the presence of very firm or extremely firm horizons, usually difficult to excavate, is indicated.

Dwellings and *small commercial buildings* referred to in table 8 are built on undisturbed soil and have foundation loads of a dwelling no more than three stories high. Separate ratings are made for small commercial buildings without basements and for dwellings with and without basements. For such structures, soils should be sufficiently stable that cracking or subsidence of the structure from settling or shear failure of the foundation does not occur. These ratings were determined from estimates of the shear strength, compressibility, and shrink-swell potential of the soil. Soil texture, plasticity and in-place density, potential frost action, soil wetness, and depth to a seasonal high water table were also considered. Soil wetness and depth to a seasonal high water table indicate potential difficulty in providing adequate drainage for

basements, lawns, and gardens. Depth to bedrock, slope, and large stones in or on the soil are also important considerations in the choice of sites for these structures and were considered in determining the ratings. Susceptibility to flooding is a serious hazard.

Local roads and streets referred to in table 8 have an all-weather surface that can carry light to medium traffic all year. They consist of a subgrade of the underlying soil material; a base of gravel, crushed rock fragments, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. The roads are graded with soil material at hand, and most cuts and fills are less than 6 feet deep.

The load supporting capacity and the stability of the soil as well as the quantity and workability of fill material available are important in design and construction of roads and streets. The classifications of the soil and the soil texture, density, shrink-swell potential, and potential frost action are indicators of the traffic supporting capacity used in making the ratings. Soil wetness, flooding, slope, depth to hard rock or very compact layers, and content of large stones affect stability and ease of excavation.

Sanitary facilities

Favorable soil properties and site features are needed for proper functioning of septic tank absorption fields, sewage lagoons, and sanitary landfills. The nature of the soil is important in selecting sites for these facilities and in identifying limiting soil properties and site features to be considered in design and installation. Also, those soil properties that affect ease of excavation or installation of these facilities will be of interest to contractors and local officials. Table 9 shows the degree and kind of limitations of each soil for such uses and for use of the soil as daily cover for landfills. It is important to observe local ordinances and regulations.

If the degree of soil limitation is expressed as *slight*, soils are generally favorable for the specified use and limitations are minor and easily overcome; if *moderate*, soil properties or site features are unfavorable for the specified use, but limitations can be overcome by special planning and design; and if *severe*, soil properties or site features are so unfavorable or difficult to overcome that major soil reclamation, special designs, or intensive maintenance is required. Soil suitability is rated by the terms *good*, *fair*, or *poor*, which, respectively, mean about the same as the terms *slight*, *moderate*, and *severe*.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into the natural soil. Only the soil horizons between depths of 18 and 72 inches are evaluated for this use. The soil properties and site features considered are those that affect the absorption of the effluent and those that affect the construction of the system.

Properties and features that affect absorption of the effluent are permeability, depth to seasonal high water table, depth to bedrock, and susceptibility to flooding. Stones, boulders, and shallowness to bedrock interfere with installation. Excessive slope can cause lateral seepage and surfacing of the effluent. Also, soil erosion and soil slippage are hazards if absorption fields are installed on sloping soils.

In some soils, loose sand and gravel or fractured bedrock is less than 4 feet below the tile lines. In these soils the absorption field does not adequately filter the effluent, and ground water in the area may be contaminated.

On many of the soils that have moderate or severe limitations for use as septic tank absorption fields, a system to lower the seasonal water table can be installed or the size of the absorption field can be increased so that performance is satisfactory.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons have a nearly level floor and cut slopes or embankments of compacted soil material. Aerobic lagoons generally are designed to hold sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Soils that are very high in content of organic matter and those that have cobbles, stones, or boulders are not suitable. Unless the soil has very slow permeability, contamination of ground water is a hazard where the seasonal high water table is above the level of the lagoon floor. In soils where the water table is seasonally high, seepage of ground water into the lagoon can seriously reduce the lagoon's capacity for liquid waste. Slope, depth to bedrock, and susceptibility to flooding also affect the suitability of sites for sewage lagoons or the cost of construction. Shear strength and permeability of compacted soil material affect the performance of embankments.

Sanitary landfill is solid waste (refuse) and soil material that is placed in successive layers either in excavated trenches or on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil material. Landfill areas are subject to heavy vehicular traffic. Risk of polluting ground water and trafficability affect the suitability of a soil for this use. The best soils have a loamy or silty texture, have moderate to slow permeability, are deep to a seasonal water table, and are not subject to flooding. Clayey soils are likely to be sticky and difficult to spread. Sandy or gravelly soils generally have rapid permeability, which might allow noxious liquids to contaminate ground water. Soil wetness can be a limitation, because operating heavy equipment on a wet soil is difficult. Seepage into the refuse increases the risk of pollution of ground water.

Ease of excavation affects the suitability of a soil for the trench type of landfill. A suitable soil is deep to bedrock and free of large stones and boulders. If the seasonal water table is high, water will seep into trenches.

Unless otherwise stated, the limitations in table 9 apply only to the soil material within a depth of about 6 feet. If the trench is deeper, a limitation of slight or moderate may not be valid. Site investigation is needed before a site is selected.

Daily cover for landfill should be soil that is easy to excavate and spread over the compacted fill in wet and dry periods. Soils that are loamy or silty and free of stones or boulders are better than other soils. Clayey soils may be sticky and difficult to spread; sandy soils may be subject to soil blowing.

The soils selected for final cover of landfills should be suitable for growing plants. Of all the horizons, the A horizon in most soils has the best workability, more organic matter, and the best potential for growing plants. Thus, for either the area- or trench-type landfill, stockpiling material from the A horizon for use as the surface layer of the final cover is desirable.

Where it is necessary to bring in soil material for daily or final cover, thickness of suitable soil material available and depth to a seasonal high water table in soils surrounding the sites should be evaluated. Other factors to be evaluated are those that affect reclamation of the borrow areas. These factors include slope, erodibility, and potential for plant growth.

Construction materials

The suitability of each soil as a source of roadfill, sand, gravel, and topsoil is indicated in table 10 by ratings of good, fair, or poor. The texture, thickness, and organic-matter content of each soil horizon are important factors in rating soils for use as construction materials. Each soil is evaluated to the depth observed, generally about 6 feet.

Roadfill is soil material used in embankments for roads (fig. 9). Soils are evaluated as a source of roadfill for low embankments, which generally are less than 6 feet high and less exacting in design than high embankments. The ratings reflect the ease of excavating and working the material and the expected performance of the material where it has been compacted and adequately drained. The performance of soil after it is stabilized with lime or cement is not considered in the ratings, but information about some of the soil properties that influence such performance is given in the descriptions of the soil series.

The ratings apply to the soil material between the A horizon and a depth of 5 to 6 feet. It is assumed that soil horizons will be mixed during excavation and spreading. Many soils have horizons of contrasting suitability within their profile. The estimated engineering properties in table 14 provide specific information about the nature of each horizon. This information can help determine the suitability of each horizon for roadfill.

Soils rated *good* are coarse grained. They have low shrink-swell potential, low potential frost action, and few cobbles and stones. They are at least moderately well drained and have slopes of 15 percent or less. Soils rated *fair* have a plasticity index of less than 15 and have other limiting features, such as moderate shrink-swell potential, moderately steep slopes, wetness, or many stones. If the thickness of suitable material is less than 3 feet, the entire soil is rated *poor*.

Sand and *gravel* are used in great quantities in many kinds of construction. The ratings in table 10 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-grained soils are not suitable sources of sand and gravel.

The ratings do not take into account depth to the water table or other factors that affect excavation of the material. Descriptions of grain size, kinds of minerals, reaction, and stratification are given in the soil series descriptions and in table 14.

Topsoil is used in areas where vegetation is to be established and maintained. Suitability is affected mainly by the ease of working and spreading the soil material in preparing a seedbed and by the ability of the soil material to support plantlife. Also considered is the damage that can result at the area from which the topsoil is taken.

The ease of excavation is influenced by the thickness of suitable material, wetness, slope, and amount of stones. The ability of the soil to support plantlife is determined by texture, structure, and the amount of soluble salts or toxic substances. Organic matter in the A1 or Ap horizon greatly increases the absorption and retention of moisture and nutrients. Therefore, the soil material from these horizons should be carefully preserved for later use.

Soils rated *good* have at least 16 inches of friable loamy material at their surface. They are free of stones and cobbles, are low in content of gravel, and have gentle slopes. They are low in soluble salts that can limit or prevent plant growth. They are naturally fertile or respond well to fertilizer. They are not so wet that excavation is difficult during most of the year.

Soils rated *fair* are loose sandy soils or firm loamy or clayey soils in which the suitable material is only 8 to 16 inches thick or soils that have appreciable amounts of gravel, stones, or soluble salt.

Soils rated *poor* are very sandy soils and very firm clayey soils; soils with suitable layers less than 8 inches thick; soils having large amounts of gravel, stones, or soluble salt; steep soils; and poorly drained soils.

Although a rating of *good* is not based entirely on high content of organic matter, a surface horizon is generally preferred for topsoil because of its organic-matter content. This horizon is designated as A1 or Ap in the soil series descriptions. The absorption and retention of moisture and nutrients for plant growth are greatly increased by organic matter.

Water management

Many soil properties and site features that affect water management practices have been identified in this soil survey. In table 11 soil and site features that affect use are indicated for each kind of soil. This information is significant in planning, installing, and maintaining water control structures.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have a low seepage potential, which is determined by permeability and the depth to fractured or permeable bedrock or other permeable material.

Embankments, dikes, and levees require soil material that is resistant to seepage, erosion, and piping and has favorable stability, shrink-swell potential, shear strength, and compaction characteristics. Large stones and organic matter in a soil downgrade the suitability of a soil for use in embankments, dikes, and levees.

Drainage of soil is affected by such soil properties as permeability; texture; depth to bedrock, hardpan, or other layers that affect the rate of water movement; depth to the water table; slope; stability of ditchbanks; susceptibility to flooding; salinity and alkalinity; and availability of outlets for drainage.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to intercept runoff. They allow water to soak into the soil or flow slowly to an outlet. Features that affect suitability of a soil for terraces are uniformity and steepness of slope; depth to bedrock, hardpan, or other unfavorable material; large stones; permeability; ease of establishing vegetation; and resistance to water erosion, soil blowing, soil slipping, and piping.

Grassed waterways are constructed to channel runoff to outlets at a nonerosive velocity. Features that affect the use of soils for waterways are slope, permeability, erodibility, wetness, and suitability for permanent vegetation.

Recreation

The soils of the survey area are rated in table 12 according to limitations that affect their suitability for recreation uses (fig. 10). The ratings are based on such restrictive soil features as flooding, wetness, slope, and texture of the surface layer. Not considered in these ratings, but important in evaluating a site, are location and accessibility of the area, size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites available, and either access to public sewerlines or capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degree, for recreation use by the duration and intensity of flooding and the season when flooding occurs. Onsite assessment of height, duration, intensity, and frequency of flooding is essential in planning recreation facilities.

The degree of the limitation of the soils is expressed as slight, moderate, or severe. *Slight* means that the soil properties are generally favorable and that the limitations are minor and easily overcome. *Moderate* means that the limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 12 can be supplemented by information in other parts of this survey. Especially helpful are interpretations for septic tank absorption fields, given in table 9, and interpretations for dwellings without basements and for local roads and streets, given in table 8.

Camp areas require such site preparation as shaping and leveling for tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils for this use have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing camping sites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for use as picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that will increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones or boulders, is firm after rains, and is not dusty when dry. If shaping is required to obtain a uniform grade, the depth of the soil over bedrock or hardpan should be enough to allow necessary grading.

Paths and trails for walking, horseback riding, bicycling, and other uses should require little or no cutting and filling. The best soils for this use are those that are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once during the annual period of use. They should have moderate slopes and have few or no stones or boulders on the surface.

Wildlife habitat

WILLIAM H. CASEY, biologist, Soil Conservation Service, assisted in the preparation of this section.

The wildlife population of Boyd and Greenup Counties is composed of 41 species of mammals, 61 species of reptiles and amphibians, and 103 kinds of breeding birds. Those most important to man are the ones that furnish hunting or commercial trapping: cottontail rabbit, gray

squirrel, fox squirrel, white-tailed deer, raccoon, red fox, mink, muskrat, bobwhite quail, ruffed grouse, mourning dove, and woodcock. Although there is much overlap in the types of habitat required by these animals, deer, squirrel, and ruffed grouse are usually classified as woodland wildlife; rabbit, quail, and dove as openland species; and mink, muskrat, and woodcock as wetland wildlife.

Soils directly affect the kind and amount of vegetation that is available to wildlife as food and cover, and they affect the construction of water impoundments. The kind and abundance of wildlife that populate an area depend largely on the amount and distribution of food, cover, and water. If any one of these elements is missing, is inadequate, or is inaccessible, wildlife either are scarce or do not inhabit the area.

If the soils have the potential, wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by helping the natural establishment of desirable plants.

In table 13, the soils in the survey area are rated according to their potential to support the main kinds of wildlife habitat in the area. This information can be used in planning for parks, wildlife refuges, nature study areas, and other developments for wildlife; selecting areas that are suitable for wildlife; selecting soils that are suitable for creating, improving, or maintaining specific elements of wildlife habitat; and determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* means that the element of wildlife habitat or the kind of habitat is easily created, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected if the soil is used for the designated purpose. A rating of *fair* means that the element of wildlife habitat or kind of habitat can be created, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* means that limitations are severe for the designated element or kind of wildlife habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* means that restrictions for the element of wildlife habitat or kind of wildlife are very severe, and that unsatisfactory results can be expected. Wildlife habitat is impractical or even impossible to create, improve, or maintain on soils having such a rating.

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

Grain and seed crops are seed-producing annuals used by wildlife. The major soil properties that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes that are planted for wildlife food and cover. Major soil properties that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, lovegrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds, that provide food and cover for wildlife. Major soil properties that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

Hardwood trees and the associated woody understory provide cover for wildlife and produce nuts or other fruit, buds, catkins, twigs, bark, or foliage that wildlife eat. Major soil properties that affect growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of native plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are commercially available and suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

Coniferous plants are cone-bearing trees, shrubs, or ground cover plants that furnish habitat or supply food in the form of browse, seeds, or fruitlike cones. Soil properties that have a major effect on the growth of coniferous plants are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites, exclusive of submerged or floating aquatics. They produce food or cover for wildlife that use wetland as habitat. Major soil properties affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, and rushes, sedges, and reeds.

Shallow water areas are bodies of water that have an average depth of less than 5 feet and that are useful to wildlife. They can be naturally wet areas, or they can be created by dams or levees or by water-control structures in marshes or streams. Major soil properties affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. The availability of a dependable water supply is important if water areas are to be developed. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The kinds of wildlife habitat are briefly described in the following paragraphs.

Openland habitat consists of cropland, pasture, meadows, and areas that are overgrown with grasses,

herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The kinds of wildlife attracted to these areas include bobwhite quail, meadowlark, field sparrow, cottontail rabbit, and red fox.

Woodland habitat consists of areas of hardwoods or conifers, or a mixture of both, and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

Wetland habitat consists of open, marshy or swampy, shallow water areas where water-tolerant plants grow. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Soil properties

Extensive data about soil properties are summarized on the following pages. The two main sources of these data are the many thousands of soil borings made during the course of the survey and the laboratory analyses of selected soil samples from typical profiles.

In making soil borings during field mapping, soil scientists can identify several important soil properties. They note the seasonal soil moisture condition or the presence of free water and its depth. For each horizon in the profile, they note the thickness and color of the soil material; the texture, or amount of clay, silt, sand, and gravel or other coarse fragments; the structure, or the natural pattern of cracks and pores in the undisturbed soil; and the consistence of the soil material in place under the existing soil moisture conditions. They record the depth of plant roots, determine the pH or reaction of the soil, and identify any free carbonates.

Samples of soil material are analyzed in the laboratory to verify the field estimates of soil properties and to determine all major properties of key soils, especially properties that cannot be estimated accurately by field observation. Laboratory analyses are not conducted for all soil series in the survey area, but laboratory data for many soil series not tested are available from nearby survey areas.

The available field and laboratory data are summarized in tables. The tables give the estimated range of engineering properties, the engineering classifications, and the physical and chemical properties of each major horizon of each soil in the survey area. They also present data about pertinent soil and water features, engineering test data, and data obtained from physical and chemical laboratory analyses of soils.

Engineering properties

Table 14 gives estimates of engineering properties and classifications for the major horizons of each soil in the survey area.

Most soils have, within the upper 5 or 6 feet, horizons of contrasting properties. Table 14 gives information for each of these contrasting horizons in a typical profile. *Depth* to the upper and lower boundaries of each horizon is indicated. More information about the range in depth and about other properties in each horizon is given for each soil series in the section "Soil series and morphology."

Texture is described in table 14 in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains gravel or other particles coarser than sand, an appropriate modifier is added, for example, "gravelly loam." Other texture terms are defined in the Glossary.

The two systems commonly used in classifying soils for engineering use are the Unified Soil Classification System (Unified) (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO) (*1*).

The *Unified* system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter, plasticity index, liquid limit, and organic-matter content. Soils are grouped into 15 classes—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 have a dual classification symbol, for example, CL-ML.

The *AASHTO* system classifies soils according to those properties that affect their use in highway construction and maintenance. In this system a mineral soil is classified 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. Soils in group A-1 are coarse grained and low in content of fines. At the other extreme, in group A-7, are fine-grained soils. Highly organic soils are classified in group A-8 on the basis of visual inspection.

When laboratory data are available, the A-1, A-2, and A-7 groups are further classified 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 an additional refinement, the desirability of soils as subgrade material can be indicated by a group index number. These numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested in the survey area, with group index numbers, is given in table 17. The estimated classification, without group index numbers, is given in table 14. Also in table 14 the percentage, by weight, of rock fragments more than 3 inches in diameter is estimated for each major horizon. These estimates are determined mainly by

observing volume percentage in the field and then converting that, by formula, to weight percentage.

Percentage of the soil material less than 3 inches in diameter that passes each of four sieves (U.S. standard) is estimated for each major horizon. The estimates are based on tests of soils that were sampled in the survey area and in nearby areas and on field estimates from many borings made during the survey.

Liquid limit and *plasticity index* indicate the effect of water on the strength and consistence of soil. These indexes are used in both the Unified and AASHTO soil classification systems. They are also used as indicators in making general predictions of soil behavior. Range in liquid limit and plasticity index are estimated on the basis of test data from the survey area or from nearby areas and on observations of the many soil borings made during the survey.

In some surveys, the estimates are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterburg limits extend a marginal amount across classification boundaries (1 or 2 percent), the classification in the marginal zone is omitted.

Physical and chemical properties

Table 15 shows estimated values for several soil characteristics and features that affect behavior of soils in engineering uses. These estimates are given for each major horizon, at the depths indicated, in the typical pedon of each soil. The estimates are based on field observations and on test data for these and similar soils.

Permeability is estimated on the basis of known relationships among the soil characteristics observed in the field—particularly soil structure, porosity, and gradation or texture—that influence the downward movement of water in the soil. The estimates are for vertical water movement when the soil is saturated. Not considered in the estimates is lateral seepage or such transient soil features as plowpans and surface crusts. Permeability of the soil is an important factor to be considered in planning and designing drainage systems, in evaluating the potential of soils for septic tank systems and other waste disposal systems, and in many other aspects of land use and management.

Available water capacity is rated on the basis of soil characteristics that influence the ability of the soil to hold water and make it available to plants. Important characteristics are content of organic matter, soil texture, and soil structure. Shallow-rooted plants are not likely to use the available water from the deeper soil horizons. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design of irrigation systems.

Soil reaction is expressed as a range in pH values. The range in pH of each major horizon is based on many field checks. For many soils, the values have been verified by laboratory analyses. Soil reaction is important in selecting the crops, ornamental plants, or other plants to be grown; in evaluating soil amendments for fertility and stabilization; and in evaluating the corrosivity of soils.

Shrink-swell potential depends mainly on the amount and kind of clay in the soil. Laboratory measurements of the swelling of undisturbed clods were made for many soils. For others the swelling was estimated on the basis of the kind and amount of clay in the soil and on measurements of similar soils. The size of the load and the magnitude of the change in soil moisture content also influence the swelling of soils. Shrinking and swelling of some soils can cause damage to building foundations, basement walls, roads, and other structures unless special designs are used. A high shrink-swell potential indicates that special design and added expense may be required if the planned use of the soil will not tolerate large volume changes.

Risk of corrosion pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to soil moisture, particle-size distribution, total acidity, and electrical conductivity of the soil material. The rate of corrosion of concrete is based mainly on the sulfate content, texture, and acidity of the soil. Protective measures for steel or more resistant concrete help to avoid or minimize damage resulting from the corrosion. Uncoated steel intersecting soil boundaries or soil horizons is more susceptible to corrosion than an installation that is entirely within one kind of soil or within one soil horizon.

Erosion factors are used to predict the erodibility of a soil and its tolerance to erosion in relation to specific kinds of land use and treatment. The soil erodibility factor (K) is a measure of the susceptibility of the soil to erosion by water. Soils having the highest K values are the most erodible. K values range from 0.10 to 0.64. To estimate annual soil loss per acre, the K value of a soil is modified by factors representing plant cover, grade and length of slope, management practices, and climate. The soil-loss tolerance factor (T) is the maximum rate of soil erosion, whether from rainfall or soil blowing, that can occur without reducing crop production or environmental quality. The rate is expressed in tons of soil loss per acre per year.

Soil and water features

Table 16 contains information helpful in planning land uses and engineering projects that are likely to be affected by soil and water features.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are placed in one of four groups on the basis of the intake of water after the soils have been wetted and have received precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist chiefly of deep, well drained to excessively drained sands or

gravels. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils that have a layer that impedes the downward movement of water or soils that have moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clay soils that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding is the temporary covering of soil with water from overflowing streams, with runoff from adjacent slopes, and by tides. Water standing for short periods after rains or after snow melts is not considered flooding, nor is water in swamps and marshes. Flooding is rated in general terms that describe the frequency and duration of flooding and the time of year when flooding is most likely. The ratings are based on evidence in the soil profile of the effects of flooding, namely thin strata of gravel, sand, silt, or, in places, clay deposited by floodwater; irregular decrease in organic-matter content with increasing depth; and absence of distinctive soil horizons that form in soils of the area that are not subject to flooding. The ratings are also based on local information about floodwater levels in the area and the extent of flooding; and on information that relates the position of each soil on the landscape to historic floods.

The generalized description of flood hazards is of value in land-use planning and provides a valid basis for land-use restrictions. The soil data are less specific, however, than those provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table is the highest level of a saturated zone more than 6 inches thick for a continuous period of more than 2 weeks during most years. The depth to a seasonal high water table applies to undrained soils. Estimates are based mainly on the relationship between grayish colors or mottles in the soil and the depth to free water observed in many borings made during the course of the soil survey. Indicated in table 16 are the depth to the seasonal high water table; the kind of water table, that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. Only saturated zones above a depth of 5 or 6 feet are indicated.

Information about the seasonal high water table helps in assessing the need for specially designed foundations, the need for specific kinds of drainage systems, and the need for footing drains to insure dry basements. Such information is also needed to decide whether or not construction of basements is feasible and to determine how septic tank absorption fields and other underground installations will function. Also, a seasonal high water table affects ease of excavation.

Depth to bedrock is shown for all soils that are underlain by bedrock at a depth of 5 to 6 feet or less. For many soils, the limited depth to bedrock is a part of the definition of the soil series. The depths shown are based on measurements made in many soil borings and on other observations during the mapping of the soils. The kind of bedrock and its hardness as related to ease of excavation is also shown. Rippable bedrock can be excavated with a single-tooth ripping attachment on a 200-horsepower tractor, but hard bedrock generally requires blasting.

Engineering test data

Table 17 contains the results of engineering tests performed by the Kentucky Department of Transportation, Bureau of Highways, on six soils in Boyd and Greenup Counties. These tests were made to help evaluate the soils for engineering purposes.

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

Mechanical analysis results may differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHTO procedure, the fine material is analyzed by the hydrometer method and the various grain-sized fractions are calculated on the basis of all material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method, and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in table 17 are not suitable for use in naming textural classes of soils.

Tests to determine liquid limit and plastic limit measure the effect of water on the consistence of soil material, as has been explained for table 14. The AASHTO and Unified systems of classification are explained in the section "Engineering properties."

The Cranston pedon was sampled for laboratory testing because it is a common source of roadbuilding material in the western part of the survey area and additional engineering test data was needed on this soil.

Elk and Whitley soils are on terraces that have become prime areas for construction sites. Additional engineering

test data were needed on these soils because they are subject to rapid urbanization. The Latham pedon was sampled because this is a dominant soil in the area and is widely used for construction sites on the more gentle slopes.

Additional engineering test data were needed on the Vandalia and Upshur soils because they are subject to slippage in this area, especially when used for construction sites or roads.

For soil profile descriptions of the Cranston, Elk, Vandalia, and Whitley pedons see the section "Soil Series and Morphology." The Latham and Upshur pedon descriptions follow.

Latham silt loam S73KY-45-35:

Ap—0 to 2 inches, brown (10YR 4/3) silt loam; weak fine and medium granular structure; friable; many fine roots; very strongly acid; abrupt smooth boundary.

B1t—2 to 6 inches, yellowish brown (10YR 5/4) silty clay loam; moderate medium and fine angular and subangular blocky structure; firm; common fine roots; few fine pores; few clay films; very strongly acid; clear smooth boundary.

B21t—6 to 15 inches, strong brown (7.5YR 5/6) silty clay; moderate medium subangular blocky structure parting to fine angular blocky; very firm; common fine roots; few fine pores; many clay films; yellowish brown (10YR 5/4) coatings on larger peds; few small soft shale fragments; very strongly acid; clear smooth boundary.

B22t—15 to 19 inches, strong brown (7.5YR 5/6) silty clay; many distinct grayish brown (2.5Y 5/2) and pale brown (10YR 6/3) mottles; weak fine and medium angular blocky structure; very firm; few fine roots; many clay films; 10 percent soft and hard shale fragments; strongly acid; gradual smooth boundary.

B23t—19 to 25 inches, mottled light brownish gray (2.5Y 6/2) and strong brown (7.5YR 5/6) clay; weak fine and medium angular blocky structure; few fine roots; many clay films; 15 percent soft and hard shale fragments; very strongly acid; gradual smooth boundary.

C—25 to 37 inches, gray (5Y 6/1) clay; many medium distinct strong brown (7.5YR 5/6) and light yellowish brown (2.5Y 6/4) mottles; weak relict platy shale structure; very firm; few fine roots; very strongly acid; clear smooth boundary.

C1r—37 to 44 inches, soft olive shale; grayish brown coatings on some shale structure planes.

C2r—44 to 50 inches, soft olive rippable shale that is harder than that in the C1r horizon.

Upshur silty clay loam S73KY-10-41:

Ap—0 to 7 inches, dark brown (7.5YR 4/2) silty clay loam; moderate medium granular structure; friable; many fine roots; mildly alkaline; clear smooth boundary.

B1t—7 to 19 inches, yellowish red (5YR 4/8) silty clay; moderate medium and fine subangular blocky structure; firm, sticky; few fine roots; thin continuous clay films; 2 percent shale fragments; very strongly acid; gradual smooth boundary.

B21t—19 to 26 inches, dark red (2.5YR 3/6) silty clay; strong fine and medium angular blocky structure; firm, very sticky and plastic; continuous clay films; very strongly acid; clear smooth boundary.

B22t—26 to 40 inches, dark red (10R 3/6) clay; few fine distinct reddish gray (10R 6/1) mottles; strong fine medium angular blocky structure; firm, very sticky and plastic; continuous clay films; extremely acid; gradual wavy boundary.

B23—40 to 46 inches, dark red (2.5YR 3/6) clay; common large prominent yellowish brown (10YR 5/6) and common medium prominent gray (10YR 6/1) mottles; moderate medium and coarse subangular blocky structure; firm, very sticky; very strongly acid; clear wavy boundary.

C1—46 to 60 inches, olive (5Y 5/3) clay and common medium distinct dusky red (10R 3/4), yellowish brown (10YR 5/6), and gray (5Y 6/1) mottles; massive; firm, very sticky; few dark concretions and shale fragments; strongly acid; clear smooth boundary.

C2—60 to 65 inches, olive and common medium distinct dusky red (10R 3/4), yellowish brown (10YR 5/6), and gray (5Y 6/1) mottles; massive; firm, very sticky; few dark concretions and shale fragments; strongly acid; clear smooth boundary.

R—65 inches, olive (5Y 5/3) clay shale.

Soil series and morphology

In this section, each soil series recognized in the survey area is described in detail. The descriptions are arranged in alphabetic order by series name.

Characteristics of the soil and the material in which it formed are discussed for each series. The soil is then compared to similar soils and to nearby soils of other series. Then a pedon, a small three-dimensional area of soil that is typical of the soil series in the survey area, is described. The detailed descriptions of each soil horizon follow standards in the Soil Survey Manual (*9*). Unless otherwise noted, colors described are for moist soil.

Following the pedon description is the range of important characteristics of the soil series in this survey area. Phases, or map units, of each soil series are described in the section "Soil maps for detailed planning."

Allegheny series

The Allegheny series consists of fine-loamy, mixed, mesic Typic Hapludults. They are deep and well drained and have a yellowish brown and strong brown loam to clay loam B2t horizon. They formed in alluvium and colluvium washed from soils derived from acid siltstone, sandstone, and shale. The Allegheny soils are on stream terraces and alluvial fans. Slope ranges from 2 to 20 percent but is dominantly 12 to 20 percent.

Allegheny soils are associated with Riney, Monongahela, and Tilsit soils on high stream terraces and with Chavies and Whitley soils on lower terraces. Allegheny soils have a thinner solum and are less red than Riney soils. They are better drained and do not have the fragipan of the Monongahela and Tilsit soils, and they contain more sand in the A horizon and upper part of the solum. Allegheny soils contain more sand throughout than the Whitley soils and have more clay in the argillic horizon than the Chavies soils.

Typical pedon of Allegheny loam, 6 to 12 percent slopes, 1/4 mile east of KY 1458, 1/4 mile south of KY 693, and 1/2 mile southeast of Flatwoods, in Greenup County:

Ap—0 to 9 inches, brown (10YR 4/3) loam; weak fine granular structure; very friable; common fine roots; strongly acid; clear smooth boundary.

B1t—9 to 20 inches, yellowish brown (10YR 5/6) heavy loam; weak medium subangular blocky structure; friable; few fine roots; thin clay films; many fine pores; strongly acid; gradual wavy boundary.

B2t—20 to 33 inches, strong brown (7.5YR 5/6) light clay loam; moderate medium subangular blocky structure; friable; continuous clay films; few fine roots; many fine pores; very strongly acid; gradual wavy boundary.

B3t—33 to 45 inches, yellowish brown (10YR 5/6) sandy clay loam; common medium dark brown (7.5YR 4/4) and pale brown (10YR 6/3) mottles; weak medium and coarse subangular blocky structure; friable, slightly compact; few fine pores; patchy clay films; few dark oxide concretions; about 5 percent, by volume, rounded quartzite and sandstone gravel 1/4 to 3 inches in diameter; very strongly acid; gradual wavy boundary.

C—45 to 66 inches, strong brown (7.5YR 5/6) sandy loam; few fine distinct light brownish gray (10YR 6/2) mottles; massive; very friable; about 20 percent, by volume, oxide concretions; quartzite and sandstone pebbles and cobblestones 1/4 inch to 6 inches in diameter; very strongly acid.

The solum thickness ranges from 30 to 48 inches. Depth to bedrock ranges from 72 to 120 inches. Reaction ranges from strongly acid to extremely acid, unless the soil is limed. Content of pebbles in the A and B horizons ranges from 0 to 10 percent and from 0 to 35 percent in the C horizon.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4.

The B horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 8. It is loam, clay loam, and sandy clay loam.

The C horizon has hue of 10YR or 7.5YR and value and chroma of 4 to 8. In some pedons the C horizon has mottles with a chroma of 2 or less. The C horizon ranges from gravelly sandy loam to clay loam.

Ashton series

The Ashton series consists of fine-silty, mixed, mesic Mollic Hapludalfs. They are deep and well drained and have a dark brown or brown silt loam and silty clay loam subsoil. They formed in alluvium derived in part from limestone or nonacid material. The soils are nearly level and are on low terraces.

Ashton soils are associated with Chavies, Elk, and Huntington soils. They have a thicker and darker A horizon than Elk and Chavies soils. They have higher base saturation than the Elk soils. Ashton soils have a finer textured argillic horizon than the Chavies soils, and the Huntington soils do not have an argillic horizon.

Typical pedon of Ashton silt loam, 20 feet north of farm road, 200 yards west of Ohio River, and 3/4 mile south of C&O Railroad bridge at Siloam, in Greenup County:

Ap—0 to 8 inches, dark brown (10YR 3/3) silt loam; weak fine granular structure; very friable; common fine roots; mildly alkaline; clear smooth boundary.

B1—8 to 14 inches, dark brown (10YR 4/3) silt loam; weak fine granular and weak fine subangular blocky structure; very friable; common fine roots; many worm holes and pores; neutral; gradual smooth boundary.

B21t—14 to 22 inches, brown (7.5YR 4/4) light silty clay loam; moderate fine and medium subangular blocky structure; friable; many worm holes and pores, dark brown (7.5YR 3/2) clay films on ped faces and in pores; neutral; gradual smooth boundary.

B22t—22 to 32 inches, brown (7.5YR 4/4) light silty clay loam; moderate fine and medium subangular blocky structure; friable; continuous dark brown (7.5YR 4/2) clay films; neutral; gradual smooth boundary.

B3—32 to 41 inches, brown (7.5YR 4/4) heavy silt loam; weak medium subangular blocky structure; friable; brown (7.5YR 5/4) silt coatings on peds; slightly acid; gradual wavy boundary.

C1—41 to 62 inches, brown (7.5YR 4/4) silt loam; massive; friable; medium acid; abrupt smooth boundary.

IIC2—62 to 72 inches, brown (10YR 4/3) fine sandy loam; very friable; medium acid.

The solum thickness ranges from 40 to 60 inches. Depth of the alluvium is 6 to 20 feet or more.

The Ap or A1 horizon has hue of 10YR or 7.5YR, value of 3, and chroma of 2 or 3.

The B horizon has hue of 7.5YR or 10YR, value of 4, and chroma of 3 or 4. It is silt loam or light silty clay loam. Reaction ranges from neutral to medium acid.

The C horizon has hue of 10YR or 7.5YR, value of 4, and chroma of 3 or 4. It is silt loam or fine sandy loam and contains thin strata of fine sand in places. Reaction ranges from slightly acid to medium acid.

Berks series

The Berks series consists of loamy-skeletal, mixed, mesic Typic Dystrochrepts. They are moderately deep and well drained and have a brown and yellowish brown channery and very channery silt loam B horizon. They formed in residuum derived from acid siltstone and shale. The Berks soils are on upper side slopes and narrow ridges. Slope ranges from 30 to 60 percent but is dominantly 45 to 55 percent.

Berks soils are associated with Cranston, Gilpin, Latham, and Shelocta soils. They are above the deep Cranston soils on side slopes and below the Latham, Shelocta, and Gilpin soils. Berks soils lack the argillic horizon typical of those soils and have more coarse fragments.

Typical pedon of Berks channery silt loam, in an area of Berks-Cranston channery silt loams, 30 to 60 percent slopes, near the head of Lowder Fork of White Oak Creek, 130 yards east of Lewis County line, in Greenup County:

Ap—0 to 5 inches, dark grayish brown (10YR 4/2) channery silt loam; weak fine granular structure; very friable;about 15 percent by volume siltstone and shale fragments; many fine roots; very strongly acid; abrupt smooth boundary.

B1—5 to 12 inches, brown (7.5YR 5/4) channery silt loam; weak fine subangular blocky structure; very friable; about 15 percent by volume siltstone and shale channery material and pebbles; many fine roots; very strongly acid; clear wavy boundary.

B2—12 to 25 inches, yellowish brown (10YR 5/4) very channery silt loam; weak medium subangular blocky structure; very friable; about 40 percent siltstone channery material and pebbles; few fine roots; common fine pores; very strongly acid; gradual wavy boundary.

B3—25 to 30 inches, yellowish brown (10YR 5/4) very channery silt loam; weak medium subangular blocky structure; friable; about 55 percent by volume siltstone channery material and pebbles; very strongly acid; abrupt irregular boundary.

R—30 inches, olive siltstone.

The thickness of solum ranges from 18 to 36 inches. Depth to rock ranges from 20 to 40 inches. Coarse fragments make up 10 to 40 percent of the Ap and B1 horizon and 40 to 65 percent of the B2 and B3 horizons. Reaction is very strongly acid throughout the profile.

The A or Ap horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4.

The B horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 4 to 6. It is channery or very channery or gravelly silt loam.

A C horizon is present in some pedons. It is yellowish brown very channery silt loam and is 60 to 80 percent coarse fragments.

Bonnie series

The Bonnie series consists of fine-silty, mixed, acid, mesic Typic Fluvaquents. They are deep and poorly drained and have a gray silt loam B horizon. They formed

in alluvium washed from soils derived from acid shale and siltstone. Bonnie soils are nearly level or depressional and are on flood plains.

Bonnie soils are associated with Stendal soils. They are less well drained than Stendal soils.

Typical pedon of Bonnie silt loam, 20 feet west of KY 1937, 660 feet north of Ellingtons Creek, and 1/4 mile south of junction of KY 3 and KY 1937, in Boyd County:

Ap—0 to 8 inches, grayish brown (2.5Y 5/2) silt loam; few dark brown (7.5YR 4/2) mottles along root channels; weak fine granular structure; very friable; many fine roots; medium acid; clear smooth boundary.

B1g—8 to 17 inches, olive gray (5Y 5/2) silt loam; common fine prominent dark brown (7.5YR 4/4) mottles along root channels; moderate medium granular and weak coarse subangular blocky structure; friable; many fine roots; strongly acid; gradual wavy boundary.

B2g—17 to 38 inches, gray (5Y 5/1) heavy silt loam; many medium prominent strong brown (7.5YR 5/6) mottles; moderate medium granular structure; friable; few fine roots; few dark concretions; strongly acid; gradual wavy boundary.

Cg—38 to 62 inches, mottled grayish brown (2.5Y 5/2), gray (5Y 5/1), and yellowish brown (10YR 5/6) heavy silt loam; massive; slightly sticky and plastic; about 5 percent gravel; few dark concretions; strongly acid.

Depth to bedrock ranges from 5 to 10 feet or more. Coarse fragments make up less than 2 percent of the solum. Unless limed, the profile is strongly acid to very strongly acid. The profile is silt loam to a depth of 40 inches. In places the C horizon contains sandy strata.

The A1 or Ap horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2.

The B and C horizons have hue of 10YR, 2.5Y, or 5Y, value of 5 to 7; and chroma of 1 or 2.

Chavies series

The Chavies series consists of coarse-loamy, mixed, mesic Ultic Hapludalfs. They are deep and well drained soils and have a dark brown fine sandy loam B2t horizon. They formed in mixed alluvium washed mainly from acid sandstone, siltstone, and shale. The Chavies soils are on long, narrow to broad areas on stream terraces. Slope ranges from 0 to 6 percent.

Chavies soils are associated with Ashton, Elk, and Lakin soils. They contain more sand and less clay than Ashton and Elk soils and have an argillic horizon that Lakin soils do not have.

Typical pedon of Chavies fine sandy loam, 0 to 6 percent slopes, 30 yards north of end of farm road, 1/8 mile south of Ohio River, and 1 mile downstream from C&O Railroad bridge at Siloam, in Greenup County:

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

B1—10 to 18 inches, dark brown (7.5YR 4/4) fine sandy loam; weak fine and medium subangular blocky structure; friable; common fine roots; common fine pores; slightly acid; gradual smooth boundary.

B2t—18 to 35 inches, dark brown (7.5YR 4/4) fine sandy loam; weak fine and medium subangular and angular blocky structure; friable; thin continuous clay films; medium acid; clear wavy boundary.

B3—35 to 44 inches, brown (7.5YR 4/4) fine sandy loam; weak medium subangular blocky structure; friable; thin discontinuous clay films; strongly acid; clear smooth boundary.

C—44 to 65 inches, brown (7.5YR 4/4) fine sandy loam and brown (10YR 5/4) loamy sand; massive; loose; few fine dark concretions; very strongly acid.

The solum thickness ranges from 30 to 48 inches. Depth to bedrock ranges from 5 feet to more than 20 feet. Unless limed, the profile is medium acid to very strongly acid.

The Ap or A1 horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 to 4.

The B horizon commonly has hue of 7.5YR but also has hue of 10YR and 5YR. It has value of 4 or 5 and chroma of 4 or 6. It is fine sandy loam, loam, or silt loam.

The C horizon is similar in hue, value and chroma to the B horizon and is commonly stratified fine sandy loam, sandy loam, or loamy sand. In places it is gravelly.

Cotaco series

The Cotaco series consists of fine-loamy, mixed, mesic Aquic Hapludults. They are deep and moderately well drained and have a mottled yellowish brown sandy clay loam and clay loam B2t horizon. They formed in alluvium and colluvium washed from acid sandstone, siltstone, and shale soils of the uplands. These soils are in narrow valleys, and slope ranges from 2 to 6 percent.

Cotaco soils are associated with Morehead, Shelocta, Stendal, and Stokly soils. They contain more sand and coarse fragments than Morehead soils, have an argillic horizon that Stendal and Stokly soils do not have, and are less well drained than Shelocta soils.

Typical pedon of Cotaco loam, on a tributary of East Fork Creek, 1/4 mile east of KY 503, and 1 1/4 mile south of junction of KY 207 and KY 503, in Greenup County:

Ap—0 to 10 inches, dark grayish brown (10YR 4/2) loam; weak fine granular structure; very friable; many fine roots; about 2 percent gravel; slightly acid; abrupt smooth boundary.

B1t—10 to 16 inches, yellowish brown (10YR 5/4) ped interiors and brown (10YR 5/3) ped faces; sandy clay loam; common medium faint strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable; many fine roots; about 5 percent by volume coarse fragments; few patchy clay films on peds; many fine pores; slightly acid; gradual smooth boundary.

B21t—16 to 23 inches, yellowish brown (10YR 5/4) sandy clay loam; common medium distinct light brownish gray (2.5Y 6/2), dark brown (7.5YR 4/4), and yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; friable; thin clay films on peds; 15 percent by volume sandstone and shale pebbles and channery material; strongly acid; gradual smooth boundary.

B22t—23 to 41 inches, mottled grayish brown (2.5Y 5/2), yellowish brown (10YR 5/8), and dark brown (7.5YR 4/4) gravelly light clay loam; moderate medium subangular blocky structure; friable; thin clay films; about 30 percent by volume coarse fragments and dark reddish brown concretions; strongly acid; gradual smooth boundary.

C1—41 to 46 inches, yellowish brown (10YR 5/4) gravelly light clay loam; many medium distinct dark brown (7.5YR 4/4) and light brownish gray (10YR 6/2) mottles; massive; friable; about 40 percent by volume pebbles and dark concretions; strongly acid; gradual smooth boundary.

C2—46 to 66 inches, mottled yellowish brown (10YR 5/6), gray (10YR 6/1), and dark brown (7.5YR 4/4) sandy clay loam; massive; slightly sticky; about 5 percent by volume coarse fragments; strongly acid.

The solum thickness ranges from 28 to 48 inches. Depth to bedrock ranges from 48 to 108 inches or more. Unless the soil is limed, reaction ranges from strongly acid to extremely acid. Coarse fragments make up 2 to 40 percent of the solum.

The Ap or A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3.

The B horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 3 to 6, and it has mottles that have chroma of 2 or less. In places the B horizon has no dominant color and is evenly mottled in hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 3 to 6. The B horizon is sandy clay loam or light clay loam.

The C horizon has of brown and gray mottles and is commonly stratified with loam, sandy loam, clay loam, and their gravelly analogues.

Cranston series

The Cranston series consists of coarse-loamy, mixed, mesic Ultic Hapludalfs. They are deep and well drained and have a yellowish brown and strong brown channery silt loam B2t horizon. They formed in colluvium washed from soils derived from acid siltstone and shale. Cranston soils are steep and are on lower side slopes. Slope ranges from 30 to 60 percent but is dominantly 40 to 50 percent.

Cranston soils are associated with Berks, Latham, and Shelocta soils. They are below areas of the associated soils. They are deeper to bedrock and contain more coarse fragments than Berks soils. They are deeper to bedrock than Latham soils and have less clay and more coarse fragments than Latham and Shelocta soils.

Typical pedon of Cranston channery silt loam in an area of Berks-Cranston channery silt loams, 30 to 60 percent slopes, 10 feet north of road on Loder Fork 1 1/2 miles upstream from White Oak Creek, and 1/4 mile east of Lewis County line, in Greenup County:

O1—1/2 inch to 0, loose hardwood leaf litter and twigs.

A1—0 to 4 inches, dark grayish brown (10YR 4/2) channery silt loam; weak fine granular structure; very friable; many fine roots; about 15 percent coarse fragments; very strongly acid; abrupt smooth boundary.

B1—4 to 14 inches, yellowish brown (10YR 5/4) channery silt loam; weak medium and fine subangular blocky structure; friable; few fine roots; about 15 percent coarse fragments; very strongly acid; gradual wavy boundary.

B2t—14 to 37 inches, strong brown (7.5YR 5/6) channery silt loam; moderate medium and fine subangular blocky structure; friable; about 20 percent coarse fragments; thin clay films; very strongly acid; gradual wavy boundary.

B3t—37 to 52 inches, yellowish brown (10YR 5/6) very channery silt loam; weak fine and medium subangular blocky structure; friable; thin patchy clay films; about 45 percent coarse fragments, 10 percent greater than 3 inches in length; very strongly acid; gradual wavy boundary.

C—52 to 65 inches, yellowish brown (10YR 5/6) very channery silt loam; massive; firm; about 60 percent coarse fragments, 10 percent greater than 3 inches in length; very strongly acid.

The thickness of the solum ranges from 40 to 60 inches. Depth to siltstone or shale bedrock ranges from 5 to 20 feet or more. Reaction is strongly to extremely acid throughout the profile.

The A horizon has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 2 or 3.

The Bt horizon has hue of 10YR, 2.5Y, or 7.5YR; value of 5 or 6; and chroma of 4 to 6. It is gravelly or channery silt loam. The B horizon is 15 to 35 percent coarse fragments in the upper part and 15 to 45 percent in the lower part.

The C horizon, where present, is similar in hue, value, chroma, and texture to the Bt horizon and in some pedons has few to common gray mottles. Coarse fragments make up 15 to 60 percent of the C horizon.

Cuba series

The Cuba series consists of fine-silty, mixed, mesic Fluventic Dystrochrepts. They are deep and well drained and have a brown and dark yellowish brown silt loam B horizon. They formed in silty alluvium washed from soils derived from acid shale and siltstone. Cuba soils are nearly level and are on flood plains.

Cuba soils are associated with Pope, Stendal, and Whitley soils. They contain less sand than Pope soils, are better drained than Stendal soils, and lack the argillic horizon of Whitley soils.

Typical pedon of Cuba silt loam, south of Plum Grove road, 400 feet north of Little Sandy River, 1/2 mile east of KY 2, and about 4 miles south of the town of Greenup:

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

B1—10 to 27 inches, brown (10YR 4/3) silt loam; weak medium granular structure; friable; few roots; very strongly acid; gradual smooth boundary.

B2—27 to 38 inches, dark yellowish brown (10YR 4/4) silt loam; weak medium granular structure; friable; very strongly acid; gradual smooth boundary.

C—38 to 70 inches, dark yellowish brown (10YR 4/4) silt loam; massive; friable; very strongly acid.

Depth to bedrock ranges from 5 to 10 feet or more. Reaction ranges from strongly acid to very strongly acid, unless the soil is limed.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3.

The B horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 5.

The C horizon is similar in hue, value, and chroma to the B horizon and in some pedons has mottles below a depth of 27 inches. It commonly consists of stratified alluvium of silt loam and fine sandy loam, and has layers of gravel in places.

Elk series

The Elk series consist of fine-silty, mixed, mesic Ultic Hapludalfs. They are deep and well drained and have a brown light silty clay loam and silt loam B2t horizon. They formed in mixed alluvium, are nearly level, and are on stream terraces.

Elk soils are associated with Huntington, Ashton, Chavies, Lakin, and Otwell soils. They lack the thick dark surface layer of Huntington and Ashton soils and contain more clay and less sand than Chavies and Lakin soils. They are better drained and lack the fragipan of the Otwell soils.

Typical pedon of Elk silt loam, 0 to 2 percent slopes, 1/2 mile east of Tygarts Creek and 1,700 feet South of Ohio River, in Greenup County:

Ap—0 to 9 inches, dark brown (10YR 4/3) silt loam; moderate medium granular structure; very friable; few fine roots; strongly acid; clear smooth boundary.

B1t—9 to 12 inches, dark brown (7.5YR 4/4) silt loam; moderate medium and fine subangular blocky structure; friable; thin continuous clay films; few fine roots; very strongly acid; clear smooth boundary.

B21t—12 to 28 inches, brown (7.5YR 5/4) light silty clay loam; moderate medium and fine subangular and angular blocky structure; friable; continuous clay films; few fine roots; very strongly acid; gradual smooth boundary.

B22t—28 to 39 inches, brown (7.5YR 5/4) silt loam; moderate medium subangular and angular blocky structure; friable; continuous clay films; dark brown (7.5YR 4/4) ped faces; very strongly acid; gradual wavy boundary.

B3—39 to 45 inches, dark brown (7.5YR 4/4) silt loam; weak medium subangular blocky structure; friable; few discontinuous clay films; strongly acid; clear smooth boundary.

C1—45 to 54 inches, dark yellowish brown (10YR 4/4) stratified loam and sandy loam; common medium distinct strong brown (7.5YR 5/6) mottles; massive; loose; strongly acid; clear smooth boundary.

C2—54 to 73 inches, dark brown (7.5YR 4/4) and dark yellowish brown (10YR 4/4) stratified sandy loam and loam; massive; loose; strongly acid.

The solum thickness ranges from 38 to 54 inches. Depth to bedrock ranges from 6 to 20 feet or more. Reaction is mostly strongly acid or medium acid but ranges from very strongly acid to slightly acid, unless the soil is limed.

The Ap horizon has hue of 10YR and 7.5YR, value of 3 and 4, and chroma of 2 to 4.

The B horizon has hue of 10YR and 7.5YR, value of 4 or 5, and chroma of 4 through 6. It is silt loam or light silty clay loam. In places the B3 and C horizons have mottles or silt coatings with chroma of 2 or less.

The C horizon is similar in hue, value, and chroma to the B horizon.

Gilpin series

The Gilpin series consists of fine-loamy, mixed, mesic Typic Hapludults. They are moderately deep and well drained and have a yellowish brown silt loam and shaly light silty clay loam B2t horizon. They formed in residuum from acid siltstone and shale. These soils are on narrow ridgetops and upper side slopes. Slope ranges from 6 to 30 percent but is dominantly 10 to 20 percent.

Gilpin soils are associated with Latham and Wernock soils. They contain less clay in the argillic horizon than Latham soils and have more coarse fragments than Wernock soils.

Typical pedon of Gilpin silt loam, 6 to 12 percent slopes, 50 feet north of fence along I-64, 200 yards south of small cemetery, approximately 1/4 mile west of Cannonsburg exit from I-64, in Boyd County:

Ap—0 to 7 inches, brown (10YR 4/3) silt loam; weak fine granular structure; very friable; many fine roots; 2 percent coarse fragments; strongly acid; abrupt smooth boundary.

B21t—7 to 16 inches, yellowish brown (10YR 5/6) heavy silt loam; weak medium and fine subangular blocky structure; friable; few fine roots; 10 percent coarse fragments; thin discontinuous clay films; strongly acid; gradual wavy boundary.

B22t—16 to 27 inches, yellowish brown (10YR 5/6) shaly light silty clay loam; moderate medium subangular blocky structure; friable; few fine roots; 30 percent shale and siltstone fragments; thin 1/2-inch shale layer at a depth of 17 inches; very strongly acid; abrupt smooth boundary.

R—27 to 34 inches, siltstone and shale; very strongly acid.

The solum thickness ranges from 20 to 36 inches. Depth to bedrock ranges from 20 to 40 inches. Coarse fragments of siltstone, shale, or sandstone make up less than 2 percent to 30 percent of the solum. Reaction ranges from strongly acid to extremely acid throughout, unless the soil is limed.

The Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4.

The Bt horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 4 or 6. Some subhorizons of the B horizon are heavy silt loam or light silty clay loam or they are shaly or channery analogues.

The C horizon, where present, has hue of 7.5YR, 10YR, and 2.5Y; value of 4 or 5; and chroma of 4 or 6. It is shaly or channery silt loam or loam. It is 30 to 60 percent coarse fragments.

Hayter series

The Hayter series consists of fine-loamy, mixed, mesic Ultic Hapludalfs. They are deep and well drained and have a dark brown and brown clay loam and gravelly sandy clay loam B2t horizon. They formed in alluvium and colluvium washed from soils of the uplands formed in material derived from acid sandstone, siltstone, and shale and minor amounts of limestone and calcareous shale. The Hayter soils are on alluvial fans and colluvial side slopes. Slope ranges from 2 to 30 percent but is dominantly 2 to 12 percent.

Hayter soils are associated with Lindside, Shelocta, and Vandalia soils. They contain less clay than the Vandalia soils, are better drained than the Lindside soils, and are browner and have higher base saturation than Shelocta soils.

Typical pedon of Hayter silt loam, 6 to 12 percent slopes, 150 feet north of a tributary of Bear Creek, 1,200 feet west of Bear Creek and 1,000 feet north of Lawrence County line, in Boyd County:

Ap—0 to 8 inches, dark brown (10YR 3/4) silt loam; weak fine granular structure; very friable; about 8 percent by volume gravel; many fine roots; neutral; clear smooth boundary.

B21t—8 to 15 inches, dark brown (7.5YR 4/4) clay loam; moderate medium subangular blocky structure; friable; about 5 percent by volume gravel; continuous reddish brown (5YR 4/4) clay films on peds; few fine roots; slightly acid; gradual smooth boundary.

B22t—15 to 24 inches, brown (7.5YR 4/4) gravelly sandy clay loam; moderate medium and fine subangular blocky structure; friable; about 20 percent by volume gravel; continuous reddish brown (5YR 4/4) clay films on peds; few fine roots; slightly acid; gradual smooth boundary.

B3t—24 to 40 inches, dark yellowish brown (10YR 4/4) gravelly sandy clay loam; weak medium and fine subangular blocky structure; friable; about 30 percent by volume sandstone, shale, and siltstone fragments; thin continuous clay films on peds; few dark reddish brown concretions; slightly acid; clear smooth boundary.

IIC—40 to 60 inches, brown (10YR 4/3) very gravelly sandy clay loam; common fine distinct olive (5Y 5/3) mottles; massive; about 60 percent by volume sandstone, shale, and siltstone pebbles and channers; many dark reddish brown concretions; medium acid.

The solum thickness ranges from 40 to 60 inches. Depth to bedrock ranges from 60 to 120 inches. Reaction ranges from strongly acid to slightly acid. Coarse fragments make up 5 to 30 percent of the solum and 30 to 60 percent of the C horizon.

The Ap horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 to 4. It is silt loam or loam.

The Bt horizon has hue of 10YR, 7.5YR, or 5YR; value of 4 or 5; and chroma of 4 or more. It is loam, sandy clay loam, clay loam and commonly is their gravelly analogues below a depth of 24 inches.

The C horizon has hue of 10YR, 7.5YR, and 5YR, and contains low chroma mottles in places. It consists of stratified beds of gravelly loam and silty clay loam.

Huntington series

The Huntington series consists of fine-silty, mixed, mesic Fluventic Hapludolls. They are deep, well drained

and have a dark brown silt loam B horizon. They formed in recent alluvium washed from soils derived from sandstone, shale, siltstone, and limestone. Huntington soils are nearly level and are on first bottoms in wide valleys.

Huntington soils are associated with Ashton, Lindside, and Newark soils. They are better drained than the Lindside and Newark soils and lack the argillic horizon of the Ashton soils.

Typical pedon of Huntington silt loam, 300 feet south of small tributary of Ohio River, 300 feet west of Ohio River, and 2 3/4 miles south of Siloam Cemetery, in Greenup County:

Ap—0 to 9 inches, very dark grayish brown (10YR 3/2) silt loam; moderate medium granular structure; very friable; many fine roots; neutral; clear smooth boundary.

B1—9 to 18 inches, dark brown (10YR 3/3) silt loam; weak medium prismatic structure parting to weak medium subangular blocky; very friable; many fine roots; many fine pores; slightly acid; gradual wavy boundary.

B21—18 to 35 inches, dark brown (10YR 4/3) silt loam; weak coarse subangular blocky and weak medium prismatic structure parting to weak medium subangular blocky; friable; many fine roots and pores; dark brown (10YR 3/3) coatings on ped faces; slightly acid; gradual wavy boundary.

B22—35 to 47 inches, dark brown (10YR 4/3) heavy silt loam; weak medium subangular blocky structure; firm; brown (10YR 5/3) coatings on ped faces; few fine dark concretions; slightly acid; clear smooth boundary.

C—47 to 72 inches, dark brown (7.5YR 4/4) silt loam;common medium distinct light brownish gray (10YR 6/2) mottles; massive; friable; few fine dark concretions; slightly acid.

The solum thickness is more than 40 inches. Depth to rock ranges from 6 to 20 feet or more. Some small areas of these soils along tributary streams are as much as 5 percent coarse fragments. Reaction ranges from medium acid to mildly alkaline.

The A1 or Ap horizon has hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 2 or 3.

The B horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 3 or 4. It is silt loam or light silty clay loam.

The C horizon is similar in hue, value, and chroma to the B horizon. It consists of stratified silt loam, loam, and fine sandy loam and commonly contains more sand than the B horizon.

Lakin series

The Lakin series consists of mixed, mesic Alfic Udipsamments. They are deep and excessively drained and have dark yellowish brown, yellowish brown, and brown loamy fine sand A and B horizons. They formed in sandy material deposited by wind or water. Lakin soils are on terraces and dunelike hills in broad valleys. Slope ranges from 2 to 12 percent.

Lakin soils are associated with Chavies and Elk soils. They contain more sand and less clay than the associated soils.

Typical pedon of Lakin loamy fine sand, 2 to 12 percent slopes, 30 yards south of farm lane, 1/4 mile south of U.S. 23, and 1 mile west of Siloam Cemetery, in Greenup County:

Ap—0 to 12 inches, brown (10YR 4/3) loamy fine sand; weak fine granular structure; very friable; many fine roots; strongly acid; abrupt smooth boundary.

A2—12 to 16 inches, dark yellowish brown (10YR 4/4) loamy fine sand; weak medium and coarse subangular blocky structure; very friable; strongly acid; clear smooth boundary.

A&B—16 to 60 inches, yellowish brown (10YR 5/4) loamy fine sand; single grained; loose; brown (7.5YR 4/4) lamellae, 0.5 to 3 centimeters thick, 3 to 6 inches apart; total thickness of lamellae is 4 or 5 inches; lamellae are very fine sandy loam with very weak subangular blocky structure; very friable; medium acid; gradual wavy boundary.

C—60 to 74 inches, yellowish brown (10YR 4/4) loamy fine sand; few medium distinct light yellowish brown (2.5Y 6/4) mottles; single grained; loose; strongly acid.

The thickness of the sandy deposits ranges from 10 to 20 feet or more. Reaction ranges from very strongly acid to medium acid, unless the soil is limed. Pebbles make up 0 to 3 percent of the A and A&B horizons.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4.

The A&B horizon has hue of 10YR and 7.5YR, value of 4 or 5, and chroma of 3 to 6. Lamellae in the B horizon are lower in chroma or value and have slightly more clay than the matrix. The A&B horizon is fine to medium sand, loamy sand, loamy fine sand, or light fine sandy loam.

The C horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4. It ranges from loamy fine sand or light sandy loam to sand and gravel.

Latham series

The Latham series consists of clayey, mixed, mesic Aquic Hapludults. They are moderately deep and moderately well drained and have a strong brown heavy silty clay loam and silty clay B2t horizon. They formed in residuum from acid shale. The Latham soils are on narrow ridgetops and upper side slopes. Slope ranges from 6 to 50 percent but is dominantly 12 to 40 percent.

Latham soils are associated with Gilpin, Shelocta, Steinsburg, Upshur, and Wernock soils. They have more clay in the B2 horizon than the Gilpin, Shelocta, and Wernock soils and are above the deep Shelocta soils on side slopes. Latham soils are finer textured throughout than Steinsburg soils. They have fewer bases in the lower part than the Upshur soils.

Typical pedon of Latham silt loam, 12 to 20 percent slopes, on a ridge 0.3 mile north of Keys Creek and 1 mile east of Skyline Drive, in Boyd County:

O1—1 1/2 inches to 1 inch, loose leaves and twigs.

O2—1 inch to 0, partially decomposed leaf litter.

A1—0 to 5 inches, brown (10YR 5/3) silt loam; weak fine granular structure; very friable; many fine roots; very strongly acid; abrupt smooth boundary.

B1t—5 to 11 inches, strong brown (7.5YR 5/6) light silty clay loam; moderate medium subangular blocky structure; friable; few thin clay films; very strongly acid; clear wavy boundary.

B21t—11 to 19 inches, strong brown (7.5YR 5/6) heavy silty clay loam; moderate medium subangular blocky structure; friable; few thin clay films; very strongly acid; clear wavy boundary.

B22t—19 to 30 inches, strong brown (7.5YR 5/6) and yellowish brown (10YR 5/6) silty clay; few fine distinct light olive gray (5Y 6/2) mottles; strong medium subangular blocky and angular blocky structure; firm; few thin clay films; extremely acid; clear wavy boundary.

Bt—30 to 38 inches, light olive brown (2.5Y 5/4) silty clay; many medium distinct light olive gray (5Y 6/2) mottles; moderate medium subangular blocky structure; firm; few thin clay films; 10 percent shale fragments; extremely acid; abrupt smooth boundary.

R—38 inches, light olive brown (2.5Y 5/4) soft shale.

The solum thickness and depth to soft shale bedrock range from 20 to 40 inches. Coarse fragments make up 0 to 15 percent of the solum. Reaction throughout ranges from extremely acid to strongly acid.

The A or Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4.

The Bt horizon has hue of 10YR and 7.5YR, value of 4 to 6, and chroma of 2 to 8. Some pedons have subhorizons that have hue of 5YR and 2.5Y. The Bt horizon is silty clay loam, silty clay, or clay.

A C horizon is in some pedons. It is similar in hue, value, and chroma, and texture to the B3 horizon, but it is massive or has relict platy structure.

Licking series

The Licking series consists of fine, mixed, mesic Aquic Hapludalfs. They are deep and moderately well drained. The upper part of the B2t horizon is yellowish brown mottled light silty clay loam, and the lower part is silty clay. Licking soils formed in lacustrine valley fill and sediment of local origin. The Licking soils are on stream terraces in broad valleys.

Licking soils are associated with McGary and Markland soils. They are less gray in the surface layer and upper part of the B horizon than the McGary soils and more silty in the A horizon and upper part of the B horizon than Markland soils.

Typical pedon of Licking silt loam, 0 to 2 percent slopes, 1/10 mile south of Tygarts Creek, 3/4 mile west of KY 1043, and 1/2 mile east of Sunshine, in Greenup County:

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

B1—8 to 13 inches, yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; friable; common fine roots; very stongly acid; clear wavy boundary.

B21t—13 to 20 inches, yellowish brown (10YR 5/6) light silty clay loam; common medium distinct gray (5Y 6/1) mottles; moderate medium and coarse subangular blocky structure; friable; yellowish brown (10YR 5/4) patchy clay films on peds; very strongly acid; gradual wavy boundary.

IIB22t—20 to 31 inches, yellowish brown (10YR 5/4) silty clay; many medium distinct light gray (10YR 6/1) and yellowish brown (10YR 5/8) mottles; weak coarse prismatic structure parting to strong coarse and medium angular blocky; slightly brittle in center of prisms; firm and sticky; few fine roots; continuous light brownish gray (10YR 6/1) clay films and silt coatings on peds; very strongly acid; gradual wavy boundary.

IIB23t—31 to 43 inches, yellowish brown (10YR 5/4) silty clay; many medium distinct yellowish brown (10YR 5/8) and light gray (10YR 6/1) mottles; moderate medium platy and moderate fine angular blocky structure; firm, plastic and sticky; light brownish gray (10YR 6/2) and gray (10YR 6/1) coatings on ped faces; slightly acid; clear smooth boundary.

IIC—43 to 68 inches, light olive brown (2.5Y 5/4) stratified silty clay and silty clay loam; common medium distinct yellowish brown (10YR 5/6) and light gray (10YR 6/1) mottles; massive; firm; few pebbles and few small dark reddish brown (5YR 3/3) concretions; slightly acid.

The solum thickness ranges from 36 to 60 inches. Depth to rock is more than 6 feet. Reaction in the upper part of the solum ranges from medium acid to very strongly acid and from medium acid to neutral in the lower part of the solum and in the C horizon. Thickness of the silt mantle ranges from 15 to 30 inches.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4.

The B1 and B21t horizons have hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 4 to 6. They are silt loam or light silty clay loam. The IIB2 horizon has hue of 7.5YR, 10YR, and 2.5Y; value of 4 or 5; and chroma of 4 to 6 and has low and high chroma mottles. The IIB2 horizon is silty clay or clay.

The C horizon commonly has hue of 10YR or 2.5Y, value of 3 through 5, and chroma of 3 to 6, and generally is mottled. It has stratified layers of silty clay, silty clay loam, silt loam, and fine sand.

Lindside series

The Lindside series consists of fine-silty, mixed, mesic Fluvaquentic Eutrochrepts. They are deep and moderately well drained and have a dark brown silt loam and light silty clay loam B horizon with gray mottles below a depth of 20 inches. They formed in mixed alluvium washed from soils formed in limestone uplands. Lindside soils are nearly level and are on flood plains and alluvial fans.

Lindside soils are associated with Ashton, Huntington, and Newark soils. They are better drained than Newark soils, less well drained than Huntington soils, and lack the argillic horizon of Ashton soils.

Typical pedon of Lindside silt loam, 30 yards south of KY 773 and 150 yards southeast of Ross Chapel, in Boyd County:

Ap—0 to 9 inches, dark brown (10YR 4/3) silt loam; moderate medium and fine granular structure; very friable; many roots; slightly acid; clear smooth boundary.

B1—9 to 21 inches, dark brown (10YR 4/3) silt loam; common medium faint dark yellowish brown (10YR 4/4) mottles; moderate medium and fine granular structure; very friable; few roots, medium acid; gradual smooth boundary.

B2—21 to 32 inches, dark brown (10YR 4/3) light silty clay loam; common medium and coarse faint grayish brown (10YR 5/2) and few medium distinct strong brown (7.5YR 5/6) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; friable; few roots; medium acid; gradual wavy boundary.

B3—32 to 41 inches, dark brown (10YR 4/3) silt loam; common medium distinct strong brown (7.5YR 5/6) and reddish brown (5YR 4/4) mottles, and common medium faint grayish brown (10YR 5/2) mottles; moderate coarse and medium subangular blocky structure; friable; slightly acid; gradual wavy boundary.

C—41 to 64 inches, brown (10YR 5/3) silt loam; many medium faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; massive; firm; common dark oxide concretions; medium acid.

The solum thickness ranges from 30 to 50 inches. Thickness of the alluvium is 5 to 10 feet or more. Reaction ranges from medium acid to slightly acid in the upper part of the solum and from medium acid to neutral in the lower part. Coarse fragments make up 0 to 5 percent of the solum. Depth to low chroma mottles ranges from 14 to 24 inches.

The Ap horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2 or 3.

The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is silt loam or light silty clay loam.

The C horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is light silty clay loam, silt loam, loam, fine sandy loam, and their gravelly analogues.

Markland series

The Markland series consists of fine, mixed, mesic Typic Hapludalfs. They are deep and well drained to moderately well drained and have a yellowish brown and dark yellowish brown silty clay B2t horizon. They formed

in lacustrine sediment. In this survey area Markland soils are a taxadjunct because the depth to carbonates is slightly deeper than is defined in the range for the Markland soils. Markland soils are on stream terraces in broad valleys. Slope ranges from 2 to 30 percent but is dominantly 6 to 12 percent.

Markland soils are associated with Licking and McGary soils. They are better drained than McGary soils and have more clay in the upper part of the B horizon than Licking soils.

Typical pedon of Markland silt loam, 2 to 6 percent slopes, 50 yards south of farm lane, 150 yards west of KY 1214, and 2 miles south of U. S. 23, in Greenup County:

Ap—0 to 7 inches, dark grayish brown (10YR 4/2) heavy silt loam; moderate medium granular and weak fine subangular blocky structure; friable; slightly acid; abrupt smooth boundary.

B21t—7 to 18 inches, yellowish brown (10YR 5/4) silty clay with few faint yellowish brown (10YR 5/6) and pale brown (10YR 6/3) mottles; moderate medium and coarse prismatic structure parting to strong coarse subangular blocky; firm; very strongly acid; gradual wavy boundary.

B22t—18 to 40 inches, dark yellowish brown (10YR 4/4) silty clay; moderate medium platy and strong medium and fine angular blocky structure; firm, sticky and plastic; thin brown (10YR 5/3) clay films on peds; strongly acid; gradual wavy boundary.

C1—40 to 65 inches, light olive brown (2.5Y 5/4) silty clay with common medium distinct dark yellowish brown (10YR 4/4) and olive gray (5Y 5/2) mottles; massive; firm and sticky; slightly acid; gradual wavy boundary.

IIC2—65 to 74 inches, light olive brown (2.5Y 5/4) silt loam with few fine distinct gray (5Y 5/1) mottles; massive; moderately alkaline; friable; gradual wavy boundary.

The solum thickness ranges from 24 to 44 inches. Depth to rock is more than 6 feet. Reaction ranges from slightly acid to very strongly acid above a depth of 3 feet and from slightly acid to moderately alkaline below a depth of 3 feet.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is silt loam or light silty clay loam.

The B2 horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. In places low chroma mottles are in the lower part of the horizon. The B2 horizon ranges from silty clay loam to clay.

The C horizon is similar in hue, value, and chroma to the B2 horizon. It is stratified silty clay, silty clay loam, and silt loam.

McGary series

The McGary series consists of fine, mixed, mesic Aeric Ochraqualfs. They are deep and somewhat poorly drained and have a mottled dark yellowish brown silty clay B2t horizon. They formed in lacustrine deposits. In this survey area McGary soils are a taxadjunct because they are more acid in the solum and carbonates are at greater depth than is defined in the range for the McGary series. These soils are nearly level and are on stream terraces in broad valleys.

McGary soils are associated with Licking, Markland, and Morehead soils. They are more poorly drained than Markland and Licking soils, and they have a finer textured B horizon than Morehead soils.

Typical pedon of McGary silt loam, 25 feet north of farm lane, 300 yards north of Fairview Church, and 100 yards east of KY 7 at Maloneton, in Greenup County:

Ap—0 to 6 inches, grayish brown (2.5Y 5/2) heavy silt loam; weak medium granular and weak medium subangular blocky structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

B1t—6 to 14 inches, yellowish brown (10YR 5/4) ped interiors and brown (10YR 5/3) prism faces; silty clay loam; common medium distinct light brownish gray (2.5Y 6/2), gray (10YR 6/1), and strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to weak medium angular and subangular blocky; friable; slightly sticky; few fine roots; many fine pores; continuous thin clay films; strongly acid; gradual wavy boundary.

B2t—14 to 36 inches, light brownish gray (2.5Y 6/2) prism and ped faces and dark yellowish brown (10YR 4/4) ped interiors; silty clay; common medium distinct gray (5Y 5/1) and strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate medium angular blocky; firm and sticky; few fine roots; few fine pores; few small dark concretions; continuous thin clay films; strongly acid; gradual smooth boundary.

C—36 to 72 inches, mottled dark yellowish brown (10YR 4/4), yellowish brown (10YR 5/6), and gray (5Y 5/1) silty clay loam; massive; firm; neutral.

The solum thickness ranges from 24 to 50 inches. Depth to rock is more than 6 feet. Reaction ranges from very strongly acid to slightly acid in the solum and from slightly acid to mildly alkaline in the C horizon.

The Ap horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2.

The upper part of the B horizon has hue of 10YR or 2.5Y, value of 5 or 6, and dominant chroma in the matrix or on ped faces of 3 or 4. The lower part of the B horizon has hue of 10YR or 2.5Y, value of 4 to 6, and dominant chroma in the matrix or on ped faces of 2 or less. Mottles in the B horizon are gray, yellowish brown, and strong brown. The B horizon ranges from silty clay loam to silty clay.

The C horizon is mottled in hue of 10YR, 2.5Y, and 5Y, value of 4 or 5; and chroma of 1 to 6. It is stratified silty clay, silty clay loam, and silt loam.

Monongahela series

The Monongahela series consists of fine-loamy, mixed, mesic Typic Fragiudults. They are deep and moderately well drained and have a strong brown and yellowish brown silt loam B2t horizon overlying a mottled yellowish brown fine sandy loam fragipan. These soils formed in silty and sandy alluvium and are on high stream terraces. Slope ranges from 2 to 12 percent.

Monongahela soils are associated with Allegheny and Riney soils. They are more silty in the upper 2 feet than the associated soils and have a fragipan which the associated soils do not have.

Typical pedon of Monongahela silt loam, 6 to 12 percent slopes, 10 feet east of private road, 500 yards north of Community Tabernacle, and 1 mile northeast of the town of Flatwoods, in Greenup County:

Ap—0 to 6 inches, brown (10YR 4/3) silt loam; weak fine granular structure; very friable; many fine roots; very strongly acid; abrupt smooth boundary.

B1—6 to 11 inches, brown (7.5YR 5/4) silt loam; weak medium and fine subangular blocky structure; friable; few fine roots; very strongly acid; clear smooth boundary.

B21t—11 to 22 inches, strong brown (7.5YR 5/6) heavy silt loam; few medium faint yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; friable; thin continuous clay films on peds; few fine roots; very strongly acid; gradual wavy boundary.

B22t—22 to 30 inches, yellowish brown (10YR 5/6) heavy silt loam; moderate medium subangular blocky structure; friable; continuous

strong brown (7.5YR 5/6) clay films on peds; very strongly acid; abrupt smooth boundary.

IIBx—30 to 51 inches, yellowish brown (10YR 5/4) fine sandy loam; many fine distinct light gray (2.5Y 7/2) and strong brown (7.5YR 5/6) mottles; moderate coarse and very coarse prismatic structure parting to moderate thick platy and moderate medium and fine subangular blocky; firm, compact and brittle; very strongly acid; clear smooth boundary.

IIC—51 to 65 inches, yellowish brown (10YR 5/6) sandy loam; massive; loose; 10 percent rounded pebbles; very strongly acid.

The solum thickness ranges from 40 to 60 inches. Depth to the fragipan ranges from 24 to 30 inches, and depth to rock ranges from 60 to 120 inches. Reaction of the unlimed soil ranges from strongly acid to very strongly acid throughout. Coarse fragments make up 0 to 15 percent of the fragipan and 5 to 30 percent of the C horizon.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4.

The Bt horizon has hue of 10YR and 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is heavy silt loam or light silty clay loam. The Bx horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It has few to many mottles with chroma of 2 or less. The Bx horizon is light silty clay loam to sandy loam. It has moderate, coarse and very coarse, prismatic structure parting to platy and blocky.

The C horizon is similar in hue, value, and chroma to the Bx horizon but contains yellowish red lamellae in places. It is fine sandy loam or sandy loam.

Morehead series

The Morehead series consists of fine-silty, mixed, mesic Aquic Hapludults. They are deep and somewhat poorly drained and have a mottled yellowish brown and brown silt loam B2t horizon. They formed in acid alluvium washed from upland soils derived from sandstone, siltstone, and shale. Morehead soils are nearly level and are on low terraces.

Morehead soils are associated with Cotaco, Tilsit, and Whitley soils. They are less well drained than the Whitley soils, lack the fragipan of the Tilsit soils, and contain less sand than the Cotaco soils.

Typical pedon of Morehead silt loam, 50 yards north of Left Fork of Trace Creek, 11/4 miles west of confluence of Right Fork of Trace Creek, in Boyd County.

Ap—0 to 7 inches, dark grayish brown (10YR 4/2) silt loam; moderate medium granular structure; very friable; many fine roots; extremely acid; clear smooth boundary.

B1—7 to 14 inches, yellowish brown (10YR 5/4) silt loam; common fine faint pale brown (10YR 6/3) and strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable; few roots; extremely acid; clear wavy boundary.

B21t—14 to 26 inches, yellowish brown (10YR 5/6, 5/4) on ped faces; heavy silt loam; common medium distinct light brownish gray (2.5Y 6/2) mottles; moderate medium subangular blocky structure; friable; clay films on peds and in pores; very strongly acid; clear wavy boundary.

B22t—26 to 35 inches, brown (10YR 5/3) heavy silt loam; many medium distinct grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; clay films on peds and in pores; very strongly acid; clear smooth boundary.

B3t—35 to 50 inches, yellowish brown (10YR 5/4) light silty clay loam; many medium distinct grayish brown (2.5Y 5/2) mottles; weak medium subangular blocky structure; friable; thin discontinuous clay films; few small dark oxide concretions; very strongly acid; clear smooth boundary.

C—50 to 72 inches, yellowish brown (10YR 5/6) light silty clay loam; common medium distinct gray (2.5Y 6/0) mottles; massive; friable; about 2 percent by volume oxide concretions larger than 2 millimeters in size; very strongly acid.

The solum thickness ranges from 40 to 52 inches. Depth to rock is 5 to 10 feet or more. The reaction ranges from strongly acid to very strongly acid, unless the soil is limed. Coarse fragments make up less than 15 percent of the solum.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3.

The B horizon matrix has hue of 10YR, 7.5YR, or 2.5Y; value of 4 to 6; and chroma of 3 to 6. Depth to low chroma mottles ranges from 8 to 14 inches. The B horizon is silt loam or light silty clay loam.

The C horizon matrix has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 to 6. Mottles have hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 or less. The C horizon is loam, silt loam, or light silty clay loam.

Newark series

The Newark series consists of fine-silty, mixed, nonacid, mesic Aeric Fluvaquents. They are deep and somewhat poorly drained and have a mottled brown and grayish brown silt loam B horizon. They formed in mixed alluvium washed from soils formed in material weathered from limestone, shale, siltstone, and sandstone. The Newark soils are nearly level and are on flood plains and alluvial fans.

Newark soils are associated with Bonnie and Lindside soils. They have more mottles and are grayer in the B horizon than Lindside soils. They are better drained and are less gray in the upper part of the B horizon than the poorly drained Bonnie soils.

Typical pedon of Newark silt loam, 40 feet south of KY 773 and 330 feet north of Bolts Fork Creek, approximately 1 1/4 miles west of KY 3, in Boyd County:

Ap—0 to 7 inches, grayish brown (10YR 5/2) silt loam; few fine faint dark yellowish brown (10YR 4/4) and dark grayish brown (10YR 4/2) mottles; weak fine granular structure; very friable; many roots; slightly acid; abrupt smooth boundary.

B1—7 to 14 inches, brown (10YR 4/3) silt loam; many medium faint dark yellowish brown (10YR 4/4) and grayish brown (2.5Y 5/2) mottles; weak medium subangular blocky structure; very friable; many roots; medium acid; gradual smooth boundary.

B2g—14 to 34 inches, grayish brown (2.5Y 5/2) silt loam; common medium distinct yellowish brown (10YR 5/6) and dark brown (10YR 4/3) mottles; weak coarse subangular blocky structure; friable; few roots; medium acid; gradual smooth boundary.

C1g—34 to 60 inches, gray (5Y 5/1) light silty clay loam; many medium prominent yellowish brown (10YR 5/6) mottles and many medium distinct light olive brown (2.5Y 5/4) mottles; massive; firm; slightly sticky and plastic; few roots; few small dark oxide concretions; slightly acid; gradual wavy boundary.

C2—60 to 72 inches, light olive brown (2.5Y 5/4) light silty clay loam; many medium distinct gray (5Y 5/1) and yellowish brown (10YR 5/6) mottles; massive; firm; sticky and plastic; few dark oxide concretions; slightly acid.

The solum thickness ranges from 20 to 40 inches. Depth to bedrock ranges from 5 to 20 feet or more. Coarse fragments make up less than 5 percent of the upper 30 inches of the profile and 15 percent of the profile below a depth of 30 inches. Reaction ranges fom medium acid to neutral throughout the profile.

The Ap horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4.

The B1 horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. The B horizon is silt loam or light silty clay loam.

The B2 horizon and upper part of the C horizon are gray in the matrix and have brown mottles. The lower part of the C horizon is gray or brown in the matrix and has gray or brown mottles. The B2 and C horizons are silt loam or light silty clay loam and have thin layers of loam or fine sandy loam in some pedons.

Nolin series

The Nolin series consists of fine-silty, mixed, mesic Dystric Fluventic Eutrochrepts. They are deep and well drained and have a dark brown and dark yellowish brown silt loam B horizon. They formed in alluvium washed from soils derived from shale, siltstone, sandstone, and limestone. The Nolin soils are nearly level and are on flood plains.

Nolin soils are associated with Cuba, Lindside, and Newark soils. They are better drained than Lindside and Newark soils and are less acid than Cuba soils.

Typical pedon of Nolin silt loam, 50 yards west of East Fork Creek, 100 yards north of road on Clays Jack Fork, and 2 miles north of Lawrence County line, in Boyd County:

Ap—0 to 9 inches, dark brown (10YR 4/3) silt loam; weak fine granular structure; very friable; many fine roots; slightly acid; gradual smooth boundary.

B1—9 to 25 inches, dark brown (10YR 4/3) silt loam; weak fine granular and weak medium subangular blocky structure; very friable; many fine roots; medium acid; clear smooth boundary.

B2—25 to 40 inches, dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure; friable; medium acid; gradual smooth boundary.

C—40 to 70 inches, dark yellowish brown (10YR 4/4) silt loam; common medium distinct light brownish gray (2.5Y 6/2) and few medium faint dark brown (7.5YR 4/4) mottles; massive; friable; few dark oxide concretions; neutral.

The solum thickness is 40 inches or more. Depth to bedrock is 6 to 12 feet or more. Reaction ranges from medium acid to neutral.

The Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 2 or 3.

The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. In some pedons mottles with chroma of 2 or less are below a depth of 24 inches.

The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. The C horizon is silt loam, fine sandy loam, or gravelly loam.

Otwell series

The Otwell series consists of fine-silty, mixed, mesic Typic Fragiudalfs. They are deep and moderately well drained and have a strong brown and brown light silty clay loam B2t horizon overlying a firm and brittle fragipan. They formed in mixed alluvium washed from soils derived from siltstone, shale, sandstone, and limestone. Otwell soils are nearly level and are on terraces in broad valleys.

Otwell soils are associated with Bonnie, Chavies, Elk, and Weinbach soils. They are better drained than the somewhat poorly drained Weinbach soils and poorly drained Bonnie soils. They have a fragipan which is lacking in Elk and Chavies soils. Otwell soils have more clay and less sand than Chavies soils.

Typical pedon of Otwell silt loam, 0 to 2 percent slopes, 10 yards west of farm road, 1/4 mile west of Siloam Cemetery, and 0.6 mile north of Junction of farm road and U.S. 23, in Greenup County:

Ap—0 to 10 inches, dark brown (10YR 4/3) silt loam; weak fine granular structure; very friable; few fine roots; many worm holes and pores; slightly acid; clear smooth boundary.

B21t—10 to 19 inches, strong brown (7.5YR 5/6) light silty clay loam; moderate fine and medium subangular blocky structure; friable; few fine roots; many fine pores; thin continuous clay films; medium acid; gradual wavy boundary.

B22t—19 to 25 inches, brown (7.5YR 5/4) light silty clay loam; few fine faint brown (10YR 5/3) mottles; moderate medium and fine subangular and angular blocky structure; friable; yellowish brown (10YR 5/4) continuous clay films; many fine pores; common dark coatings on peds; strongly acid; clear smooth boundary.

Bx—25 to 56 inches, brown (7.5YR 5/4) heavy silt loam; many medium and coarse distinct light brownish gray (10YR 6/2) mottles; moderate very coarse prismatic structure parting to moderate fine angular blocky; firm; brittle; light brownish gray silt coatings and clean very fine sand grains between prisms; few thin clay films on prisms and in pores; few fine dark concretions; very strongly acid; gradual wavy boundary.

C—56 to 74 inches, brown (7.5YR 5/4) heavy silt loam; common medium distinct light brownish gray (10YR 6/2) mottles; massive; firm; few small dark concretions; very strongly acid.

The solum thickness ranges from 40 to 65 inches. Depth to rock ranges from 5 to 10 feet or more. Depth to the fragipan ranges from 20 to 30 inches. Reaction ranges from very strongly acid to medium acid, except where the soil is limed.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4.

The B2 horizon has hue of 7.5YR or 10YR, value of 4 to 6; and chroma of 3, 4, and 6. It is heavy silt loam or light silty clay loam.

The Bx and C horizons have hue of 7.5YR, 10YR, and 2.5Y, value of 4 to 6, and chroma of 3, 4, or 6 in the matrix and have gray mottles. The Bx horizon is silt loam or light silty clay loam. It has moderate, very coarse, prismatic structure that parts to angular blocky. The Bx horizon is firm or very firm, and brittle.

The C horizon is silt loam and has stratified layers of loam, fine sandy loam, and silty clay loam in places.

Pope series

The Pope series consists of coarse-loamy, mixed, mesic Fluventic Dystrochrepts. They are deep and well drained and have a dark yellowish brown fine sandy loam B horizon. They formed in recent alluvium washed from soils derived from acid sandstone, siltstone, and shale. Pope soils are nearly level and are on flood plains in narrow to fairly broad valleys.

Pope soils are associated with Cuba and Stendal soils. They contain more sand and coarse fragments than the associated soils, and they are better drained than the Stendal soils.

Typical pedon of Pope fine sandy loam, 30 yards west of Williams Creek and 1/4 mile west of Junction of KY 5 and US 60, in Boyd County:

Ap—0 to 8 inches, brown (10YR 4/3) fine sandy loam; weak fine granular structure; very friable; many fine roots; few small pieces of coal; medium acid; clear smooth boundary.

B1—8 to 16 inches, dark yellowish brown (10YR 4/4) fine sandy loam; weak medium and coarse subangular blocky structure; very friable; many fine roots; very strongly acid; gradual wavy boundary.

B2—16 to 38 inches, dark yellowish brown (10YR 4/4) fine sandy loam; few fine distinct light yellowish brown (2.5Y 6/4) mottles; weak medium and coarse subangular blocky structure; very friable; few fine roots; very strongly acid; abrupt smooth boundary.

IIC—38 to 65 inches, yellowish brown (10YR 5/4) loamy sand; single grained; loose; very strongly acid.

The solum thickness ranges from 30 to 48 inches. Depth to bedrock ranges from 5 to 10 feet or more. Reaction of the unlimed soil ranges from strongly acid to extremely acid. The A and B horizons are 0 to 30 percent gravel, and the C horizon is 0 to 40 percent gravel.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is fine sandy loam, gravelly loam, or silt loam.

The B and C horizons have hue of 10YR and 7.5YR, value of 4 or 5, and chroma of 3 to 6. The B horizon is sandy loam, fine sandy loam, loam, or silt loam, and their gravelly analogues.

The C horizon is stratified layers of loamy sand, sandy loam, fine sandy loam, loam, and their gravelly analogues.

Riney series

The Riney series consists of fine-loamy, siliceous, mesic Typic Hapludults. They are deep and well drained and have a yellowish red and red clay loam and sandy clay loam B2t horizon. They formed in mixed alluvium washed from soils derived from sandstone, siltstone, and shale. Riney soils are on high stream terraces on narrow to broad sloping ridges. Slope ranges from 6 to 12 percent.

Riney soils are associated with Allegheny and Monongahela soils. They have a redder, thicker solum than the associated soils. They are better drained and lack the fragipan of the Monongahela soils.

Typical pedon of Riney loam, 6 to 12 percent slopes, 1/4 mile north of KY 757 and 3/4 mile west of Big Sandy River, in Boyd County:

Ap—0 to 6 inches, dark grayish brown (10YR 4/2) loam; moderate fine granular structure; very friable; many fine roots; very strongly acid; clear smooth boundary.

A2—6 to 13 inches, yellowish brown (10YR 5/4) loam; weak fine granular structure; very friable; many fine roots; very strongly acid; clear smooth boundary.

B1t—13 to 23 inches, strong brown (7.5YR 5/6) sandy clay loam; moderate medium subangular blocky structure; friable; few fine roots; thin continuous clay films; very strongly acid; gradual smooth boundary.

B21t—23 to 32 inches, yellowish red (5YR 4/8) clay loam; moderate medium subangular blocky structure; friable; few fine roots; thin continuous clay films; very strongly acid; gradual smooth boundary.

B22t—32 to 48 inches, yellowish red (5YR 5/6) sandy clay loam; pale brown (10YR 6/3) mottles or streaks along ped faces; weak medium subangular blocky structure; friable; few sandstone fragments; few patchy clay films; very strongly acid; gradual smooth boundary.

B23t—48 to 66 inches, red (2.5YR 4/6) clay loam; strong brown (7.5YR 5/6) mottles or streaks along ped faces; moderate medium subangular and angular blocky structure; friable; continuous clay films; extremely acid; gradual smooth boundary.

B3t—66 to 76 inches, red (2.5YR 5/6) sandy clay loam; weak coarse subangular blocky structure; friable; thin discontinuous clay films on peds; few sandstone fragments; extremely acid.

The solum thickness ranges from 40 to 80 inches. Depth to rock is 6 to 10 feet or more. Reaction ranges from strongly acid to extremely acid, unless the soil is limed.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The A2 horizon is similar in hue, value, chroma, and texture to the Ap horizon.

The B1t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 or 6. The B2t and B3t horizons have hue of 5YR or 2.5YR, value of 4 or 5, and chroma of 6 or 8 and are clay loam or sandy clay loam.

Some pedons have a C horizon that is similar in hue, value, and chroma to the B3t horizon. They have textures of red sandy clay loam, sandy loam, fine sandy loam, and loamy sand. It is 5 to 20 percent sandstone and quartzite pebbles and cobbles.

Shelocta series

The Shelocta series consists of fine-loamy, mixed, mesic Typic Hapludults. They are deep and well drained and have a strong brown and yellowish brown light silty clay loam B2t horizon. They formed in colluvium or colluvium and alluvium from soils derived from acid shale and siltstone. The Shelocta soils are on side slopes, foot slopes, and alluvial fans. Slope ranges from 2 to 50 percent but is dominantly 20 to 40 percent.

Shelocta soils are associated with the Cranston, Latham, and Vandalia soils. They have more clay and fewer coarse fragments in the solum than Cranston soils. They have less clay in the solum than Latham and Vandalia soils.

Typical pedon of Shelocta silt loam in an area of Latham-Shelocta silt loams, 30 to 50 percent slopes, 1,000 yards east of Kilgore and 1/4 mile east of the Carter County line, in Boyd County:

Ap—0 to 5 inches, dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; few fine roots; about 5 percent gravel; very strongly acid; clear smooth boundary.

B1—5 to 15 inches, strong brown (7.5YR 5/6) silt loam; weak fine and medium subangular blocky structure; friable; few roots; about 5 percent gravel; extremely acid; clear wavy boundary.

B21t—15 to 26 inches, strong brown (7.5YR 5/6) light silty clay loam; moderate medium and fine subangular and angular blocky structure; friable; continuous thin clay films on peds; about 8 percent gravel; extremely acid; clear wavy boundary.

B22t—26 to 41 inches, yellowish brown (10YR 5/6) light silty clay loam; moderate medium subangular and angular blocky structure; friable; continuous thin strong brown (7.5YR 5/6) clay films on peds; about 15 percent gravel; extremely acid; gradual wavy boundary.

B3t—41 to 53 inches, yellowish brown (10YR 5/4) gravelly silt loam; common medium faint pale brown (10YR 6/3) and few faint grayish brown (10YR 5/2) mottles; weak medium and coarse subangular blocky structure; firm; common thin clay films; common medium dark brown (7.5YR 3/2) concretions; about 15 percent gravel; extremely acid; gradual smooth boundary.

C—53 to 74 inches, yellowish brown (10YR 5/4) gravelly silt loam; massive; firm; about 40 percent gravel and dark brown (7.5YR 3/2) fine and medium concretions; extremely acid.

The solum thickness ranges from 40 to 60 inches. Depth to bedrock ranges from 5 to 10 feet or more. Coarse fragments make up 5 to 20 percent of the solum and 15 to 60 percent of the C horizon. Reaction throughout the soil ranges from extremely acid to strongly acid, unless the soil is limed.

The A horizon has hue of 10YR and 7.5YR, value of 3 to 5, and chroma of 2 to 4. It is silt loam or gravelly silt loam.

The B horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 or 6. It is silt loam, light silty clay loam, or their gravelly analogues.

The C horizon has hue of 10YR or 2.5Y, value of 5, and chroma of 4 or 6. It has low chroma mottles in places. It is silt loam, light silty clay loam, or their gravelly or channery analogues.

Steinsburg series

The Steinsburg series consists of coarse-loamy, mixed, mesic Typic Dystrochrepts. They are moderately deep and well drained and have a yellowish brown sandy loam and very channery sandy loam B horizon. They formed in acid sandstone residuum. In this survey area Steinsburg soils are a taxadjunct because they contain more coarse fragments in the lower B horizon and have a slightly thicker solum than are defined in the range for the Steinsburg series. The Steinsburg soils are on narrow convex ridgetops and upper side slopes. Slope ranges from 6 to 50 percent but is dominantly 20 to 50 percent.

Steinsburg soils are associated with Gilpin, Latham, and Upshur soils. They lack the argillic horizon of the associated soils and are more sandy throughout.

Typical pedon of Steinsburg sandy loam in an area of Steinsburg stony sandy loam, 20 to 50 percent slopes, near the junction of KY 1937 and KY 752, 1,000 feet south of Huff Branch, and 1,500 feet west of confluence of Huff Branch and Bear Creek, about 18 miles southwest of Ashland, in Boyd County:

A1—0 to 3 inches, dark grayish brown (10YR 4/2) sandy loam; moderate fine granular structure; very friable; many fine roots; slightly darker ped coatings; about 5 percent sandstone fragments; very strongly acid; clear smooth boundary.

B1—3 to 9 inches, yellowish brown (10YR 5/4) sandy loam; weak medium and fine subangular blocky structure; very friable; common fine roots; about 5 percent sandstone fragments; very strongly acid; clear smooth boundary.

B2—9 to 14 inches, yellowish brown (10YR 5/6) sandy loam; weak medium and fine subangular blocky structure; very friable; common fine roots; few fine pores and root channels; about 5 percent sandstone fragments; few uncoated sand grains and mica flakes; strongly acid; clear smooth boundary.

B3—14 to 21 inches, yellowish brown (10YR 5/6) very channery sandy loam; weak fine and medium subangular blocky structure; very friable; common fine roots; about 60 percent soft sandstone fragments; few uncoated sand grains and mica flakes; strongly acid; clear smooth boundary.

C—21 to 29 inches, yellowish brown (10YR 5/6) channery sandy loam; single grained; loose; about 25 percent soft sandstone fragments; few uncoated sand grains and mica flakes; strongly acid; abrupt smooth boundary.

R—29 inches, soft grayish sandstone; rippable.

The solum thickness and depth to bedrock range from 20 to 40 inches. Reaction ranges from strongly acid to extremely acid, unless the soil is limed. Coarse fragments make up 5 to 60 percent of the soil, but they commonly make up less than 35 percent.

The A horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4. It is sandy loam and stony sandy loam.

The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 or 6. It is sandy loam, fine sandy loam, and their gravelly or very gravelly or channery or very channery analogues.

The C horizon is similar in hue, chroma, and value to the B horizon. It is sandy loam or loamy sand and their gravelly or channery analogues.

Stendal series

The Stendal series consists of fine-silty, mixed, acid, mesic Aeric Fluvaquents. They are deep and somewhat poorly drained and have a mottled grayish brown silt loam B horizon. They formed in alluvium washed from soils derived from shale, siltstone, and sandstone. Stendel soils are nearly level and are on flood plains.

Stendal soils are associated with Bonnie, Cotaco, Cuba, Morehead, and Stokly soils. They are less well drained than Cuba soils, contain less sand than Cotaco and Stokly soils, lack the argillic horizon of Morehead and Cotaco soils, and are better drained than the poorly drained Bonnie soils.

Typical pedon of Stendal silt loam, 25 yards south of gravel road and 65 yards north of Fourmile Creek, about 3/4 mile west of East Fork Creek, in Boyd County:

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

Bg—10 to 24 inches, grayish brown (2.5Y 5/2) silt loam; common medium and fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; very friable; few fine roots; few oxide concretions; very strongly acid; gradual smooth boundary.

Cg—24 to 68 inches, gray (5Y 5/1) light silty clay loam; common medium distinct yellowish brown (10YR 5/6) and brown (10YR 5/3) mottles; massive; slightly sticky; few oxide concretions; very strongly acid.

The solum thickness ranges from 24 to 40 inches, and depth to bedrock is greater than 5 feet. Reaction is strongly acid or very strongly acid throughout, unless the soil is limed.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2.

The B horizon has a matrix with hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or 3 and has mottles with hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 1 to 6. The B horizon is silt loam or light silty clay loam.

The C horizon is similar in hue, value, and chroma to the B horizon but is more gleyed. It is silt loam or light silty clay loam and in places has thin strata of loam or fine sandy loam.

Stokly series

The Stokly series consists of coarse-loamy, mixed, acid, mesic Aeric Fluvaquents. They are deep and somewhat poorly drained and have a mottled fine sandy loam B horizon that is brown in the upper part and dark gray in the lower part. They formed in alluvium washed from soils derived from acid sandstone, siltstone, and shale. The Stokly soils are nearly level and are on flood plains of small streams.

Stokly soils are associated with Bonnie, Cuba, Pope, and Stendal soils. They are less well drained than Pope and Cuba soils and have more sand above a depth of 40 inches than Cuba, Bonnie, and Stendal soils. They are better drained than the poorly drained Bonnie soils.

Typical pedon of Stokly fine sandy loam, 30 yards south of Fourmile Creek, 1 1/2 miles west of East Fork Creek, about 14 miles south of Ashland, in Boyd County.

Ap—0 to 8 inches, dark grayish brown (10YR 4/2) fine sandy loam; common medium distinct brown (7.5YR 4/4; 10YR 4/3) and olive gray (5Y 5/2) mottles; weak fine granular structure; very friable; many fine roots; very strongly acid; clear smooth boundary.

B21—8 to 19 inches, brown (10YR 5/3) fine sandy loam; common medium distinct olive gray (5Y 5/2) and brown(7.5YR 4/4) mottles; weak medium subangular blocky structure; very friable; many fine roots; strongly acid; gradual smooth boundary.

B22g—19 to 34 inches, dark gray (5Y 4/1) fine sandy loam; few fine distinct brown (7.5YR 4/4) mottles; weak medium and fine subangular blocky structure; very friable; few fine roots; about 5 percent sandstone pebbles; strongly acid; clear smooth boundary.

C—34 to 76 inches, olive gray (5Y 5/2) gravelly sandy loam; many medium distinct brown (7.5YR 4/4) and yellowish brown (10YR 5/6) mottles; massive; very friable; about 30 percent sandstone and siltstone pebbles and fragments; very strongly acid.

The solum thickness ranges from 20 to 40 inches, and depth to bedrock is more than 5 feet. Reaction ranges from strongly acid to extremely acid except where the soil is limed. Sandstone and siltstone pebbles make up 0 to 15 percent of the solum and 0 to 40 percent of the C horizon.

The Ap and A1 horizons have hue of 10YR, value of 4 or 5, and chroma of 2 or 3.

The B21 horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4 and has brown and gray mottles.

The B22g horizon has hue of 10YR, 2.5Y, or 5Y; value of 4 or 5; chroma of 2 or less, and brown, gray or olive mottles. The B horizon is fine sandy loam, sandy loam, or loam.

C horizon is similar in hue, value, and chroma to the B22g horizon and is fine sandy loam, sandy loam, or loam and their gravelly or channery analogues.

Tilsit series

The Tilsit series consists of fine-silty, mixed, mesic Typic Fragiudults. They are deep and moderately well drained and have a yellowish brown silt loam B2t horizon underlain by a brittle and compact fragipan. They formed in silty alluvium or residuum derived from acid siltstone and fine grained sandstone. In this survey area the Tilsit soils are a taxadjunct because they have an argillic horizon below the fragipan and a thicker solum than is defined in the range for the Tilsit series. The Tilsit soils are on upland ridges and high stream terraces. Slope ranges from 2 to 12 percent but is dominantly 2 to 6 percent.

Tilsit soils are associated wth Monongahela, Wernock, and Whitley soils. They contain less sand than Monongahela soils and have a fragipan which the Wernock and Whitley soils do not have.

Typical pedon of Tilsit silt loam, 2 to 6 percent slopes, at the end of private road, 1,000 feet west of KY 1458 and 1/2 mile southeast of Flatwoods, in Greenup County:

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

B1—8 to 16 inches, yellowish brown (10YR 5/6) silt loam; weak fine and medium subangular blocky structure; friable; many fine roots; many fine pores; strongly acid; clear smooth boundary.

B2t—16 to 25 inches, yellowish brown (10YR 5/6) heavy silt loam; moderate medium subangular blocky structure; friable; common dark coatings on peds; few fine roots; many fine pores; thin continuous clay films; strongly acid; abrupt smooth boundary.

IIBx1—25 to 43 inches, yellowish brown (10YR 5/6) loam; common medium distinct light gray (2.5Y 7/2) and common large distinct strong brown (7.5YR 5/8) mottles; moderate very coarse prismatic structure parting to fine subangular blocky; firm, compact and brittle; few patchy clay films; few dark coatings on peds; very strongly acid; gradual wavy boundary.

IIBx2—43 to 58 inches, yellowish brown (10YR 5/8) loam; common fine distinct light brownish gray (10YR 6/2) and strong brown (7.5YR 5/8) mottles; moderate very coarse prismatic structure parting to fine subangular blocky; firm, compact and brittle; few patchy clay films; few dark coatings on peds; very strongly acid; gradual smooth boundary.

IIIB3t—58 to 72 inches, strong brown (7.5YR 5/8) heavy silty clay loam; common medium distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm, slightly sticky; discontinuous thick clay films; very strongly acid.

The thickness of the solum ranges from 40 to 72 inches and depth to bedrock ranges from 40 to 120 inches or more. Depth to the fragipan ranges from 20 to 28 inches. Reaction ranges from strongly acid to extremely acid, unless the soil is limed.

The Ap horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or 3.

The B1 and B2t horizons have hue of 10YR, value of 5, and chroma of 6 or 8. They are silt loam or light silty clay loam.

The Bx horizon has a matrix with hue of 10YR, value of 5 or 6, and chroma of 6 or 8 and has gray, strong brown, and yellowish brown mottles. It is loam, silt loam, or light silty clay loam. The Bx horizon has mainly moderate or strong very coarse prismatic structure.

The IIIBt horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 4 to 8 and low chroma mottles. It is silt loam, loam, sandy clay loam, and silty clay loam.

In some pedons a C horizon is below the Bx horizon. It is similar in hue, value, chroma, and texture to the Bx horizon.

Upshur series

The Upshur series consists of fine, mixed, mesic Typic Hapludalfs. They are deep and well drained and have a reddish brown silty clay and dark reddish brown clay B2t horizon. They formed in residuum from shale and siltstone. The Upshur soils are on ridges, benches, and side slopes. Slope ranges from 6 to 60 percent but is dominantly 12 to 30 percent.

Upshur soils are associated with Latham, Steinsburg, and Gilpin soils on ridges and with Vandalia soils on lower slopes. They are redder, deeper to rock, and less acid in lower horizons than Latham soils. They are deeper and contain more clay than Steinsburg and Gilpin soils. Upshur soils contain more clay in the upper part of the B horizon than Vandalia soils.

Typical pedon of Upshur silty clay loam, 12 to 30 percent slopes, 250 yards south of Ross Cemetery, in Boyd County:

Ap—0 to 6 inches, reddish brown (5YR 5/3) silty clay loam; moderate medium granular and moderate fine subangular blocky structure; friable; many fine roots; very strongly acid, clear smooth boundary.

B21t—6 to 17 inches, reddish brown (2.5YR 4/4) silty clay; moderate medium angular blocky structure; firm, plastic, sticky; few fine roots; continuous clay films; very strongly acid; gradual wavy boundary.

B22t—17 to 35 inches, dark reddish brown (2.5YR 3/4) clay; strong coarse angular blocky structure parting to fine angular blocky; firm, very sticky, very plastic; continuous clay films; few fine roots; few vertical cracks 2 to 10 millimeters wide; common slickensides; few wedges; very strongly acid; clear smooth boundary.

B3t—35 to 39 inches, reddish brown (5YR 4/4) clay; weak coarse subangular blocky structure; firm, very sticky and plastic; few clay films; few light gray and common dark coatings; few fine roots; very strongly acid; clear smooth boundary.

C—39 to 49 inches, reddish brown (5YR 5/4) silty clay loam; common medium prominent gray (10YR 6/1) mottles; massive; firm; about 20 percent by volume siltstone fragments; very strongly acid; abrupt smooth boundary.

R—49 inches, light olive brown acid siltstone and shale.

The solum thickness ranges from 26 to 42 inches. Depth to rock or soft shale ranges from 3 1/2 to 5 feet. Coarse fragments make up 0 to 10 percent of the upper part of the solum and as much as 25 percent of the

lower part. Reaction ranges from very strongly acid to medium acid in the upper 20 inches of the solum and from very strongly acid to neutral in the lower part of the solum and in the C horizon.

The Ap horizon has hue of 10YR, 7.5YR, or 5YR, value of 3 to 5, and chroma of 2 to 4. It ranges from silt loam to clay.

The B horizon has hue of 5YR, 2.5YR, or 10R ; value of 3 or 4; and chroma of 3, 4, or 6. It is silty clay or clay. Consistence is firm, plastic or very plastic and sticky or very sticky.

The C horizon is similar in hue, value, and chroma to the B horizon, but it is commonly variegated olive, olive brown, or yellow. It ranges from silty clay loam to clay and is 20 to 60 percent coarse fragments.

Vandalia series

The Vandalia series consists of fine, mixed, mesic Typic Hapludalfs. The soils are deep and well drained and have a yellowish red silty clay B2t horizon. They formed in colluvium derived from upland soils that formed in material weathered from calcareous shale, acid siltstone, and sandstone. The Vandalia soils are on side slopes and benches. Slope ranges from 12 to 60 percent but is dominantly 25 to 50 percent.

Vandalia soils are associated with Hayter, Latham, Shelocta, and Upshur soils. They are deeper to rock than Latham and Upshur soils and are less acid than Latham soils. Vandalia soils contain more clay in the solum than Hayter and Shelocta soils.

Typical pedon of Vandalia silt loam, in an area of Vandalia-Upshur complex, 30 to 60 percent slopes, 250 yards south of Durbin Road and 350 yards west of U.S. 23, in Boyd County:

Ap—0 to 5 inches, dark brown (7.5YR 4/2) heavy silt loam; moderate medium granular structure; very friable; many fine roots; 5 percent coarse fragments; medium acid; abrupt smooth boundary.

B1t—5 to 16 inches, reddish brown (5YR 4/4) heavy silty clay loam; moderate fine and medium subangular blocky and angular blocky structure; friable; slightly sticky; few small roots; 8 percent shale and small sandstone fragments; thin continuous clay films; strongly acid; gradual wavy boundary.

B2t—16 to 34 inches, yellowish red (5YR 4/6) silty clay; moderate coarse subangular blocky structure parting to strong medium and fine angular blocky; firm, sticky and plastic; few small roots; about 10 percent coarse fragments of shale; continuous clay films; medium acid; gradual wavy boundary.

B3t—34 to 42 inches, reddish brown (5YR 4/4) and yellowish red (5YR 4/6) heavy silty clay; strong medium angular blocky and subangular blocky structure; firm, sticky and plastic; few clay films; about 30 percent coarse fragments of shale and siltstone 1/2 to 6 inches in diameter; medium acid; gradual wavy boundary.

C1—42 to 50 inches, light olive brown (2.5Y 5/4) clay; common medium faint olive gray (5Y 5/2) and few medium distinct reddish brown (5YR 5/4) mottles; massive; firm, sticky and plastic; about 10 percent shale fragments; slightly acid; gradual wavy boundary.

C2—50 to 65 inches, variegated olive brown (2.5Y 5/4), olive gray (5Y 5/2), brownish yellow (10YR 6/6), and reddish brown (5YR 5/4) silty clay; massive; firm, sticky and plastic; about 10 percent shale fragments; medium acid; abrupt smooth boundary.

R—65 inches, olive shale.

The solum thickness ranges from 36 to 60 inches. Depth to bedrock is more than 5 feet. Reaction of the upper part of the B horizon ranges from medium acid to very strongly acid, in the lower part of the B horizon it is medium acid to slightly acid, and in the C horizon it is medium acid to mildly alkaline. Coarse fragments make up 5 to 30 percent of the solum and as much as 35 percent of the C horizon.

The Ap horizon has hue of 7.5YR, 5YR, or 10YR; value of 4 or 5; and chroma of 2 to 4. It is silt loam or light silty clay loam.

The upper part of the B horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4 to 6. It is heavy silt loam, silty clay loam, or light silty clay.

The lower parts of the B horizon and the C horizon have hue of 5YR, 2.5YR, and 2.5Y; value of 3 to 6; chroma of 3 to 6; and mottles are in shades of gray and brown. They are heavy silty clay loam, silty clay, or clay.

Weinbach series

The Weinbach series consists of fine-silty, mixed, mesic Aeric Fragiaqualfs. They are deep, somewhat poorly drained and nearly level and have a mottled light brownish gray light silty clay loam B2t horizon, over a brittle and compact fragipan. They formed in mixed alluvium on terraces. In this survey area Weinbach soils are a taxadjunct because they have an argillic horizon above the fragipan that is not within the range defined for the Weinbach series.

Weinbach soils are associated with Otwell soils and Bonnie soils. They are not as well drained as the Otwell soils and are better drained than the Bonnie soils. They are less brown than the Otwell soils and not as gray as the Bonnie soils.

Typical pedon of Weinbach silt loam, 40 yards north of farm lane, 75 yards east of C&O Railroad, and 0.4 mile north of Grays Branch, in Greenup County:

Ap—0 to 10 inches, grayish brown (10YR 5/2) silt loam; weak fine granular structure; very friable; few fine roots; slightly acid; abrupt smooth boundary.

B1t—10 to 16 inches, brown (10YR 5/3) silt loam; few fine faint yellowish brown (10YR 5/4, 5/6) mottles; friable; few fine roots; few dark concretions; many fine pores; continuous clay films; strongly acid; clear smooth boundary.

B2t—16 to 24 inches, light brownish gray (10YR 6/2) light silty clay loam; common medium distinct strong brown (7.5YR 5/6), yellowish brown (10YR 5/6), and light gray (2.5Y 7/2) mottles; few fine roots; few dark concretions; many fine pores; continuous clay films; strongly acid; clear smooth boundary.

Bx1—24 to 36 inches, light brownish gray (2.5Y 6/2) heavy silt loam; many medium and coarse prominent brown (7.5YR 5/4) mottles; strong very coarse prismatic structure parting to moderate medium and fine blocky; firm, brittle; few medium dark concretions; dark coatings on peds; few clay films and silt coatings; very strongly acid; clear smooth boundary.

Bx2—36 to 50 inches, brown (7.5YR 5/4) silt loam; strong very coarse prismatic structure parting to moderate thick platy and moderate fine blocky; firm, brittle; few dark concretions and coatings on peds; gray (10YR 6/1) and brown (7.5YR 5/2) clay films and silt coatings on peds; very strongly acid; gradual wavy boundary.

C—50 to 70 inches, brown (7.5YR 5/4) silt loam; common medium distinct light brownish gray (10YR 6/2) and strong brown (7.5YR 5/6) mottles; massive; friable; few dark brown stains along cracks; strongly acid.

The solum thickness ranges from 45 to 60 inches. Depth to rock ranges from 6 to 10 feet or more. The depth to the fragipan ranges from 18 to 28 inches. Reaction below the Ap horizon ranges from medium acid to very strongly acid.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3.

The B1 horizon has hue of 10YR, value of 5 or 6, and chroma of 2 to 4. The B2t horizon has matrix with hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 to 4 and has mottles with hue of 7.5YR, 10YR, and 2.5Y, value of 4 to 6; and chroma of to 6. It is silt loam or light silty clay loam. The Bx horizon has strong, very coarse prismatic structure parting to blocky and platy.

The C horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 to 6. It is silt loam or light silty clay loam and is commonly stratified with thin layers of fine sandy loam.

Wernock series

The Wernock series consists of fine-silty, mixed, mesic Typic Hapludults. They are moderately deep and well drained soils and have a yellowish brown and strong brown silt loam and light silty clay loam B2t horizon. They formed in residuum from acid siltstone, shale, and sandstone. The Wernock soils are on narrow to fairly broad ridgetops. Slope ranges from 2 to 20 percent but is dominantly 4 to 15 percent.

Wernock soils are associated with Gilpin, Latham, and Tilsit soils. They have fewer coarse fragments throughout the solum than Gilpin soils, contain less clay than Latham soils, and lack the fragipan of the Tilsit soils.

Typical pedon of Wernock silt loam, 2 to 6 percent slopes, on Beauty Ridge 2,000 feet northeast of right angle turn on gravel road between Peter Cave Branch and North Branch of Plum Fork, about 11 1/2 miles northwest of Greenup, in Greenup County:

O1—1/2 inch to 0, partially decomposed hardwood leaf litter.

A1—0 to 2 inches, dark grayish brown (10YR 4/2) silt loam; weak fine and very fine granular structure; very friable; many fine roots; strongly acid; abrupt smooth boundary.

A2—2 to 5 inches, yellowish brown (10YR 5/4) silt loam; weak fine and medium subangular blocky structure; very friable; common fine roots; few fine pores and channels; very strongly acid; clear smooth boundary.

B21t—5 to 11 inches, yellowish brown (10YR 5/6) heavy silt loam; moderate medium subangular blocky structure parting to fine and very fine angular blocky; friable; common fine roots; few fine pores; common strong brown (7.5YR 5/6) clay films; few pale brown (10YR 6/3) silt coatings on larger peds; about 2 percent small siltstone fragments; very strongly acid; clear smooth boundary.

B22t—11 to 27 inches, strong brown (7.5YR 5/6) light silty clay loam; moderate medium angular blocky structure parting to fine and very fine angular blocky; firm; common fine roots; many clay films; about 5 percent siltstone fragments; common fine faint pale brown (10YR 7/3) and yellowish red (5YR 4/6) mottles in lower 5 inches; very strongly acid; clear smooth boundary.

B3t—27 to 31 inches, strong brown (7.5YR 5/6) channery clay loam; common fine faint very pale brown (10YR 7/3) and yellowish red (5YR 4/6) mottles; moderate medium angular blocky structure parting to fine and very fine angular blocky; firm; few fine roots; many clay films; about 40 percent siltstone and soft shale fragments; very strongly acid; abrupt smooth boundary.

C—31 to 38 inches, soft reddish sandstone and brownish sandy shale 1/4 to 1 inch thick; clay films between some layers; few fine roots; very strongly acid; abrupt smooth boundary.

R—38 inches, rippable brownish and reddish sandstone and interbedded grayish soft clay shale.

The solum thickness and depth to soft sandstone, siltstone, or shale range from 30 to 40 inches. Reaction is strongly acid to extremely acid, unless the soil is limed. Coarse fragments make up 0 to 10 percent of the profile above a depth of 24 inches and 5 to 40 percent below a depth of 24 inches.

The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The A2 and Ap horizons have hue of 10YR, value of 4 or 5, and chroma of 2 to 4.

The B2t horizon has hue of 10YR, 7.5YR, and 5YR; value of 4 or 5; and chroma of 4 to 8. It is silt loam or silty clay loam. The B3t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 8. In some pedons the B horizon is mottled in shades of brown or red above a depth of 24 inches and gray below a depth of 24 inches. It is silt loam, silty clay loam, clay loam, or their shaly or channery analogues.

The C horizon is gray, red, or brown weathered sandstone, siltstone, or shale, which is commonly interbedded.

Whitley series

The Whitley series consists of fine-silty, mixed, mesic Typic Hapludults. They are deep and well drained and have a brown light silty clay loam, silt loam, and loam B2t horizon. They formed in alluvium washed from soils derived from acid siltstone, shale, and sandstone. Whitley soils are on low and high stream terraces. Slope ranges from 0 to 12 percent but is dominantly 2 to 10 percent.

Whitley soils are associated with Allegheny, Cuba, Morehead, and Tilsit soils. They are better drained than Tilsit and Morehead soils and lack the fragipan of the Tilsit soils. Whitley soils have an argillic horizon which the Cuba soils do not have, and they contain less sand in the upper 40 inches than Allegheny soils.

Typical pedon of Whitley silt loam, 0 to 2 percent slopes, 1,000 feet west of KY 7, and 1/2 mile south of junction of KY 7 and KY 827, in Greenup County:

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

B1—10 to 18 inches, strong brown (7.5YR 5/6) silt loam; weak medium and fine subangular blocky structure; very friable; common fine roots; few fine pores; few root channels filled with material from the Ap horizon; strongly acid; clear smooth boundary.

B21t—18 to 28 inches, brown (7.5YR 4/4) light silty clay loam; moderate medium subangular blocky structure parting to fine angular blocky; friable; few fine roots; few fine pores; common clay films; very strongly acid; gradual smooth boundary.

B22t—28 to 40 inches, brown (7.5YR 5/4) silt loam; few fine faint pale brown (10YR 6/3) mottles; moderate medium subangular blocky structure parting to weak fine angular blocky; friable; few fine roots; common fine pores; common clay films; very strongly acid; gradual smooth boundary.

B23t—40 to 52 inches, brown (7.5YR 5/4) loam; common medium faint pale brown (10YR 6/3) mottles; weak medium and fine angular and subangular blocky structure; friable; few fine pores; few clay films; very strongly acid; gradual smooth boundary.

B24t—52 to 68 inches, brown (7.5YR 4/4) loam; common medium faint light yellowish brown (10YR 6/4) and light brownish gray (10YR 6/2) mottles; weak medium and fine angular and subangular blocky structure; common fine pores; few clay films; very strongly acid; clear smooth boundary.

B3—68 to 74 inches, brown (7.5YR 4/4) fine sandy loam; common medium distinct light gray (10YR 7/2) and very pale brown (10YR 7/3) mottles; weak medium angular blocky structure; very friable; few fine pores; very strongly acid.

The solum thickness ranges from 36 to 74 inches. Depth to rock ranges from 5 to 10 feet or more. Reaction is strongly acid or very strongly acid, unless the soil is limed. Coarse fragments make up 0 to 6 percent of the Ap horizon and upper part of the B horizon and as much as 50 percent of the lower part of the B horizon and the C horizon.

The Ap horizon has hue of 10YR hue, value of 3 or 4, and chroma of 2 or 3.

The upper part of the Bt horizon has hue of 7.5YR and 10YR, value of 4 or 5, and chroma of 4 or 6. It is silt loam or light silty clay loam. The lower part of the Bt horizon and the C horizon are similar in hue, value, and chroma. They are loam, silt loam, silty clay loam, fine sandy loam, and their gravelly analogues.

Formation and classification of the soils

The first part of this section discusses the factors of soil formation, relates them to the formation of soils in the survey area, and explains the processes of soil formation. The second part defines the categories in the system of soil classification and shows where the soils in Boyd and Greenup Counties are placed in the system.

Factors of soil formation

Soil is a natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and plant and animal life acting on earthy parent material, as conditioned by relief or topography over a period of time.

The interaction of five main factors results in differences among the soils. These factors are the physical and chemical composition of the parent material, the climate during and after the accumulation of the parent material, the kinds of plants and organisms living in the soil, the relief of the land and its effect on runoff, and the length of time it took the soil to form.

The effects of one factor can differ from place to place, but the interaction of all the factors determines the kind of soil that forms. In the following paragraphs the factors of soil formation are discussed as they relate to the soils in the survey area.

Climate

Climate affects the physical, chemical, and biological relationship in soils. It influences the kind and number of plants and animals, the weathering of rocks and minerals, the susceptibility of the soil to erosion, and the rate of soil formation.

The climate of Boyd and Greenup Counties is temperate and humid. The average annual precipitation is about 40 inches, and the mean annual air temperature is about 57 degrees F. The soils are almost never dry and are subject to leaching throughout the year. The soluble bases have been largely leached out of the solum, and clay minerals have moved from the surface layer into the subsoil. As a result, most of the soils have a leached, acid surface layer and a subsoil that is finer textured than the surface layer. The soils of the Latham and Wernock series are examples of this type.

Plant and animal life

Plants affect soil formation mainly by adding organic matter. Animals, bacteria, and fungi affect soil formation mainly by converting the remains of plants to organic matter and plant nutrients. The organic matter imparts a dark color to the soil material, and humus aids in the formation of soil structure.

Most of the soils in this area formed under hardwood forests. They have a thin, dark-colored surface layer and a leached, lighter colored subsurface layer. Local differences in drainage, parent material, elevation, aspect, and other features contributed to differences in forest density, composition of plant species, and the kinds of associated ground cover. These local differences are reflected in variations in the soils. Shelocta soils, for example, have a darker colored surface layer on steep, north-facing slopes than on south-facing slopes.

Man has greatly altered the surface layer and changed the soil environment where he has cleared the forests, drained the swamps, and plowed the soil. He has mixed some of the soil horizons, moved soil materials from place to place, added fertilizer and lime, and introduced new plants. Where he has misused the land, accelerated erosion has removed part or all of the original surface layer and subsoil is exposed.

Parent material

The parent material is the unconsolidated mass from which the soils develop (fig. 11). The soils in Boyd and Greenup Counties formed mostly in residual material from the underlying rock and in stream alluvium washed from soils formed in residual material. In some valleys there are deposits of lacustrine material.

Most of the surface rock formations consist of acid shale, siltstone, and sandstone, and a few thin layers of limestone and calcareous shale. The chemical and mineralogical content, the texture of the soil, and the depth to rock have been greatly influenced by the kind of parent material in which the soils formed. Steinsburg soils, for example, formed in materials weathered from sandstone and are coarser textured than Latham soils, which formed in materials weathered from shale. Berks and Cranston soils are medium textured and formed in siltstone parent material. Cuba soils and other alluvial soils have the same general composition as the surrounding soils on uplands. Markland soils are fine textured and formed in lacustrine deposits.

Topography

The topography, or the position, shape, and slope of the soils on the landscape, influences the formation of soils, primarily through its effect on drainage and erosion. It also influences the formation of soils through variations in exposure to the sun and wind, aeration, soil temperature, and plant cover.

The topography of Boyd and Greenup Counties varies from nearly level in the valleys to narrow sloping ridges and steep or very steep side slopes. The maximum difference in elevation between the valleys and the adjacent hillcrests ranges from about 300 to 600 feet.

Most soils with steep slopes are deep because they developed in colluvial materials that have washed and crept downhill from very steep upper slopes. Examples of these are Vandalia and Shelocta soils. Some soils with steep or very steep slopes are moderately deep, largely because of the rapid geological erosion. Berks soils are an

example of this type. These steep to very steep soils tend to have fewer and less distinct horizons than those formed in less sloping areas because water runs off the surface, thus limiting percolation. In less steep areas more rainfall penetrates the soil and the soils are less eroded.

The shape of the land surface is generally related to the different rates of weathering of the underlying rocks. Shale weathers more rapidly than siltstone and sandstone; consequently, landscapes underlain by shale have a rounded, highly dissected appearance. Where there is interbedding of shale, siltstone, and sandstone, the landscape has a benched appearance and more abrupt changes in slope.

Topography generally controls the depth of the water table, which is an important factor in profile development. In nearly level areas some soils are saturated with water for extended periods. Mottling and the gray colors of soils, such as those in the Newark and Morehead soils, reflect this condition.

Time

The formation of soils requires time for the parent material to be altered and form uniquely different kinds of soils. The length of time required for a soil to develop in Boyd and Greenup Counties depends mainly on the kind and nature of the parent materials and the topography. Plant and animal life and climate have comparatively less influence on the rate of soil development. With the exception of soils formed in recent alluvium, enough time has elapsed in the survey area for a full expression of the interaction of the factors of soil formation.

Steinsburg and Latham soils are examples of those formed from different parent material in about the same length of time. Steinsburg soils formed in residuum from resistant sandstone and exhibit weaker profile development than Latham soils, which formed in residuum from easily weathered soft shale.

Berks and Gilpin soils are examples of those formed in similar parent material but on different topography. Both formed in residuum from siltstone and shale, but Gilpin soils are sloping to moderately steep and Berks soils are very steep. Gilpin soils show greater horizon development than Berks soils, even though both have been developing about the same length of time.

Soils formed in recent sediments have weak horizon development. In places the surface layer shows a slight increase in organic matter content, and the subsoil has weak structure. Such soils are said to be immature, or youthful. Examples of this type are Cuba and Pope soils. After a long time and if there are no further additions of sediment, weathering occurs, some of the finer material moves into the subsoil, and the structure and color of the subsoil may change. Whitley soils are an example of soils that have undergone this maturing process. A soil is generally said to be mature when it has been in place long enough to acquire distinct profile characteristics. Examples of mature soils in Boyd and Greenup Counties are Riney, Latham, and Tilsit soils.

Processes of soil formation

The formation of a succession of layers, called horizons, in soils is the result of one or more of the following processes: (1) accumulation of organic matter; (2) leaching of carbonates and more soluble minerals; (3) chemical weathering, chiefly by hydrolysis, of primary minerals into silicate clay minerals; (4) translocation of the silicate clays, and probably some silt-sized particles, from one horizon to another; and (5) reduction and transfer of iron.

Several of these processes have been active in the formation of most soils in Boyd and Greenup Counties. The interaction of the first four processes is reflected in the strongly expressed horizons of the well drained Upshur and Riney soils, and all five processes have probably been active in the formation of the moderately well drained Monongahela, Tilsit, and Otwell soils. The process of accumulation of organic matter has had the greatest effect on the Huntington soils, which formed in recent sediments.

Some organic matter has accumulated in all the soils to form the immediate surface layer, or A1 horizon. The organic matter content ranges from low in the Berks soils to high in the Huntington soils. The A1 horizon becomes a part of the Ap horizon through tillage and thus is no longer recognizable.

Most of the soils in the survey area are acid and formed in materials low in carbonates and the more soluble materials. Some soils formed in calcareous deposits, are acid in the upper layers, and contain carbonates in the lower layers. Licking and Markland soils are examples of this type. Recently deposited materials on first bottoms generally reflect the composition of the surrounding soils on uplands. Cuba and Pope soils, for example, are strongly acid and formed in acid material washed from uplands. Huntington and Nolin soils are less acid and are washed from material influenced by limestone and calcareous shale.

The translocation of clay minerals is an important process in the horizon development of many soils in the survey area. Clay minerals removed from the A horizon are largely immobilized and accumulate as clay films on ped faces, in pores, and in root channels in the B horizon.

The reduction and transfer of iron has occurred in all soils that lack good natural drainage. This process is known as gleying. Part of the iron may be reoxidized and segregated, forming the yellowish brown, strong brown, and other bright colored mottles on an essentially gray matrix in the subsoil. Concretions of iron or manganese are commonly formed under these conditions.

As silicate clay forms from primary minerals, some iron is commonly freed as hydrated oxide. These oxides are more or less red, and even when present in small amounts, they give at least a brownish color to the soil material. They are largely responsible for the strong brown, yellowish brown, or reddish brown colors that dominate the subsoils of many soils in the survey area.

Classification

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965. Readers interested in further details about the system should refer to "Soil taxonomy" (*8*, *10*).

The system of classification has six categories. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. In this system the classification is based on the different soil properties that can be observed in the field or those that can be inferred either from other properties that are observable in the field or from the combined data of soil science and other disciplines. The properties selected for the higher categories are the result of soil genesis or of factors that affect soil genesis. In table 18, the soils of the survey area are classified according to the system. Categories of the system are discussed in the following paragraphs.

ORDER. Ten soil orders are recognized as classes in the system. The properties used to differentiate among orders are those that reflect the kind and degree of dominant soil-forming processes that have taken place. Each order is identified by a word ending in *sol*. An example is Entisol.

SUBORDER. Each order is divided into suborders based primarily on properties that influence soil genesis and are important to plant growth or that are selected to reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquent (*Aqu*, meaning water, plus *ent*, from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of expression of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and a prefix that suggests something about the properties of the soil. An example is Fluvaquents (*Fluv*, meaning deposited by water, plus *aquent*, the suborder of Entisols that have an aquic moisture regime).

SUBGROUP. Each great group may be divided into three subgroups: the central (typic) concept of the great groups, which is not necessarily the most extensive subgroup; the intergrades, or transitional forms to other orders, suborders, or great groups; and the extragrades, which have some properties that are representative of the great groups but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that is thought to typify the great group. An example is Typic Fluvaquents.

FAMILY. Families are established within a subgroup on the basis of similar physical and chemical properties that affect management. Among the properties considered in horizons of major biological activity below plow depth are particle-size distribution, mineral content, temperature regime, thickness of the soil penetrable by roots, consistence, moisture equivalent, soil slope, and permanent cracks. A family name consists of the name of a subgroup and a series of adjectives. The adjectives are the class names for the soil properties used as family differentiae. An example is fine-silty, mixed, acid, mesic, Typic Fluvaquents.

SERIES. The series consists of soils that formed in a particular kind of material and have horizons that, except for texture of the surface soil or of the underlying substratum, are similar in differentiating characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineral and chemical composition.

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is com-

monly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	Less than 2.4
Low	2.4 to 3.2
Moderate	3.2 to 5.2
High	More than 5.2

Base saturation. The degree to which material having base exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to frequent flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Broad-base terrace. A ridge-type terrace built to control erosion by diverting runoff along the contour at a nonscouring velocity. The terrace is 10 to 20 inches high and 15 to 30 feet wide and has gently sloping sides, a rounded crown, and a dish-shaped channel along the upper side. It may be nearly level or have a grade toward one or both ends.

Calcareous soil. A soil containing enough calcium carbonate (commonly with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid. A soil having measurable amounts of calcium carbonate or magnesium carbonate.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Channery soil. A soil, that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coat, clay skin.

Coarse fragments. Mineral or rock particles up to 3 inches (2 millimeters to 7.5 centimeters) in diameter.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the bases of steep slopes.

Complex, soil. A map unit of two or more kinds of soil occurring in such an intricate pattern that they cannot be shown separately on a soil map at the selected scale of mapping and publication.

Compressible. Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping (or contour farming). Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is 40 or 80 inches (1 or 2 meters).

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave. Unstable walls of cuts made by earthmoving equipment. The soil sloughs easily.

Depth to rock. Bedrock at a depth that adversely affects the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the

growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climatic moors."

Drainage, surface. Runoff, or surface flow of water, from an area.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Gleyed soil. A soil having one or more neutral gray horizons as a result of waterlogging and lack of oxygen. The term "gleyed" also designates gray horizons and horizons having yellow and gray mottles as a result of intermittent waterlogging.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material from 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Green manure (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table, which is the upper limit of saturation.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows:

O horizon.—An organic layer, fresh and decaying plant residue, at the surface of a mineral soil.

A horizon.—The mineral horizon, formed or forming at or near the surface, in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon most of which was originally part of a B horizon.

A2 horizon.—A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or a combination of these; (2) by prismatic or blocky structure; (3) by redder or browner colors than those in the A horizon; or (4) by a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that from which the solum is presumed to have formed. If the material is known to differ from that in the solum the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered, but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Landslide. The rapid downhill movement of a mass of soil and loose rock generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones. Rock fragments 10 inches (25 centimeters) or more across. Large stones adversely affect the specified use.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. Inadequate strength for supporting loads.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous areas. Areas that have little or no natural soil, are too nearly inaccessible for orderly examination, or cannot otherwise be feasibly classified.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few*, *common*, and *many*; size—*fine*, *medium*, and *coarse*; and contrast—*faint*, *distinct*, and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three single variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Parent material. The great variety of unconsolidated organic and mineral material in which soil forms. Consolidated bedrock is not yet parent material by this concept.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Percs slowly. The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality that enables the soil to transmit water or air, measured as the number of inches per hour that water moves through the soil. Terms describing permeability are *very slow* (less than 0.06 inch), *slow* (0.06 to 0.20 inch), *moderately slow* (0.2 to 0.6 inch), *moderate* (0.6 to 2.0 inches), *moderately rapid* (2.0 to 6.0 inches), *rapid* (6.0 to 20 inches), and *very rapid* (more than 20 inches).

Piping. Moving water of subsurface tunnels or pipelike cavities in the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from a semisolid to a plastic state.

Poorly graded. Refers to soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Profile, soil. A vertical section of the soil extending through all its horizons and 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 described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulates over disintegrating rock.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth. Shallow root zone. The soil is shallow over a layer that greatly restricts roots. See Root zone.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged in stream channels from a drainage area. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Seepage. The rapid movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils, formed from a particular type of parent material, having horizons that, except for the texture of the A or surface horizon, are similar in all profile characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineralogical and chemical composition.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Small stones. Rock fragments 3 to 10 inches (7.5 to 25 centimeters) in diameter. Small stones adversely affect the specified use.

Soil. A natural, three-dimensional body at the earth's surface that is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent 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 millimeters 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* (0.005 to 0.002 millimeter); and *clay* (less than 0.002 millimeter).

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in mature soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristics of the soil are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stratified. Arranged in strata, or layers. The term refers to geologic material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use or management.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it can soak into the soil or flow slowly to a prepared outlet without harm. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. A stream terrace is frequently called a second bottom, in contrast with a flood plain, and is seldom subject to overflow. A marine terrace, generally wide, was deposited by the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt, silt loam, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or " very fine."

Thin layer. Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The condition of the soil, especially the soil structure, as related to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Topsoil (engineering). Presumably a fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Water table. The upper limit of the soil or underlying rock material that is wholly saturated with water.

Water table, apparent. A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

Water table, artesian. A water table under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

Water table, perched. A water table standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Illustrations

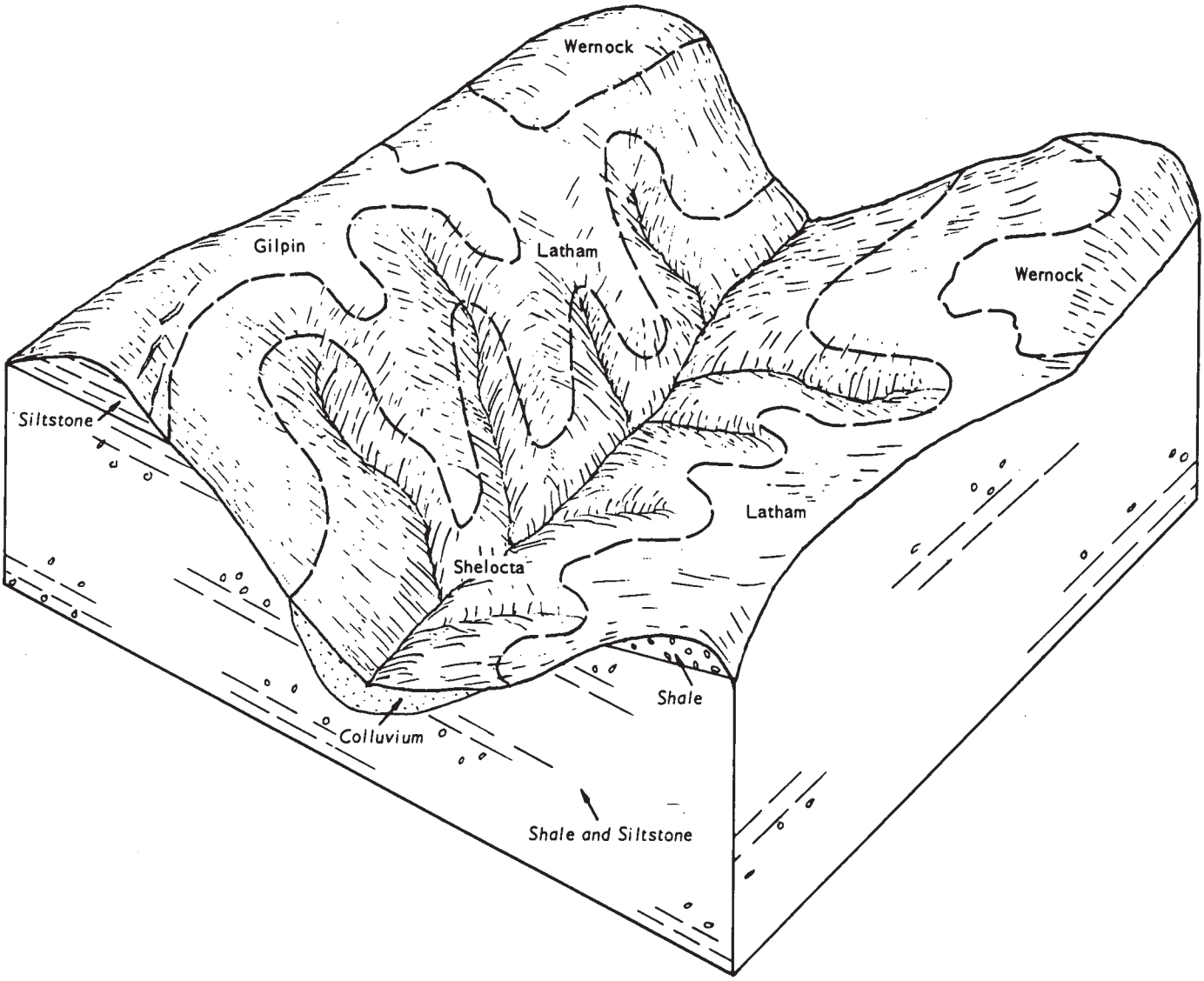

Figure 1.—Typical pattern of soils and parent material in the Latham-Shelocta map unit.

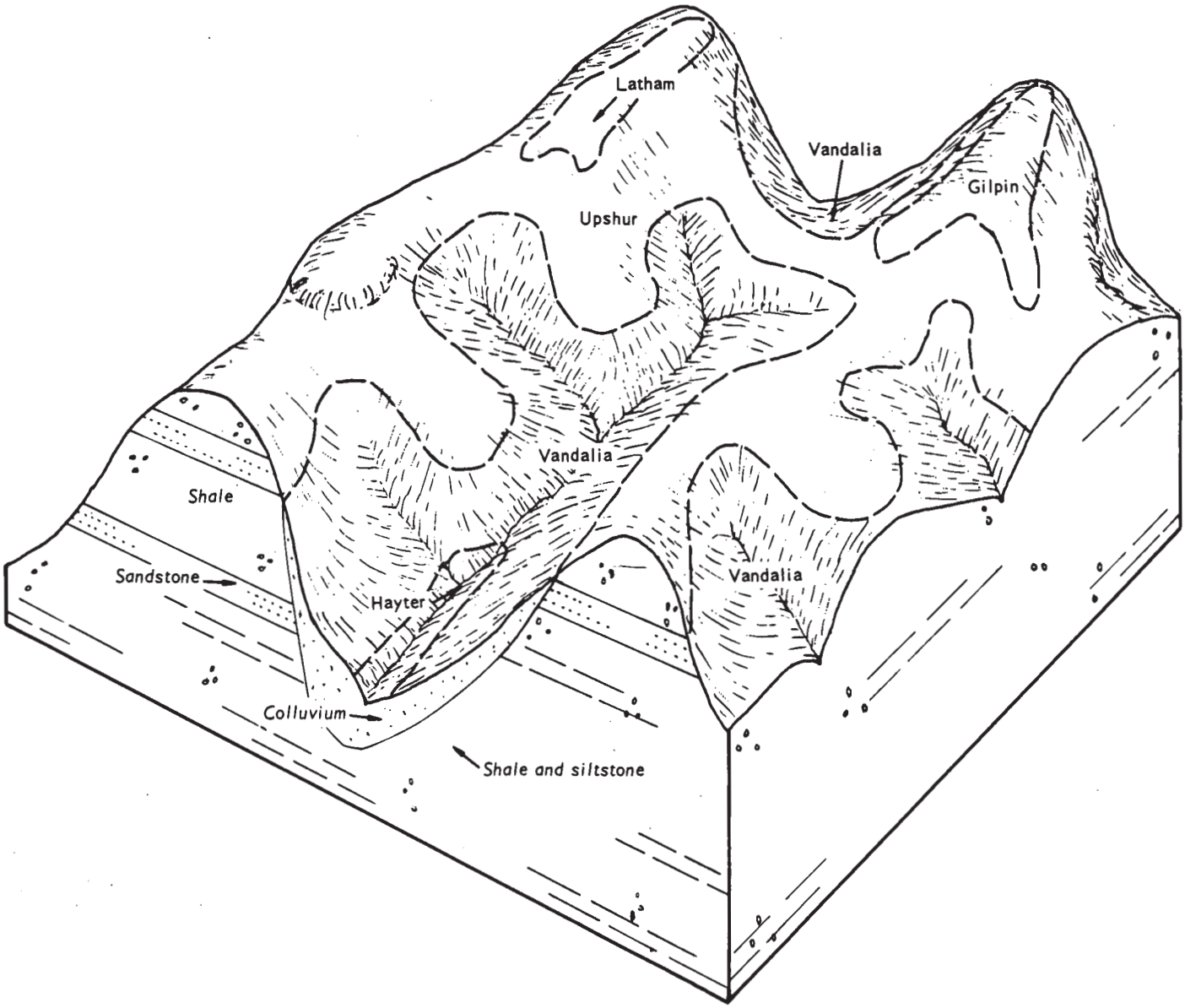

Figure 2.—Typical pattern of soils and parent material in the Vandalia-Upshur map unit.

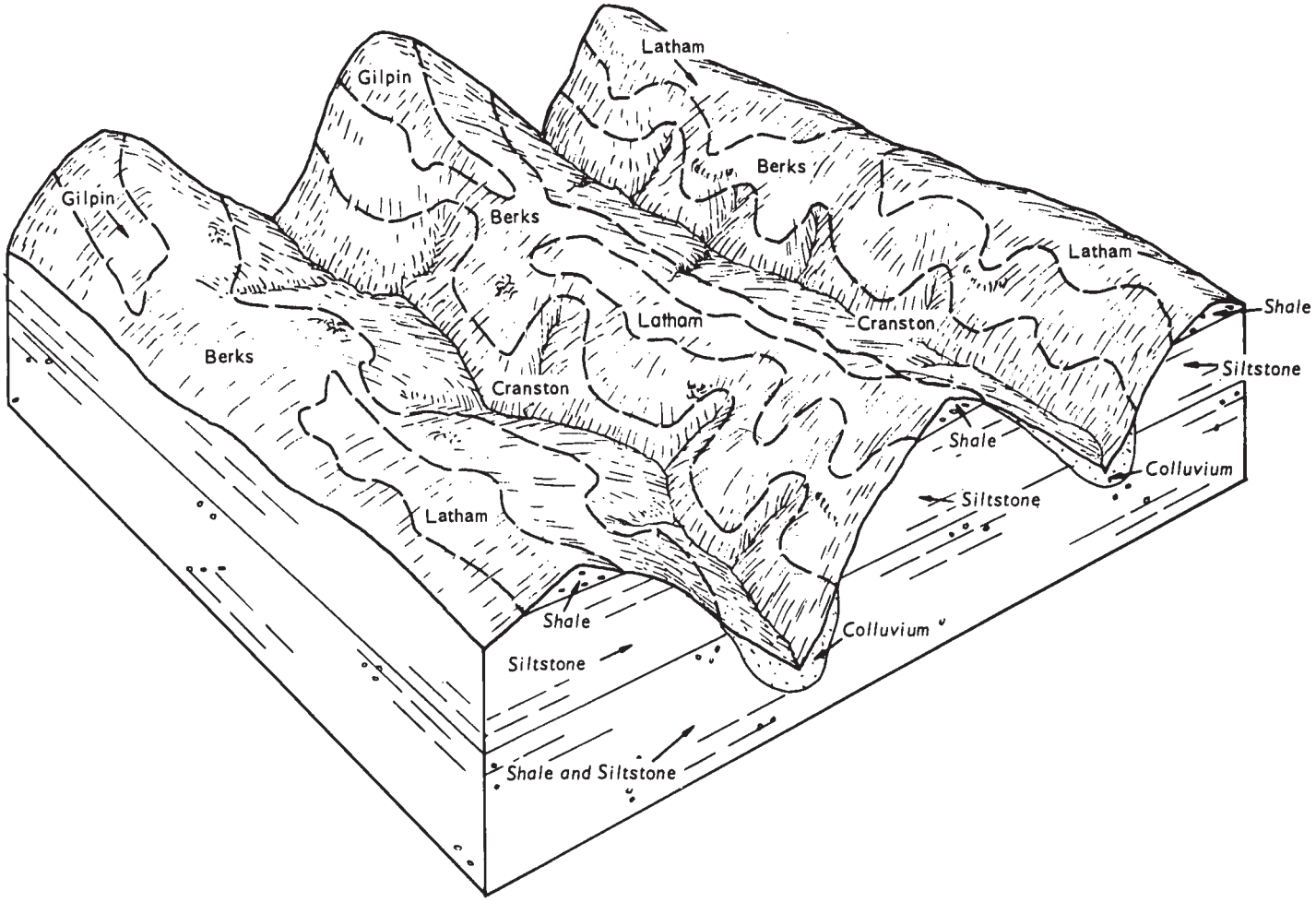

Figure 3.—Typical pattern of soils and parent material in the Berks-Cranston map unit.

Figure 4.—Burley tobacco and corn on Ashton silt loam.

Figure 5.—Soybeans on Elk silt loam.

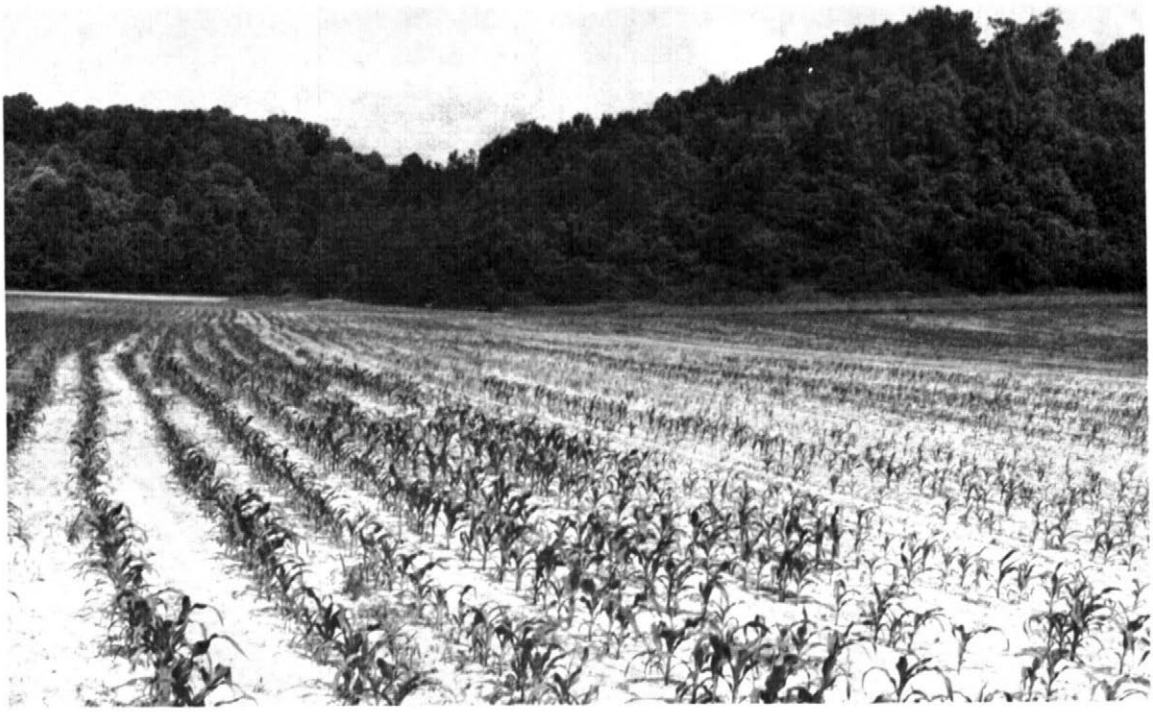

Figure 6.—An area of Stendal silt loam in the foreground showing crop damage from flooding. Wooded area in background is Latham-Shelocta silt loams, 30 to 50 percent slopes.

Figure 7.—An area of strip mines graded and seeded to ryegrass and fescue.

Figure 8.—An area of Vandalia-Upshur complex, 30 to 60 percent slopes, in unimproved pasture.

Figure 9.—Embankment failure in an area of the Vandalia-Upshur map unit.

Figure 10.—Camping and picnic area on Shelocta gravelly silt loam, 2 to 6 percent slopes.

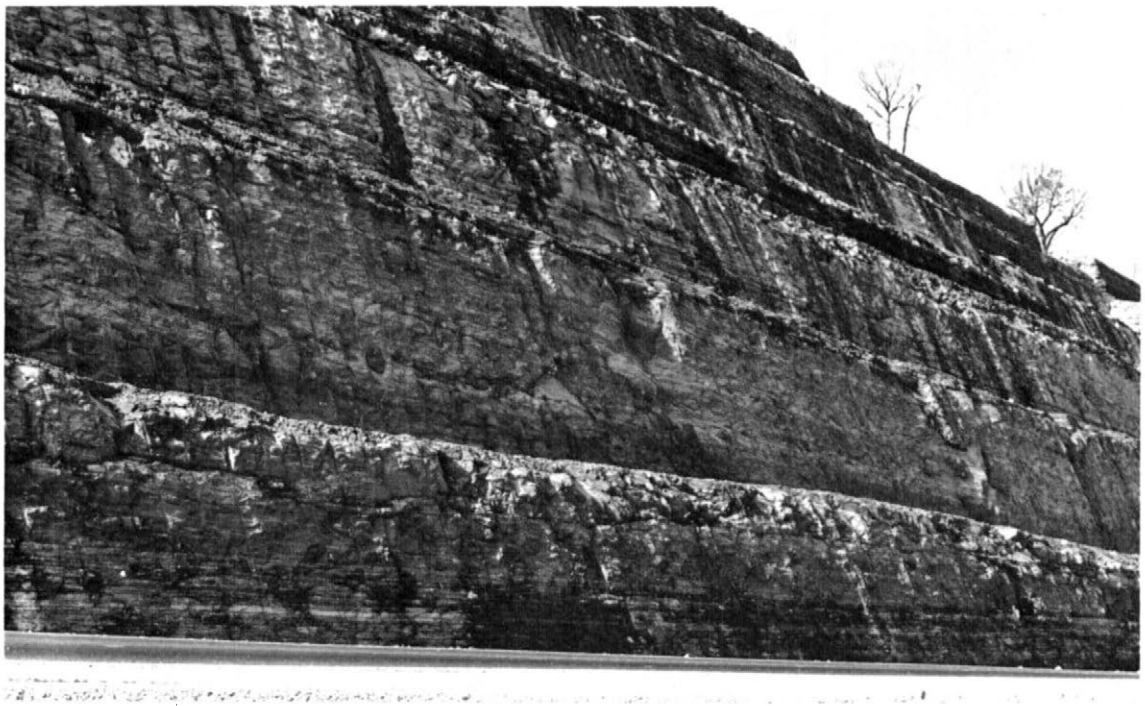

Figure 11.—Siltstone in a roadcut. Berks and Cranston soils formed in this material.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION DATA

Month	Temperature[1]						Precipitation[1]				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[2]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January	43.5	23.2	33.4	72	-6	73	3.13	1.90	4.23	7	4.7
February	46.4	24.6	35.5	73	0	92	3.00	1.47	4.24	7	4.1
March	55.6	32.0	43.9	84	12	201	4.02	2.36	5.49	8	2.6
April	68.4	41.4	55.0	89	23	450	3.64	2.32	4.82	8	.1
May	77.1	50.3	63.7	92	31	735	4.18	2.60	5.60	9	.0
June	84.0	59.0	71.5	96	43	945	3.69	2.01	5.05	7	.0
July	87.0	63.0	75.0	98	49	1,085	4.61	2.59	6.26	8	.0
August	85.9	61.6	73.8	97	47	1,048	3.54	1.85	4.92	6	.0
September	80.7	55.3	68.1	96	36	843	2.89	1.80	3.86	5	.0
October	70.1	42.9	56.5	89	24	512	2.06	.95	2.94	5	.0
November	56.6	33.1	44.9	81	13	162	2.92	1.70	3.92	6	.9
December	46.5	26.5	36.5	74	2	110	3.09	1.60	4.31	7	2.6
Year	66.8	42.7	54.8	100	-6	6,256	40.77	35.91	45.47	83	15.0

[1]Recorded in the period 1951-74 at Ashland, Ky.

[2]A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

Probability	Temperature[1]		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 14	May 1	May 12
2 years in 10 later than--	April 8	April 23	May 6
5 years in 10 later than--	March 25	April 9	April 26
First freezing temperature in fall:			
1 year in 10 earlier than--	October 23	October 13	October 1
2 years in 10 earlier than--	October 29	October 19	October 7
5 years in 10 earlier than--	November 8	October 29	October 20

[1]Recorded in the period 1951-74 at Ashland, Ky.

TABLE 3.--GROWING SEASON LENGTH

Probability	Daily minimum temperature during growing season[1]		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	198	175	151
8 years in 10	208	184	160
5 years in 10	227	202	176
2 years in 10	246	220	192
1 year in 10	256	229	201

[1]Recorded in the period 1951-74 at Ashland, Ky.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Boyd County	Greenup County	Total-- Area	Total-- Extent
		Acres	Acres	Acres	Pct
AlB	Allegheny loam, 2 to 6 percent slopes	130	360	490	0.2
AlC	Allegheny loam, 6 to 12 percent slopes	140	200	340	0.1
AlD	Allegheny loam, 12 to 20 percent slopes	540	810	1,350	0.4
As	Ashton silt loam	10	800	810	0.2
BcF	Berks-Cranston channery silt loams, 30 to 60 percent slopes	0	34,500	34,500	10.6
Bo	Bonnie silt loam	280	1,100	1,380	0.4
ChA	Chavies fine sandy loam, 0 to 6 percent slopes	250	1,230	1,480	0.4
Co	Cotaco loam	1,000	2,350	3,350	1.0
Cu	Cuba silt loam	1,560	3,330	4,890	1.5
EkA	Elk silt loam, 0 to 2 percent slopes	1,910	3,700	5,610	1.7
GlC	Gilpin silt loam, 6 to 12 percent slopes	310	180	490	0.2
GlD	Gilpin silt loam, 12 to 20 percent slopes	260	780	1,040	0.3
GlE	Gilpin silt loam, 20 to 30 percent slopes	70	570	640	0.2
HsB	Hayter silt loam, 2 to 6 percent slopes	720	0	720	0.2
HsC	Hayter silt loam, 6 to 12 percent slopes	570	0	570	0.2
HtE	Hayter loam, 20 to 30 percent slopes	300	0	300	0.1
Hu	Huntington silt loam	1,070	1,190	2,260	0.7
LkB	Lakin loamy fine sand, 2 to 12 percent slopes	0	510	510	0.2
LmC	Latham silt loam, 6 to 12 percent slopes	730	2,360	3,090	0.9
LmD	Latham silt loam, 12 to 20 percent slopes	4,090	17,400	21,490	6.6
LsE	Latham-Shelocta silt loams, 20 to 30 percent slopes	4,180	11,000	15,180	4.6
LsF	Latham-Shelocta silt loams, 30 to 50 percent slopes	31,900	100,030	131,930	40.4
LtA	Licking silt loam, 0 to 2 percent slopes	0	390	390	0.1
Lu	Lindside silt loam	670	60	730	0.2
MkB	Markland silt loam, 2 to 6 percent slopes	110	1,380	1,490	0.5
MlC	Markland soils, 6 to 12 percent slopes	190	460	650	0.2
MlD	Markland soils, 12 to 30 percent slopes	60	480	540	0.2
Mm	McGary silt loam	60	600	660	0.2
MnB	Monongahela silt loam, 2 to 6 percent slopes	30	820	850	0.3
MnC	Monongahela silt loam, 6 to 12 percent slopes	10	520	530	0.2
Mo	Morehead silt loam	1,490	2,670	4,160	1.3
Nk	Newark silt loam	560	530	1,090	0.3
No	Nolin silt loam	320	430	750	0.2
OtA	Otwell silt loam, 0 to 2 percent slopes	140	1,490	1,630	0.5
Pf	Pope fine sandy loam	1,040	2,740	3,780	1.1
Pg	Pope gravelly silt loam	0	4,380	4,380	1.3
RnC	Riney loam, 6 to 12 percent slopes	1,190	350	1,540	0.5
ScB	Shelocta gravelly silt loam, 2 to 6 percent slopes	370	3,020	3,390	1.0
ScC	Shelocta gravelly silt loam, 6 to 12 percent slopes	270	1,620	1,890	0.6
ScD	Shelocta gravelly silt loam, 12 to 20 percent slopes	310	2,080	2,390	0.7
SgD	Steinsburg sandy loam, 6 to 20 percent slopes	290	1,460	1,750	0.5
ShF	Steinsburg stony sandy loam, 20 to 50 percent slopes	3,990	1,160	5,150	1.6
Sm	Stendal silt loam	1,180	1,180	2,360	0.7
Sn	Stokly fine sandy loam	360	1,260	1,620	0.5
St	Strip mines	2,770	1,000	3,770	1.1
TlB	Tilsit silt loam, 2 to 6 percent slopes	640	1,260	1,900	0.6
TlC	Tilsit silt loam, 6 to 12 percent slopes	80	540	620	0.2
UpC	Upshur silty clay loam, 6 to 12 percent slopes	270	0	270	0.1
UpD	Upshur silty clay loam, 12 to 30 percent slopes	2,060	160	2,220	0.7
VnD	Vandalia silt loam, 12 to 20 percent slopes	240	0	240	0.1
VnE	Vandalia silt loam, 20 to 30 percent slopes	1,870	0	1,870	0.6
VuF	Vandalia-Upshur complex, 30 to 60 percent slopes	30,500	200	30,700	9.4
Wb	Weinbach silt loam	30	750	780	0.2
WcB	Wernock silt loam, 2 to 6 percent slopes	0	1,180	1,180	0.4
WcC	Wernock silt loam, 6 to 12 percent slopes	270	3,810	4,080	1.3
WcD	Wernock silt loam, 12 to 20 percent slopes	20	1,500	1,520	0.5
WhA	Whitley silt loam, 0 to 2 percent slopes	290	570	860	0.3
WhB	Whitley silt loam, 2 to 6 percent slopes	140	1,180	1,320	0.4
WhC	Whitley silt loam, 6 to 12 percent slopes	180	690	870	0.3
	Total	102,020	224,320	326,340	100.0

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[All yields were estimated for a high level of management in 1974. Absence of a yield figure indicates the crop is seldom grown or is not suited]

Soil name and map symbol	Corn	Soybeans	Tobacco	Grass-legume hay	Pasture
	Bu	Bu	Lb	Ton	AUM[1]
Allegheny:					
AlB	115	40	3,000	3.5	6.5
AlC	105	35	2,700	3.5	6.5
AlD	80	30	2,400	3.0	5.5
Ashton:					
As	130	45	3,000	4.5	9.5
Berks:					
[2]BcF	---	---	---	---	3.0
Bonnie:					
Bo	100	35	---	3.0	6.0
Chavies:					
ChA	115	40	2,800	3.5	6.5
Cotaco:					
Co	110	35	2,700	3.5	6.5
Cuba:					
Cu	125	40	---	4.5	9.5
Elk:					
EkA	125	45	3,000	4.5	9.5
Gilpin:					
GlC	85	---	2,400	3.0	6.0
GlD	70	---	2,000	2.5	5.5
GlE	---	---	---	---	4.5
Hayter:					
HsB	120	40	3,000	4.0	8.0
HsC	110	30	2,800	3.0	7.0
HtE	---	---	---	---	5.0
Huntington:					
Hu	135	45	---	4.5	9.5
Lakin:					
LkB	80	---	---	3.0	6.0
Latham:					
LmC	80	---	2,200	3.0	6.0
LmD	---	---	---	2.5	5.0
[2]LsE	---	---	---	---	5.5
[2]LsF	---	---	---	---	4.0
Licking:					
LtA	100	35	2,600	4.0	8.0
Lindside:					
Lu	130	45	2,800	4.5	9.5
Markland:					
MkB	85	30	2,400	3.5	7.0
MlC	---	---	---	3.0	6.0
MlD	---	---	---	---	5.0

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Tobacco	Grass-legume hay	Pasture
	Bu	Bu	Lb	Ton	AUM[1]
McGary:					
Mm	90	35	---	3.5	7.0
Monongahela:					
MnB	100	35	2,700	3.5	7.0
MnC	85	25	2,200	3.0	6.5
Morehead:					
Mo	110	40	2,800	4.0	8.5
Newark:					
Nk	110	40	2,500	4.5	9.0
Nolin:					
No	135	45	3,000	4.5	9.0
Otwell:					
OtA	110	40	2,800	4.0	8.5
Pope:					
Pf, Pg	110	40	2,700	4.0	8.5
Riney:					
RnC	90	30	2,600	3.5	6.5
Shelocta:					
ScB	110	35	2,700	4.0	8.5
ScC	100	30	2,500	4.0	8.5
ScD	80	---	2,200	3.0	6.0
Steinsburg:					
SgD	75	---	---	2.5	5.0
ShF	---	---	---	---	3.0
Stendal:					
Sm	130	40	2,500	4.0	8.5
Stokly:					
Sn	110	35	2,200	3.5	8.0
Strip mines:					
St	---	---	---	---	---
Tilsit:					
TlB	100	35	2,600	3.5	7.0
TlC	85	25	2,200	3.0	6.5
Upshur:					
UpC	80	---	---	3.0	7.0
UpD	---	---	---	2.5	5.0
Vandalia:					
VnD	90	---	---	3.0	7.5
VnE	---	---	---	---	5.0
[2]VuF	---	---	---	---	3.5
Weinbach:					
Wb	100	35	---	3.5	7.5
Wernock:					
WcB	90	30	2,600	3.5	7.5

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Tobacco	Grass-legume hay	Pasture
	Bu	Bu	Lb	Ton	AUM[1]
Wernock:					
WcC	80	25	2,400	3.0	6.0
WcD	70	---	2,200	2.5	5.5
Whitley:					
WhA	125	40	3,000	4.5	9.5
WhB	110	35	2,800	4.0	8.5
WhC	90	30	2,600	4.0	8.0

[1]Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for a period of 30 days.
[2]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole map unit.

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas excluded. Dashes mean no acreage]

Class	Total acreage	Major management concerns (Subclass)			
		Erosion (e)	Wetness (w)	Soil problem (s)	Climate (c)
		Acres	Acres	Acres	Acres
I	19,690	---	---	---	---
II	30,310	11,330	14,600	4,380	---
III	18,840	15,510	2,820	510	---
IV	30,700	30,700	---	---	---
V	---	---	---	---	---
VI	20,750	20,750	---	---	---
VII	202,280	197,130	---	5,150	---

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed in this table. Absence of an entry in a column means the information was not available]

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Important trees	Site index	
Allegheny:								
AlB, AlC	2o	Slight	Slight	Slight	Moderate	Northern red oak Yellow-poplar Virginia pine Eastern white pine Shortleaf pine	80 90 75 90 75	Eastern white pine, yellow-poplar, black walnut.
AlD	2r	Moderate	Moderate	Slight	Moderate	Northern red oak Yellow-poplar Virginia pine Eastern white pine Shortleaf pine	80 90 75 90 75	Eastern white pine, yellow-poplar, black walnut.
Ashton:								
As	1o	Slight	Slight	Slight	Severe	Northern red oak Pin oak Yellow-poplar Sweetgum	85 103 95 77	Eastern white pine, yellow-poplar, black walnut, sweetgum.
Berks:								
[1]BcF:								
Berks part:								
North aspect	3f	Moderate	Severe	Moderate	Slight	Northern red oak Black oak Virginia pine	70 70 70	Virginia pine, eastern white pine, shortleaf pine, yellow-poplar.
Cranston part:								
North aspect	2r	Moderate	Severe	Slight	Moderate	Yellow-poplar Northern red oak	90 80	Northern red oak, yellow-poplar, eastern white pine, shortleaf pine, black locust.
[1]BcF:								
Berks part:								
South aspect	4f	Moderate	Severe	Severe	Slight	Northern red oak Black oak Virginia pine	60 60 60	Virginia pine, shortleaf pine.
Cranston part:								
South aspect	3r	Moderate	Severe	Moderate	Slight	Scarlet oak Shortleaf pine	70 70	Shortleaf pine, white oak, Virginia pine.
Bonnie:								
Bo	1w	Slight	Severe	Severe	Severe	Pin oak Eastern cottonwood	90 100	Eastern cottonwood, red maple, American sycamore, sweetgum, baldcypress, pin oak.
Chavies:								
ChA	2o	Slight	Slight	Slight	Moderate	Northern red oak Yellow-poplar Pin oak	80 97 90	Eastern white pine, yellow-poplar, black walnut.
Cotaco:								
Co	2o	Slight	Slight	Slight	Moderate	Northern red oak Yellow-poplar Virginia pine	83 99 75	Eastern white pine, yellow-poplar, Virginia pine, white oak, sweetgum, shortleaf pine, black walnut.

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Important trees	Site index	
Cuba:								
Cu	1o	Slight	Slight	Slight	Severe	Yellow-poplar	100	Eastern white pine, black walnut, yellow-poplar, shortleaf pine.
Elk:								
EkA	2o	Slight	Slight	Slight	Moderate	Northern red oak Yellow-poplar Shortleaf pine	80 90 80	Eastern white pine, yellow-poplar, black walnut, shortleaf pine.
Gilpin:								
GlC	3o	Slight	Slight	Slight	Slight	Black oak Virginia pine	66 75	Yellow-poplar, shortleaf pine, Virginia pine, eastern white pine.
GlD, GlE:								
North aspect	2r	Moderate	Moderate	Slight	Moderate	Yellow-poplar	98	Yellow-poplar, shortleaf pine, eastern white pine, Virginia pine.
GlD, GlE:								
South aspect	3r	Severe	Severe	Slight	Slight	Virginia pine	67	Shortleaf pine, Virginia pine.
Hayter:								
HsB, HsC	2o	Slight	Slight	Slight	Moderate	Northern red oak Sugar maple Yellow-poplar	85 85 108	Yellow-poplar, eastern white pine, black walnut.
HtE	2r	Moderate	Moderate	Slight	Moderate	Northern red oak Sugar maple Yellow-poplar	85 85 95	Yellow-poplar, eastern white pine, black walnut.
Huntington:								
Hu	1o	Slight	Slight	Slight	Severe	Yellow-poplar Northern red oak	95 85	Yellow-poplar, black walnut, black locust, eastern white pine.
Lakin:								
LkB	4s	Slight	Moderate	Moderate	Slight	Northern red oak	60	Virginia pine, eastern white pine, shortleaf pine.
Latham:								
LmC	4c	Moderate	Moderate	Slight	Slight	Northern red oak	57	Eastern white pine, shortleaf pine, Virginia pine.
LmD (North aspect)	3c	Severe	Moderate	Slight	Slight	Northern red oak	68	Eastern white pine, shortleaf pine, Virginia pine.
LmD (South aspect)	4c	Severe	Moderate	Moderate	Slight	Northern red oak	59	Virginia pine, shortleaf pine.
[1]LsE:								
Latham part:								
North aspect	3c	Severe	Severe	Slight	Slight	Northern red oak	68	Eastern white pine, shortleaf pine, Virginia pine.
Shelocta part:								
North aspect	2r	Moderate	Moderate	Slight	Moderate	Northern red oak Yellow-poplar Virginia pine Shortleaf pine	76 102 78 75	Eastern white pine, yellow-poplar, black walnut, Virginia pine, shortleaf pine.

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Important trees	Site index	
Latham:								
[1]LsE:								
Latham part:								
South aspect---	4c	Severe	Severe	Moderate	Slight	Northern red oak----	59	Eastern white pine, Virginia pine, shortleaf pine.
Shelocta part:								
South aspect---	3r	Moderate	Moderate	Slight	Slight	Northern red oak----	69	Eastern white pine, Virginia pine, shortleaf pine.
						Virginia pine-------	71	
						Shortleaf pine------	65	
[1]LsF:								
Latham part:								
North aspect---	3c	Severe	Severe	Slight	Slight	Northern red oak----	68	Eastern white pine, shortleaf pine, Virginia pine.
Shelocta part:								
North aspect---	2r	Severe	Severe	Slight	Moderate	Northern red oak----	76	Eastern white pine, yellow-poplar, black walnut, Virginia pine, shortleaf pine.
						Yellow-poplar-------	102	
						Virginia pine-------	78	
						Shortleaf pine------	75	
[1]LsF:								
Latham part:								
South aspect---	4c	Severe	Severe	Moderate	Slight	Northern red oak----	59	Virginia pine, shortleaf pine.
Shelocta part:								
South aspect---	3r	Severe	Severe	Moderate	Slight	Northern red oak----	69	Eastern white pine, Virginia pine, shortleaf pine.
						Virginia pine-------	71	
						Shortleaf pine------	65	
Licking:								
LtA----------	2o	Slight	Slight	Slight	Moderate	White oak----------	75	Eastern white pine, yellow-poplar, shortleaf pine, black walnut.
						Northern red oak----	80	
						Yellow-poplar-------	90	
Lindside:								
Lu----------	1o	Slight	Slight	Slight	Severe	Northern red oak----	85	Eastern white pine, yellow-poplar, black walnut, shortleaf pine.
						Yellow-poplar-------	95	
Markland:								
MkB, MlC----------	2c	Moderate	Moderate	Slight	Moderate	White oak----------	75	Eastern white pine, yellow-poplar, white ash.
						Northern red oak----	75	
MlD----------	2c	Severe	Severe	Moderate	Moderate	White oak----------	75	Eastern white pine, yellow-poplar, white ash.
						Northern red oak----	75	
McGary:								
Mm----------	3w	Slight	Moderate	Slight	Moderate	White oak----------	66	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
						Pin oak------------	66	
Monongahela:								
MnB, MnC----------	3o	Slight	Slight	Slight	Slight	Northern red oak----	70	Eastern white pine, Virginia pine, yellow-poplar, black cherry, European larch.
						Yellow-poplar-------	85	
						Eastern white pine--	72	
						Virginia pine-------	77	
						Loblolly pine-------	82	

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Important trees	Site index	
Morehead:								
Mo	2w	Slight	Moderate	Slight	Moderate	Yellow-poplar Shortleaf pine Northern red oak	82 84 96	Shortleaf pine, yellow-poplar, Virginia pine, sweetgum, pin oak, eastern white pine.
Newark:								
Nk	1w	Slight	Moderate	Slight	Severe	Pin oak Eastern cottonwood Northern red oak Yellow-poplar Sweetgum	99 94 85 95 88	Eastern cottonwood, sweetgum, American sycamore, eastern white pine, yellow-poplar.
Nolin:								
No	1o	Slight	Slight	Slight	Severe	Sweetgum Yellow-poplar	92 107	Sweetgum, yellow-poplar, eastern white pine, eastern cottonwood, white ash, black walnut.
Otwell:								
OtA	3o	Slight	Slight	Slight	Slight	White oak	72	Eastern white pine, red pine, yellow-poplar, white ash.
Pope:								
Pf, Pg	1o	Slight	Slight	Slight	Moderate	Northern red oak Yellow-poplar Eastern white pine Virginia pine	80 102 89 74	Eastern white pine, yellow-poplar, black walnut, shortleaf pine.
Riney:								
RnC	2o	Slight	Slight	Slight	Moderate	Northern red oak Yellow-poplar Shortleaf pine	80 90 80	Yellow-poplar, shortleaf pine, loblolly pine, black walnut, eastern white pine.
Shelocta:								
ScB, ScC	2o	Slight	Slight	Slight	Moderate	Northern red oak Yellow-poplar Virginia pine Shortleaf pine	71 105 76 69	Eastern white pine, yellow-poplar, black walnut, Virginia pine.
ScD (North aspect)	2r	Slight	Moderate	Slight	Moderate	Northern red oak Yellow-poplar Virginia pine Shortleaf pine	76 102 78 75	Eastern white pine, yellow-poplar, black walnut, Virginia pine.
ScD (South aspect)	3r	Slight	Moderate	Slight	Slight	Northern red oak Virginia pine Shortleaf pine	69 71 65	Eastern white pine, Virginia pine, shortleaf pine.
Steinsburg:								
SgD	3r	Slight	Moderate	Moderate	Slight	Virginia pine	70	Eastern white pine, Virginia pine, shortleaf pine.

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Important trees	Site index	
Steinsburg:								
ShF	3r	Moderate	Severe	Moderate	Slight	Virginia pine Yellow-poplar Northern red oak	70 --- ---	Eastern white pine, Virginia pine, shortleaf pine.
Stendal:								
Sm	2w	Slight	Moderate	Slight	Moderate	Pin oak Sweetgum Yellow-poplar Virginia pine	90 85 90 90	Eastern white pine, American sycamore, white ash, sweetgum.
Stokly:								
Sn	2w	Slight	Moderate	Slight	Moderate	Pin oak Sweetgum Yellow-poplar Virginia pine	90 90 90 85	Eastern white pine, American sycamore, sweetgum.
Strip mines:								
St	---	------	------	------	------	----------	---	
Tilsit:								
T1B, T1C	3o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar Eastern white pine Virginia pine Shortleaf pine	70 89 80 79 78	Eastern white pine, Virginia pine, shortleaf pine, yellow-poplar.
Upshur:								
UpC	3c	Moderate	Moderate	Slight	Slight	Northern red oak Yellow-poplar Eastern white pine Virginia pine	65 82 82 66	Eastern white pine, Virginia pine, shortleaf pine, yellow-poplar.
UpD (North aspect)	3c	Severe	Severe	Slight	Slight	Northern red oak Yellow-poplar Eastern white pine Virginia pine	70 89 89 71	Eastern white pine, Virginia pine, shortleaf pine, yellow-poplar.
UpD (South aspect)	4c	Severe	Severe	Moderate	Slight	Northern red oak Virginia pine	66 62	Virginia pine, shortleaf pine, eastern redcedar.
Vandalia:								
VnD, VnE:								
North aspect	2c	Moderate	Severe	Slight	Moderate	Northern red oak Yellow-poplar	77 90	Eastern white pine, Virginia pine, yellow-poplar, black walnut, shortleaf pine.
VnD, VnE:								
South aspect	3c	Moderate	Severe	Slight	Slight	Northern red oak	68	Virginia pine, shortleaf pine.
[1]VuF:								
Vandalia part:								
North aspect	2c	Severe	Severe	Slight	Moderate	Northern red oak Yellow-poplar	77 90	Eastern white pine, Virginia pine, yellow-poplar, black walnut, shortleaf pine.

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Important trees	Site index	
Vandalia:								
Upshur part:								
North aspect---	3c	Severe	Severe	Slight	Slight	Northern red oak----	70	Eastern white pine,
						Yellow-poplar-------	89	Virginia pine,
						Eastern white pine--	89	shortleaf pine,
						Virginia pine-------	71	yellow-poplar.
[1]VuF:								
Vandalia part:								
South aspect---	3c	Severe	Severe	Slight	Slight	Northern red oak----	68	Virginia pine, shortleaf pine.
Upshur part:								
South aspect---	4c	Severe	Severe	Moderate	Slight	Northern red oak----	66	Virginia pine,
						Virginia pine-------	62	shortleaf pine, eastern redcedar.
Weinbach:								
Wb----------	2w	Slight	Moderate	Slight	Moderate	White oak----------	75	Eastern white pine,
						Pin oak----------	90	white ash,
						Yellow-poplar-------	85	yellow-poplar,
						Sweetgum----------	88	American sycamore, sweetgum.
Wernock:								
WcB, WcC----------	2o	Slight	Slight	Slight	Moderate	Northern red oak----	80	Yellow-poplar,
						Yellow-poplar-------	75	eastern white pine,
						Virginia pine-------	70	shortleaf pine.
						Shortleaf pine------	68	
WcD----------	2r	Moderate	Slight	Slight	Moderate	Northern red oak----	80	Yellow-poplar,
						Yellow-poplar-------	75	eastern white pine,
						Virginia pine-------	70	shortleaf pine.
						Shortleaf pine------	68	
Whitley:								
WhA, WhB, WhC-----	2o	Slight	Slight	Slight	Moderate	Northern red oak----	80	Yellow-poplar,
						Yellow-poplar-------	75	eastern white pine,
						Virginia pine-------	70	shortleaf pine.
						Shortleaf pine------	68	

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole map unit.

TABLE 8.--BUILDING SITE DEVELOPMENT

["Shrink-swell" and some of the other terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe"]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Allegheny:					
AlB	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength.
AlC	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, low strength.
AlD	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ashton:					
As	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Berks:					
[1]BcF:					
Berks part	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.
Cranston part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Bonnie:					
Bo	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: wetness, floods.
Chavies:					
ChA	Slight	Slight	Slight	Slight	Slight.
Cotaco:					
Co	Moderate: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: low strength.
Cuba:					
Cu	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Elk:					
EkA	Slight	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.
Gilpin:					
GlC	Severe: depth to rock.	Moderate: depth to rock, slope.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope.
GlD, GlE	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.
Hayter:					
HsB	Moderate: small stones.	Slight	Slight	Moderate: slope.	Moderate: low strength.
HsC	Moderate: slope, small stones.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope.
HtE	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnotes at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Huntington:					
Hu	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Lakin:					
LkB	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
Latham:					
LmC	Moderate: slope, depth to rock, too clayey.	Moderate: slope, shrink-swell, low strength.	Moderate: slope, depth to rock, shrink-swell.	Severe: slope.	Moderate: low strength.
LmD	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
[1]LsE:					
Latham part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Shelocta part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
[1]LsF:					
Latham part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Shelocta part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Licking:					
LtA	Moderate: too clayey.	Moderate: low strength, shrink-swell.	Moderate: low strength, wetness, shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.
Lindside:					
Lu	Severe: floods.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: floods.
Markland:					
MkB	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
MlC	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: slope, shrink-swell.	Severe: shrink-swell, low strength.
MlD	Severe: slope.	Severe: shrink-swell, slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell, low strength.
McGary:					
Mm	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, low strength.
Monongahela:					
MnB	Moderate: wetness.	Moderate: low strength.	Moderate: wetness, low strength.	Moderate: slope, low strength, wetness.	Moderate: low strength.
MnC	Moderate: slope, wetness.	Moderate: slope, low strength.	Moderate: wetness. slope, low strength.	Severe: slope.	Moderate: slope, low strength.

See footnotes at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Morehead:					
Mo	Severe: wetness.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Moderate: wetness, low strength.
Newark:					
Nk	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods.
Nolin:					
No	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Otwell:					
OtA	Moderate: wetness.	Moderate: low strength, wetness.	Severe: wetness.	Moderate: low strength, wetness.	Moderate: low strength.
Pope:					
Pf, Pg	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Riney:					
RnC	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, low strength.
Shelocta:					
ScB	Moderate: small stones.	Slight	Slight	slight	Moderate: low strength.
ScC	Moderate: slope, small stones.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, low strength.
ScD	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Steinsburg:					
SgD	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
ShF	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Stendal:					
Sm	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods.
Stokly:					
Sn	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods.
Strip mines:					
St	Severe: slope, large stones.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Tilsit:					
TlB	Moderate: wetness, depth to rock.	Moderate: wetness, low strength.	Severe: wetness.	Moderate: slope, wetness, low strength.	Moderate: low strength.
TlC	Moderate: wetness, depth to rock.	Moderate: slope, wetness, low strength.	Severe: wetness.	Severe: slope.	Moderate: slope, low strength.

See footnotes at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Upshur:					
UpC	Severe: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: slope, shrink-swell.	Severe: shrink-swell.
UpD	Severe: slope, too clayey.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.
Vandalia:					
VnD, VnE	Severe: slope, too clayey.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.
[1]VuF:					
Vandalia part	Severe: slope, too clayey.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.
Upshur part	Severe: slope, too clayey.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.
Weinbach:					
Wb	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: low strength, wetness.
Wernock:					
WcB	Moderate: depth to rock.	Moderate: low strength.	Moderate: depth to rock, low strength.	Moderate: slope, low strength.	Moderate: low strength.
WcC	Moderate: slope, depth to rock.	Moderate: slope, low strength.	Moderate: slope, low strength, depth to rock.	Severe: slope.	Moderate: slope, low strength.
WcD	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Whitley:					
WhA, WhB	Slight	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.
WhC	Moderate: slope.	Moderate: slope, low strength.	Moderate: slope, low strength.	Severe: slope.	Moderate: slope, low strength.

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole map unit.

TABLE 9.--SANITARY FACILITIES

["Seepage" and some of the other terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms used to rate soils]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Allegheny:					
AlB	Slight	Moderate: slope, seepage.	Slight	Slight	Good.
AlC	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.	Fair: slope.
AlD	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.	Poor: slope.
Ashton:					
As	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
Berks:					
[1]BcF:					
Berks part	Severe: depth to rock, slope.	Severe: slope, seepage, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: seepage, slope.	Poor: small stones, slope.
Cranston part	Severe: slope.	Severe: slope, seepage.	Severe: slope, seepage.	Severe: slope, seepage.	Poor: slope.
Bonnie:					
Bo	Severe: floods, wetness.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Poor: wetness.
Chavies:					
ChA	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
Cotaco:					
Co	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey.
Cuba:					
Cu	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
Elk:					
EkA	Slight	Moderate: seepage.	Slight	Slight	Good.
Gilpin:					
GlC	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Moderate: slope.	Fair: thin layer.
GlD	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: slope.	Poor: slope.
GlE	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.

See footnotes at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Hayter:					
HsB	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: small stones, too clayey.
HsC	Moderate: slope.	Severe: slope, seepage.	Severe: seepage.	Severe: seepage.	Fair: small stones, too clayey.
HtE	Severe: slope.	Severe: slope, seepage.	Severe: slope, seepage.	Severe: slope, seepage.	Poor: slope.
Huntington:					
Hu	Severe: floods.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Good.
Lakin:					
LkB	Slight	Severe: slope, seepage.	Severe: seepage.	Severe: seepage.	Fair: too sandy.
Latham:					
LmC	Severe: percs slowly, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Fair: too clayey.
LmD	Severe: slope, percs slowly, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Poor: slope.
[1]LsE:					
Latham part	Severe: slope, percs slowly, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope.
Shelocta part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
[1]LsF:					
Latham part	Severe: slope, percs slowly, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope.
Shelocta part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Licking:					
LtA	Severe: percs slowly.	Slight	Moderate: too clayey, wetness.	Moderate: wetness.	Fair: too clayey.
Lindside:					
Lu	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Good.
Markland:					
MkB	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
MlC	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey.
MlD	Severe: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Severe: slope.	Poor: too clayey.

See footnotes at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
McGary:					
Mm	Severe: wetness, percs slowly.	Slight	Severe: too clayey, wetness.	Moderate: wetness.	Poor: too clayey.
Monongahela:					
MnB	Severe: percs slowly.	Moderate: slope.	Moderate: wetness.	Moderate: wetness.	Good.
MnC	Severe: percs slowly.	Severe: slope.	Moderate: wetness.	Moderate: slope, wetness.	Fair: slope.
Morehead:					
Mo	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Good.
Newark:					
Nk	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Good.
Nolin:					
No	Severe: floods.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Good.
Otwell:					
OtA	Severe: percs slowly.	Slight	Moderate: wetness.	Moderate: wetness.	Fair: thin layer.
Pope:					
Pf, Pg	Severe: floods.	Severe: floods, seepage.	Severe: floods, seepage.	Severe: floods, seepage.	Good.
Riney:					
RnC	Moderate: slope.	Severe: slope, seepage.	Severe: seepage.	Severe: seepage.	Fair: slope.
Shelocta:					
ScB	Slight	Severe: seepage.	Severe: seepage.	Slight	Fair: small stones.
ScC	Moderate: slope.	Severe: slope, seepage.	Severe: seepage.	Moderate: slope.	Fair: small stones.
ScD	Severe: slope.	Severe: slope, seepage.	Severe: seepage.	Severe: slope.	Poor: slope.
Steinsburg:					
SgD	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock, seepage.	Severe: seepage.	Fair: slope, thin layer, small stones.
ShF	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage.	Poor: slope.
Stendal:					
Sm	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Good.

See footnotes at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Stokly:					
Sn	Severe: floods, wetness.	Severe: floods, wetenss.	Severe: floods, seepage.	Severe: floods, seepage, wetness.	Good.
Strip mines:					
St	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope, large stones.
Tilsit:					
TlB	Severe: percs slowly.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: wetness.	Fair: too clayey.
TlC	Severe: percs slowly.	Severe: slope.	Severe: depth to rock.	Moderate: wetness, slope.	Fair: too clayey, slope.
Upshur:					
UpC	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey.
UpD	Severe: slope.	Severe: slope.	Severe: too clayey.	Severe: slope.	Poor: slope, too clayey.
Vandalia:					
VnD	Severe: slope.	Severe: slope.	Severe: too clayey.	Severe: slope.	Poor: slope.
VnE	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: slope.
[1]VuF:					
Vandalia part	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: slope.
Upshur part	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: slope, too clayey.
Weinbach:					
Wb	Severe: wetness, percs slowly.	Slight	Moderate: wetness.	Moderate: wetness.	Good.
Wernock:					
WcB	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Fair: thin layer.
WcC	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Fair: slope, thin layer.
WcD	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Poor: slope.
Whitley:					
WhA, WhB	Slight	Moderate: slope, seepage.	Slight	Slight	Good.
WhC	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.	Fair: slope.

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole map unit.

TABLE 10.--CONSTRUCTION MATERIALS

["Shrink-swell" and some of the other terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," and "unsuited"]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Allegheny:				
AlB	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
AlC	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope.
AlD	Fair: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Ashton:				
As	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Berks:				
[1]BcF:				
Berks part	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones, slope.
Cranston part	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, small stones.
Bonnie:				
Bo	Poor: wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
Chavies:				
ChA	Fair: low strength.	Poor: excess fines.	Poor: excess fines.	Good.
Cotaco:				
Co	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: small stones.
Cuba:				
Cu	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Elk:				
EkA	Fair: low strength.	Poor: excess fines.	Poor: excess fines.	Fair: too clayey.
Gilpin:				
GlC	Fair: thin layer, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: small stones, thin layer.
GlD	Fair: slope, thin layer, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
GlE	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Hayter:				
HsB, HsC	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: small stones.
HtE	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.

See footnotes at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Huntington:				
Hu	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Lakin:				
LkB	Good	Poor: excess fines.	Unsuited: excess fines.	Poor: too sandy.
Latham:				
LmC	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer.
LmD	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
[1]LsE:				
Latham part	Poor: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Shelocta part	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
[1]LsF:				
Latham part	Poor: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Shelocta part	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Licking:				
LtA	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Lindside:				
Lu	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Markland:				
MkB, MlC	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
MlD	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, slope.
McGary:				
Mm	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Monongahela:				
MnB	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
MnC	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope.
Morehead:				
Mo	Fair: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Newark:				
Nk	Fair: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Good.

See footnotes at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Nolin:				
No	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Otwell:				
OtA	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Pope:				
Pf, Pg	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Good.
Riney:				
RnC	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope.
Shelocta:				
ScB, ScC	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones.
ScD	Fair: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, small stones.
Steinsburg:				
SgD	Fair: slope, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
ShF	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Stendal:				
Sm	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Stokly:				
Sn	Fair: wetness, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Strip mines:				
St	Poor: slope.	Unsuited	Unsuited	Poor: slope.
Tilsit:				
TlB, TlC	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Upshur:				
UpC	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
UpD	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, too clayey.
Vandalia:				
VnD	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
VnE	Poor: slope, shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.

See footnotes at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
[1]VuF:				
Vandalia part	Poor: slope, shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Upshur part	Poor: slope, shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, too clayey.
Weinbach:				
Wb	Fair: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Wernock:				
WcB	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
WcC	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope.
WcD	Fair: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Whitley:				
WhA, WhB	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
WhC	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope.

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole map unit.

TABLE 11.--WATER MANAGEMENT

["Seepage," and some of the other terms that describe restrictive soil features are defined in the Glossary]

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
Allegheny: AlB, AlC, AlD	Slope, seepage.	Piping, low strength.	Not needed	Slope, piping.	Slope.
Ashton: As	Seepage	Piping, low strength.	Not needed	Not needed	Favorable.
Berks: [1]BcF:					
Berks part	Slope, depth to rock.	Seepage, thin layer.	Not needed	Slope, depth to rock.	Depth to rock, droughty, slope.
Cranston part	Seepage, slope.	Seepage	Not needed	Slope	Slope.
Bonnie: Bo	Seepage	Low strength, piping.	Floods, wetness, poor outlets.	Not needed	Not needed.
Chavies: ChA	Seepage	Piping	Not needed	Erodes easily	Erodes easily.
Cotaco: Co	Seepage	Low strength, piping.	Favorable	Not needed	Not needed.
Cuba: Cu	Seepage	Piping, low strength.	Not needed	Not needed	Not needed.
Elk: EkA	Seepage	Low strength, piping.	Not needed	Not needed	Favorable.
Gilpin: GlC, GlD, GlE	Slope, depth to rock.	Low strength, piping.	Not needed	Depth to rock, slope.	Depth to rock, slope.
Hayter: HsB, HsC, HtE	Seepage, slope.	Piping	Not needed	Erodes easily, slope.	Slope, erodes easily.
Huntington: Hu	Seepage	Low strength, piping.	Not needed	Not needed	Not needed.
Lakin: LkB	Seepage	Seepage, piping.	Not needed	Too sandy, piping, slope, erodes easily.	Droughty, slope, erodes easily.
Latham: LmC, LmD	Depth to rock, slope.	Hard to pack, low strength, compressible.	Not needed	Percs slowly, erodes easily, slope.	Percs slowly, erodes easily, slope.
[1]LsE:					
Latham part	Depth to rock, slope.	Hard to pack, low strength, compressible.	Not needed	Percs slowly, erodes easily, slope.	Percs slowly, erodes easily, slope.
Shelocta part	Seepage, slope.	Seepage	Not needed	Slope, erodes easily.	Slope, erodes easily.

See footnotes at end of table.

TABLE 11.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
Latham:					
[1]LsF:					
Latham part	Depth to rock, slope.	Hard to pack, low strength, compressible.	Not needed	Percs slowly, erodes easily, slope.	Percs slowly, erodes easily, slope.
Shelocta part	Seepage, slope.	Seepage	Not needed	Slope, erodes easily.	Slope, erodes easily.
Licking:					
LtA	Favorable	Compressible, low strength.	Percs slowly	Percs slowly	Percs slowly.
Lindside:					
Lu	Seepage	Piping, low strength.	Floods	Not needed	Wetness.
Markland:					
MkB, MlC, MlD	Slope	Low strength, compressible, shrink-swell.	Not needed	Complex slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
McGary:					
Mm	Favorable	Shrink-swell, low strength, compressible.	Percs slowly	Percs slowly, wetness.	Percs slowly, wetness.
Monongahela:					
MnB, MnC	Slope	Low strength, piping.	Percs slowly, slope.	Percs slowly, slope.	Percs slowly, erodes easily, slope.
Morehead:					
Mo	Seepage	Piping, low strength.	Favorable	Not needed	Not needed.
Newark:					
Nk	Seepage	Low strength, piping.	Wetness, floods, poor outlets.	Not needed	Wetness.
Nolin:					
No	Seepage	Piping, low strength.	Not needed	Not needed	Not needed.
Otwell:					
OtA	Favorable	Low strength, piping.	Percs slowly	Percs slowly	Erodes easily, percs slowly.
Pope:					
Pf, Pg	Seepage	Piping	Not needed	Not needed	Not needed.
Riney:					
RnC	Seepage, slope.	Piping	Not needed	Slope, erodes easily.	Slope, erodes easily.
Shelocta:					
ScB, ScC, ScD	Seepage, slope.	Seepage	Not needed	Slope, erodes easily.	Slope, erodes easily.
Steinsburg:					
SgD, ShF	Depth to rock, slope, seepage.	Piping	Not needed	Slope, depth to rock, rooting depth.	Droughty, slope.
Stendal:					
Sm	Seepage	Piping, low strength.	Floods, wetness.	Not needed	Wetness.
Stokly:					
Sn	Seepage	Piping	Floods, wetness.	Not needed	Wetness.

See footnotes at end of table.

TABLE 11.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
Strip mines: St	Slope	Large stones	Slope	Slope	Slope.
Tilsit: TlB, TlC	Slope	Low strength, piping.	Percs slowly, slope.	Slope, percs slowly.	Slope, erodes easily, percs slowly.
Upshur: UpC, UpD	Slope	Low strength, compressible, hard to pack.	Not needed	Erodes easily, slope.	Erodes easily, slope.
Vandalia: VnD, VnE	Slope	Low strength, compressible, hard to pack.	Not needed	Erodes easily, slope.	Erodes easily, slope.
[1]VuF: Vandalia part	Slope	Low strength, compressible, hard to pack.	Not needed	Erodes easily, slope.	Erodes easily, slope.
Upshur part	Slope	Low strength, compressible, hard to pack.	Not needed	Erodes easily, slope.	Erodes easily, slope.
Weinbach: Wb	Favorable	Low strength, piping.	Percs slowly, wetness.	Not needed	Not needed.
Wernock: WcB, WcC, WcD	Depth to rock, slope.	Low strength, piping.	Not needed	Slope, depth to rock.	Slope, depth to rock.
Whitley: WhA, WhB, WhC	Seepage, slope.	Piping, low strength.	Not needed	Erodes easily, slope.	Erodes easily, slope.

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole map unit.

TABLE 12.--RECREATIONAL DEVELOPMENT

["Shrink-swell" and some of the other terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe"]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Allegheny:				
AlB	Slight	Slight	Moderate: slope.	Slight.
AlC	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
AlD	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Ashton:				
As	Moderate: floods.	Slight	Moderate: floods.	Slight.
Berks:				
[1]BcF:				
Berks part	Severe: slope.	Severe: slope.	Severe: small stones, slope.	Severe: slope.
Cranston part	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
Bonnie:				
Bo	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness.
Chavies:				
ChA	Slight	Slight	Moderate: slope.	Slight.
Cotaco:				
Co	Moderate: wetness.	Slight	Moderate: wetness.	Slight.
Cuba:				
Cu	Severe: floods.	Moderate: floods.	Severe: floods.	Slight.
Elk:				
EkA	Slight	Slight	Slight	Slight.
Gilpin:				
GlC	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
GlD	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
GlE	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Hayter:				
HsB	Slight	Slight	Moderate: slope.	Slight.
HsC	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight:
HtE	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Huntington:				
Hu	Severe: floods.	Moderate: floods.	Severe: floods.	Slight.

See footnotes at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Lakin:				
LkB	Moderate: too sandy.	Moderate: too sandy.	Severe: slope.	Moderate: too sandy.
Latham:				
LmC	Moderate: slope, percs slowly.	Moderate: slope.	Severe: slope.	Slight.
LmD	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
[1]LsE:				
Latham part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Shelocta part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
[1]LsF:				
Latham part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Shelocta part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Licking:				
LtA	Moderate: percs slowly.	Slight	Moderate: percs slowly, wetness.	Slight.
Lindside:				
Lu	Severe: floods.	Moderate: floods, wetness.	Severe: floods.	Slight.
Markland:				
MkB	Moderate: percs slowly.	Slight	Moderate: slope, percs slowly.	Slight.
MlC	Moderate: slope, percs slowly.	Moderate: slope.	Severe: slope.	Slight.
MlD	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
McGary:				
Mm	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness, percs slowly.	Moderate: wetness.
Monongahela:				
MnB	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: slope, wetness, percs slowly.	Slight.
MnC	Moderate: slope, wetness, percs slowly.	Moderate: slope.	Severe: slope.	Slight.
Morehead:				
Mo	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.

See footnotes at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Newark:				
Nk	Severe: floods, wetness.	Moderate: floods, wetness.	Severe: floods, wetness.	Moderate: wetness.
Nolin:				
No	Severe: floods.	Moderate: floods.	Severe: floods.	Slight.
Otwell:				
OtA	Moderate: percs slowly, wetness.	Moderate: wetness.	Moderate: percs slowly, wetness.	Slight.
Pope:				
Pf, Pg	Severe: floods.	Moderate: floods.	Severe: floods.	Slight.
Riney:				
RnC	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Shelocta:				
ScB	Moderate: small stones.	Slight	Severe: small stones.	Slight.
ScC	Moderate: slope, small stones.	Moderate: slope.	Severe: slope, small stones.	Slight.
ScD	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.
Steinsburg:				
SgD	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
ShF	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Stendal:				
Sm	Severe: floods, wetness.	Moderate: floods, wetness.	Severe: floods, wetness.	Moderate: floods, wetness.
Stokly:				
Sn	Severe: floods, wetness.	Moderate: floods, wetness.	Severe: floods, wetness.	Moderate: floods, wetness.
Strip mines:				
St	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, large stones.
Tilsit:				
TlB	Moderate: percs slowly, wetness.	Moderate: wetness.	Moderate: slope, wetness, percs slowly.	Slight.
TlC	Moderate: slope, percs slowly, wetness.	Moderate: slope, wetness.	Severe: slope.	Slight.
Upshur:				
UpC	Moderate: percs slowly, too clayey.	Moderate: too clayey.	Severe: slope.	Moderate: too clayey.

See footnotes at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Upshur:				
UpD	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, too clayey.
Vandalia:				
VnD	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
VnE	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
[1]VuF:				
Vandalia part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Upshur part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Weinbach:				
Wb	Severe: percs slowly, wetness.	Moderate: wetness.	Severe: percs slowly, wetness.	Moderate: wetness.
Wernock:				
WcB	Slight	Slight	Moderate: slope, depth to rock.	Slight.
WcC	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
WcD	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Whitley:				
WhA	Slight	Slight	Slight	Slight.
WhB	Slight	Slight	Moderate: slope.	Slight.
WhC	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole map unit.

TABLE 13.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Allegheny:										
AlB	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
AlC	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
AlD	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Ashton:										
As	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Berks:										
[1]BcF:										
Berks part	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Cranston part	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Bonnie:										
Bo	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Chavies:										
ChA	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Cotaco:										
Co	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Poor.
Cuba:										
Cu	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Poor.
Elk:										
EkA	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Gilpin:										
GlC	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
GlD	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
GlE	Very poor.	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Hayter:										
HsB	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
HsC	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
HtE	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Huntington:										
Hu	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

See footnotes at end of table.

TABLE 13.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Lakin:										
LkB	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
Latham:										
LmC	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
LmD	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
[1]LsE:										
Latham part	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Shelocta part	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
[1]LsF:										
Latham part	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Shelocta part	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Licking:										
LtA	Good	Good	Good	Good	Good	Poor	Fair	Good	Good	Poor.
Lindside:										
Lu	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Markland:										
MkB	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MlC	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MlD	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
McGary:										
Mm	Fair	Fair	Good	Good	Good	Fair	Fair	Fair	Good	Fair.
Monongahela:										
MnB	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MnC	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Morehead:										
Mo	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Newark:										
Nk	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
Nolin:										
No	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Otwell:										
OtA	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Pope:										
Pf, Pg	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

See footnotes at end of table.

TABLE 13.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Riney:										
RnC	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Shelocta:										
ScB	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
ScC	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
ScD	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Steinsburg:										
SgD	Fair	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
ShF	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Stendal:										
Sm	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
Stokly:										
Sn	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
Strip mines:										
St	---	---	---	---	---	---	---	---	---	---
Tilsit:										
TlB	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
TlC	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Upshur:										
UpC	Fair	Good	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
UpD	Poor	Fair	Fair	Good	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
Vandalia:										
VnD	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
VnE	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
[1]VuF:										
Vandalia part	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Upshur part	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Weinbach:										
Wb	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Wernock:										
WcB	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WcC	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

See footnotes at end of table.

TABLE 13.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Wernock:										
WcD	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Whitley:										
WhA	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WhB	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WhC	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole map unit.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS

[The symbol < means less than; > means greater than. Absence of an entry means data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Allegheny:											
AlB, AlC, AlD	0-9	Loam	ML, CL	A-4	0	90-100	80-100	65-95	50-75	<35	[1]NP-10
	9-45	Clay loam, loam, sandy clay loam.	ML, CL, SM, SC	A-4, A-6	0	90-100	80-100	65-95	45-80	<35	NP-15
	45-66	Clay loam, sandy loam, gravelly sandy loam.	SM, SC, ML, CL	A-4, A-6, A-2, A-1	0-5	65-100	50-100	30-95	15-75	<35	NP-15
Ashton:											
As	0-14	Silt loam	ML, CL	A-4	0	95-100	90-100	80-100	60-90	<35	NP-10
	14-41	Silt loam, silty clay loam.	ML, CL	A-4, A-6	0	95-100	90-100	85-100	75-100	25-40	5-20
	41-72	Silt loam, fine sandy loam.	ML, CL, SM	A-4	0-5	90-100	85-100	65-95	40-90	<40	NP-10
Berks:											
[2]BcF:											
Berks part	0-12	Channery silt loam.	GM, ML, GC, SM	A-2, A-4	0-20	50-80	45-70	40-60	30-55	25-35	5-10
	12-30	Channery silt loam, very channery silt loam, gravelly silt loam.	GM, GC, SM	A-2, A-4	0-30	40-80	35-70	35-65	30-50	25-35	5-10
	30	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Cranston part	0-14	Channery silt loam.	GM-GC, GC, ML, SM	A-4, A-2	0-15	50-95	45-70	40-65	30-55	25-35	5-10
	14-52	Gravelly silt loam, channery silt loam.	ML, CL, GM-GC, GC	A-4	0-10	60-85	55-85	50-80	40-75	25-35	5-10
	52-65	Gravelly silt loam, very channery silt loam.	GM-GC, GC	A-4, A-2, A-1	0-15	50-80	25-75	23-60	18-45	25-35	5-10
Bonnie:											
Bo	0-17	Silt loam	ML, CL	A-4, A-6	0	100	100	95-100	90-100	27-34	8-12
	17-38	Silt loam	ML, CL	A-4, A-6	0	100	100	95-100	90-100	27-34	8-12
	38-62	Stratified sand to silty clay.	ML, CL, SM	A-4, A-6	0	100	95-100	60-100	35-90	<39	NP-15
Chavies:											
ChA	0-10	Fine sandy loam	SM, ML	A-4, A-2	0-5	80-100	75-100	60-85	30-55	<25	NP-5
	10-44	Fine sandy loam, loam, silt loam.	SM, ML	A-4, A-2	0-5	75-100	70-100	60-100	30-85	<35	NP-8
	44-65	Fine sandy loam, gravelly fine sandy loam, loamy sand.	SM, ML	A-4, A-2, A-1	0-5	70-100	60-95	40-80	20-55	<25	NP-5
Cotaco:											
Co	0-10	Loam	ML, CL-ML, SM, SM-SC	A-4	0-5	80-100	75-95	65-85	45-70	<30	NP-7
	10-66	Sandy clay loam, clay loam, gravelly clay loam.	SC, SM, GC, CL	A-2, A-4, A-6	0-10	65-90	60-85	50-85	20-60	<35	NP-15

See footnotes at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Cuba:											
Cu	0-38	Silt loam	CL, ML	A-4	0	100	98-100	90-100	70-90	25-35	4-10
	38-70	Stratified silt loam to fine sand.	CL, ML	A-4	0	100	90-100	75-100	50-85	15-30	2-10
Elk:											
EkA	0-12	Silt loam	ML, CL	A-4	0	95-100	95-100	85-100	70-95	25-35	3-10
	12-45	Silty clay loam, silt loam.	ML, CL	A-4, A-6	0	95-100	90-100	85-100	75-100	25-40	5-20
	45-73	Loam, sandy loam, silt loam.	ML, CL, SM, SC	A-4, A-2	0	75-100	75-100	50-100	25-75	<35	NP-10
Gilpin:											
GlC, GlD, GlE	0-16	Silt loam	ML, CL	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	16-27	Shaly silt loam, very shaly silty clay loam, silt loam.	GM, GC, ML, CL	A-2, A-4, A-6	0-25	55-85	45-80	40-75	30-70	20-40	4-15
	27	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Hayter:											
HsB, HsC	0-8	Silt loam	ML, CL	A-4	0-5	90-100	75-95	70-85	55-80	25-35	5-10
	8-40	Clay loam, gravelly sandy clay loam, loam.	CL, ML, SM	A-6, A-4, A-2	0-5	85-100	60-90	50-85	30-70	<35	NP-15
	40-60	Very gravelly sandy clay loam, gravelly loam.	SM, ML, CL	A-4, A-6, A-2, A-1	5-20	60-85	40-75	30-70	15-55	<35	NP-15
HtE	0-8	Loam	SM, ML, CL	A-4	0-5	90-100	75-100	65-90	45-70	<35	NP-10
	8-40	Clay loam, gravelly sandy clay loam, loam.	CL, ML, SM	A-6, A-4, A-2	0-5	85-100	75-90	50-85	30-70	<35	NP-15
	40-60	Gravelly sandy clay loam, gravelly loam.	SM, ML, CL, SC	A-4, A-6, A-2	5-20	75-100	55-95	45-90	30-60	<35	NP-15
Huntington:											
Hu	0-9	Silt loam	CL-ML, CL	A-4, A-6	0	95-100	95-100	85-100	70-95	25-35	5-15
	9-72	Silt loam, loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	95-100	95-100	85-100	60-95	25-35	5-15
Lakin:											
LkB	0-12	Loamy fine sand	SM	A-2	0	95-100	95-100	60-80	20-35	---	NP
	12-74	Loamy sand, loamy fine sand, fine sandy loam.	SM, SC-SM	A-2, A-4	0	95-100	95-100	50-75	15-50	<15	NP-5

See footnotes at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Latham:											
LmC, LmD----------	0-11	Silt loam-------	ML, CL-ML	A-4, A-6	0-5	85-100	75-100	70-100	65-90	20-40	5-12
	11-38	Silty clay, clay, silty clay loam.	CH, CL, MH	A-7, A-6	0-10	85-100	75-100	70-100	60-95	35-65	15-40
	38	Weathered bedrock.	---	---	---	---	---	---	---	---	---
[2]LsE:											
Latham part------	0-11	Silt loam-------	ML, CL-ML	A-4, A-6	0-5	85-100	75-100	70-100	65-90	20-40	5-12
	11-38	Silty clay, clay, silty clay loam.	CH, CL, MH	A-7, A-6	0-10	85-100	75-100	70-100	60-95	35-65	15-40
	38	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Shelocta part----	0-15	Silt loam-------	ML, CL	A-4	0-5	80-95	75-95	60-95	55-90	<35	NP-10
	15-53	Silty clay loam, silt loam, gravelly silty clay loam.	ML, CL, GM, GC	A-6, A-4	0-10	55-95	50-95	45-95	40-90	25-40	5-20
	53-74	Gravelly silt loam, gravelly silty clay loam, very gravelly silt loam.	GM, GC, ML, CL	A-4, A-6, A-2	0-15	40-85	35-70	25-70	20-65	20-40	3-20
[2]LsF:											
Latham part------	0-11	Silt loam-------	ML, CL-ML	A-4, A-6	0-5	85-100	75-100	70-100	65-90	20-40	5-12
	11-38	Silty clay, clay, silty clay loam.	CH, CL, MH	A-7, A-6	0-10	85-100	75-100	70-100	60-95	35-65	15-40
	38	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Shelocta part----	0-15	Silt loam-------	ML, CL	A-4	0-5	80-95	75-95	60-95	55-90	<35	NP-10
	15-53	Silty clay loam, silt loam, gravelly silty clay loam.	ML, CL, GM, GC	A-6, A-4	0-10	55-95	50-95	45-95	40-90	25-40	5-20
	53-74	Gravelly silt loam, gravelly silty clay loam, very gravelly silt loam.	GM, GC, ML, CL	A-4, A-6, A-2	0-15	40-85	35-70	25-70	20-65	20-40	3-20
Licking:											
LtA---------------	0-13	Silt loam-------	ML, CL-ML	A-4	0	95-100	95-100	90-100	70-90	22-40	4-10
	13-20	Silty clay loam, silt loam.	CL	A-7, A-6	0	100	100	90-100	70-95	30-50	15-25
	20-43	Silty clay, clay	CH, MH, CL	A-7	0	100	100	95-100	75-95	45-70	26-42
	43-68	Clay, silty clay, silt loam.	CH, CL, MH	A-7, A-6	0	100	100	90-100	70-95	35-65	12-36
Lindside:											
Lu----------------	0-64	Silt loam-------	ML, CL	A-4, A-6	0	100	95-100	85-100	60-95	25-40	2-15
Markland:											
MkB, MlC, MlD-----	0-7	Silt loam-------	CL, ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	7-65	Silty clay loam, silty clay, clay.	CL, CH, MH	A-7, A-6	0	100	100	95-100	90-95	35-60	20-35
	65-74	Stratified clay to silt loam.	CL, CH, MH	A-6, A-7	0	100	100	90-100	75-95	35-60	20-35

See footnotes at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
McGary:											
Mm	0-14	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-95	25-35	5-15
	14-36	Silty clay, silty clay loam.	CL, CH, MH	A-7, A-6	0	100	100	95-100	90-95	35-60	15-30
	36-72	Stratified silty clay loam to clay.	CL, CH, MH	A-6, A-7	0	100	100	95-100	85-95	35-55	20-35
Monongahela:											
MnB, MnC	0-11	Silt loam	ML, SM	A-4	0	90-100	85-100	75-100	45-90	25-35	1-11
	11-30	Silt loam, silty clay loam.	ML, CL	A-4, A-6	0	90-100	90-100	80-100	70-90	25-40	2-25
	30-51	Silt loam, sandy loam, fine sandy loam.	ML, CL, SM	A-4, A-6, A-2	0	80-100	75-100	45-95	25-90	<35	NP-15
	51-65	Sandy loam, fine sandy loam.	SM, SM-SC	A-4, A-2	0-10	75-100	70-100	45-85	25-50	<20	NP-7
Morehead:											
Mo	0-14	Silt loam	ML, CL	A-4	0	95-100	95-100	90-100	80-100	25-35	2-10
	14-50	Silt loam, silty clay loam.	ML, CL	A-4, A-6	0	95-100	95-100	90-100	85-100	25-40	5-20
	50-72	Silt loam, loam, silty clay loam.	ML, CL	A-4, A-6	0	90-100	85-100	70-100	60-95	20-40	2-20
Newark:											
Nk	0-7	Silt loam	CL-ML, CL	A-4	0	95-100	90-100	80-100	55-95	25-40	5-15
	7-34	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	95-100	90-100	85-100	70-95	25-40	5-20
	34-72	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0-3	75-100	70-100	65-100	55-95	25-40	5-20
Nolin:											
No	0-9	Silt loam	CL-ML, CL	A-4, A-6	0	100	95-100	90-100	80-90	25-40	5-20
	9-70	Silt loam, fine sandy loam.	ML, SM	A-4	0	100	95-100	70-100	40-90	<35	NP-10
Otwell:											
OtA	0-10	Silt loam	ML, CL-ML	A-4	0	100	100	90-100	70-95	25-35	5-10
	10-25	Silty clay loam, silt loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-95	25-40	5-20
	25-56	Silty clay loam, silt loam.	CL, CL-ML	A-6, A-4	0	95-100	95-100	85-100	65-90	25-40	5-20
	56-74	Stratified silt loam to silty clay loam.	CL, CL-ML	A-6, A-4	0	95-100	90-100	85-100	80-95	25-40	5-20
Pope:											
Pf	0-8	Fine sandy loam	SM, CL-ML	A-2, A-4	0-5	75-100	75-100	50-85	30-55	<15	NP-5
	8-65	Fine sandy loam, sandy loam, gravelly sandy loam, loamy sand.	SM, CL-ML, GM	A-2, A-4	0-5	55-100	50-100	35-80	15-55	<15	NP-5
Pg	0-27	Gravelly silt loam.	SM, ML, CL-ML	A-4	0-5	75-100	50-75	45-75	35-65	25-35	5-10
	27-60	Gravelly sandy loam, gravelly fine sandy loam, very gravelly loam.	SM, GM	A-2, A-1, A-4	0-5	55-100	40-75	35-65	20-40	<30	NP-7

See footnotes at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Riney:											
RnC	0-13	Loam	CL, ML	A-4	0	90-100	85-100	75-90	50-75	20-30	NP-10
	13-66	Clay loam, sandy clay loam.	ML, CL, SC	A-6, A-2, A-4	0	80-100	75-100	70-85	25-75	20-35	2-15
	66-76	Sandy loam, sandy clay loam, loamy sand.	SC, SM, ML, CL	A-4, A-6, A-2, A-1	0	80-100	70-100	40-80	15-55	<35	NP-15
Shelocta:											
ScB, ScC, ScD	0-7	Gravelly silt loam.	ML, CL, GM, GC	A-4, A-2	0-10	55-95	50-80	40-70	35-65	<35	NP-10
	7-60	Gravelly silt loam, gravelly silty clay loam.	CL-ML, CL, GM-GC	A-6, A-4	0-10	55-85	50-75	45-75	40-65	25-40	5-20
Steinsburg:											
SgD	0-9	Sandy loam	SM	A-4, A-2	0-5	95-100	90-100	55-70	25-40	---	NP
	9-14	Gravelly sandy loam, fine sandy loam, sandy loam.	SM, SC-SM	A-2, A-4, A-1	0-5	75-95	65-85	40-60	20-40	<15	NP-5
	14-29	Gravelly sandy loam, gravelly loamy sand, very channery sandy loam.	SM, GM, SM	A-2, A-1	0-10	45-85	30-80	20-55	10-30	---	NP
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
ShF	0-9	Stony sandy loam.	SM	A-1, A-2	0-5	80-95	70-85	45-60	20-35	---	NP
	9-14	Gravelly sandy loam, fine sandy loam, sandy loam.	SM, SM-SC	A-2, A-4, A-1	0-5	75-95	65-85	40-60	20-40	<15	NP-5
	14-29	Channery sandy loam, gravelly loamy sand, very channery sandy loam.	SM, GM, SW-SM	A-2, A-1	0-10	45-85	30-80	20-55	10-30	---	NP
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Stendal:											
Sm	0-10	Silt loam	CL, ML	A-4, A-6	0	100	100	90-100	75-90	25-40	5-15
	10-68	Silt loam, silty clay loam.	CL, ML	A-4, A-6	0	100	100	90-100	75-90	25-40	5-15
Stokly:											
Sn	0-34	Fine sandy loam	ML, SM	A-4	0	85-100	80-100	65-85	35-55	<15	NP-4
	34-76	Gravelly sandy loam, gravelly fine sandy loam.	SM	A-1, A-2, A-4	0	65-100	50-75	30-65	15-40	<15	NP-4
Strip mines:											
St	0-60	Variable	---	---	0-35	---	---	---	---	---	---

See footnotes at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Tilsit:											
TlB, TlC----------	0-16	Silt loam-------	ML, CL	A-4	0	90-100	85-100	75-100	60-100	20-35	NP-10
	16-25	Silt loam, silty clay loam, loam.	CL-ML, CL	A-4, A-6	0	90-100	85-100	75-100	65-100	25-40	5-20
	25-58	Silt loam, silty clay loam, loam.	CL-ML, CL	A-4, A-6, A-7	0	90-100	85-100	75-100	65-100	25-45	5-25
	58-72	Silt loam, silty clay loam, sandy clay loam.	CL-ML, CL	A-4, A-6, A-7	0-5	75-100	75-90	60-85	60-80	25-45	5-25
Upshur:											
UpC, UpD----------	0-6	Silty clay loam	CL	A-6, A-7	0	95-100	85-100	80-100	70-95	35-45	15-25
	6-39	Silty clay, clay	MH, CH, CL	A-7	0	95-100	80-100	75-100	60-95	45-70	15-40
	39-49	Silty clay loam, silty clay, clay.	MH, CH, CL	A-6, A-7	0	70-100	65-100	60-100	55-100	35-70	12-40
	49	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Vandalia:											
VnD, VnE----------	0-5	Silt loam-------	CL-ML, CL	A-4, A-6	0	75-100	75-90	65-80	50-70	25-35	5-15
	5-42	Silty clay loam, clay, silty clay.	MH, CL, CH	A-6, A-7	0	70-100	70-100	65-100	60-95	30-70	11-40
	42-65	Silty clay, clay.	MH, CH, CL	A-7	0	70-100	75-100	70-100	55-95	45-70	20-40
[2]VuF:											
Vandalia part----	0-5	Silt loam-------	CL-ML, CL	A-4, A-6	0	75-100	75-90	65-80	50-70	25-35	5-15
	5-42	Silty clay loam, clay, silty clay.	MH, CL, CH	A-6, A-7	0	70-100	70-100	65-100	60-95	30-70	11-40
	42-65	Silty clay, clay.	MH, CH, CL	A-7	0	70-100	75-100	70-100	55-95	45-70	20-40
Upshur part------	0-6	Silty clay loam	CL	A-6, A-7	0	95-100	85-100	80-100	70-95	35-45	15-25
	6-39	Silty clay, clay	MH, CH, CL	A-7	0	95-100	80-100	75-100	60-95	45-70	15-40
	39-49	Silty clay loam, silty clay, clay.	MH, CH, CL	A-6, A-7	0	70-100	65-100	60-100	55-100	35-70	12-40
	49	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Weinbach:											
Wb----------	0-16	Silt loam-------	CL, CL-ML	A-4, A-6	0	100	100	85-100	60-90	20-35	5-15
	16-24	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-40	5-15
	24-50	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-40	5-15
	50-70	Stratified silty clay loam to fine sand.	CL, ML	A-6, A-4	0	100	100	90-100	70-95	25-40	5-15

See footnotes at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	> 3 inches	4	10	40	200		
	In				Pct					Pct	
Wernock:											
WcB, WcC, WcD-----	0-5	Silt loam-------	ML, CL	A-4, A-6	0	90-100	85-100	75-95	65-90	25-35	4-11
	5-27	Silt loam, silty clay loam.	ML, CL	A-4, A-6	0	90-100	85-100	75-100	65-95	25-40	4-22
	27-31	Silt loam, silty clay loam, channery clay loam.	ML, CL	A-4, A-6	10-20	65-100	60-100	55-95	50-95	25-40	4-22
	31-38	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Whitley:											
WhA, WhB, WhC-----	0-10	Silt loam-------	ML, CL	A-4	0	95-100	90-100	75-100	60-95	<35	NP-10
	10-40	Silty clay loam, silt loam.	ML, CL	A-6, A-4	0	95-100	95-100	85-100	70-95	25-40	5-20
	40-74	Gravelly silt loam, silty clay loam, fine sandy loam.	ML, CL, SM	A-6, A-4	0	75-100	65-100	60-100	35-90	10-40	2-25

[1]NP means nonplastic.
[2]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole map unit.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[Dashes indicate data were not available. The symbol < means less than; > means greater than. The erosion tolerance factor (T) is for the entire profile. Absence of an entry means data were not estimated]

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete	Erosion factors: K	Erosion factors: T
	In	In/hr	In/in	pH					
Allegheny:									
AlB, AlC, AlD-----	0-9	0.6-2.0	0.12-0.22	4.5-5.5	Low-------	Low-------	High------	0.32	4
	9-45	0.6-2.0	0.13-0.18	4.5-5.5	Low-------	Low-------	High------	0.28	
	45-66	0.6-2.0	0.08-0.17	4.5-5.5	Low-------	Low-------	High------	0.28	
Ashton:									
As----------	0-14	0.6-2.0	0.16-0.23	6.1-7.3	Low-------	Low-------	Low-------	0.28	4
	14-41	0.6-2.0	0.18-0.23	5.6-7.3	Low-------	Low-------	Low-------	0.43	
	41-72	0.6-2.0	0.14-0.20	5.6-7.3	Low-------	Low-------	Low-------	0.43	
Berks:									
[1]BcF:									
Berks part-------	0-12	0.6-6.0	0.08-0.12	4.5-5.5	Low-------	Low-------	High------	0.28	3
	12-30	0.6-6.0	0.04-0.10	4.5-5.5	Low-------	Low-------	High------	0.17	
	30	---	---	---	----------	----------	----------	---	
Cranston part----	0-14	2.0-6.0	0.12-0.20	3.6-5.5	Low-------	Low-------	Moderate	0.28	4
	14-52	2.0-6.0	0.14-0.19	3.6-5.5	Low-------	Low-------	Moderate	0.28	
	52-65	2.0-6.0	0.12-0.18	3.6-5.5	Low-------	Low-------	Moderate	0.28	
Bonnie:									
Bo----------	0-17	0.6-2.0	0.22-0.24	4.5-7.3	Low-------	High------	Low-------	0.43	---
	17-38	0.6-2.0	0.20-0.22	4.5-5.5	Low-------	High------	High------	0.43	
	38-62	0.6-2.0	0.18-0.20	4.5-5.5	Low-------	High------	Moderate	0.43	
Chavies:									
ChA----------	0-10	2.0-6.0	0.11-0.18	4.5-5.5	Low-------	Low-------	Moderate	0.24	4
	10-44	2.0-6.0	0.11-0.20	4.5-5.5	Low-------	Low-------	Moderate	0.24	
	44-65	2.0-6.0	0.11-0.18	4.5-5.5	Low-------	Low-------	Moderate	0.24	
Cotaco:									
Co----------	0-10	0.6-6.0	0.12-0.20	3.6-5.5	Low-------	Moderate	High------	0.37	3
	10-66	0.6-2.0	0.07-0.15	3.6-5.5	Low-------	Moderate	High------	0.28	
Cuba:									
Cu----------	0-38	0.6-2.0	0.22-0.24	4.5-5.5	Low-------	Low-------	High------	0.43	---
	38-70	0.6-2.0	0.19-0.21	4.5-5.5	Low-------	Low-------	High------	0.43	
Elk:									
EkA----------	0-12	0.6-2.0	0.18-0.23	4.5-6.5	Low-------	Moderate	Moderate	0.32	4
	12-45	0.6-2.0	0.18-0.22	4.5-6.5	Low-------	Moderate	Moderate	0.28	
	45-73	0.6-2.0	0.14-0.20	4.5-6.5	Low-------	Moderate	Moderate	0.28	
Gilpin:									
GlC, GlD, GlE-----	0-16	0.6-2.0	0.12-0.18	3.6-5.5	Low-------	Low-------	High------	0.28	3
	16-27	0.6-2.0	0.06-0.10	3.6-5.5	Low-------	Low-------	High------	0.28	
	27	---	---	---	----------	----------	----------	---	
Hayter:									
HsB, HsC, HtE-----	0-8	2.0-6.0	0.10-0.16	5.1-6.5	Low-------	Low-------	Moderate	0.20	4
	8-40	2.0-6.0	0.11-0.19	5.1-6.5	Moderate	Moderate	Moderate	0.28	
	40-60	2.0-6.0	0.06-0.10	5.1-6.5	Low-------	Low-------	Moderate	0.17	
Huntington:									
Hu----------	0-9	0.6-2.0	0.18-0.24	5.6-7.8	Low-------	Low-------	Moderate	0.43	---
	9-72	0.6-2.0	0.10-0.16	5.6-7.8	Low-------	Low-------	Moderate	0.43	
Lakin:									
LkB----------	0-12	>6.0	0.04-0.08	4.5-6.0	Low-------	Low-------	High------	0.17	5
	12-74	>6.0	0.04-0.08	4.5-6.0	Low-------	Low-------	High------	0.17	

See footnotes at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion		Erosion factors	
						Uncoated steel	Concrete	K	T
	In	In/hr	In/in	pH					
Latham:									
LmC, LmD	0-11	0.6-2.0	0.15-0.19	3.6-5.5	Moderate	High	High	0.43	3
	11-38	<0.2	0.11-0.15	3.6-5.5	Moderate	High	High	0.28	
	38	---	---	---	---	---	---	---	
[1]LsE:									
Latham part	0-11	0.6-2.0	0.15-0.19	3.6-5.5	Moderate	High	High	0.43	3
	11-38	<0.2	0.11-0.15	3.6-5.5	Moderate	High	High	0.28	
	38	---	---	---	---	---	---	---	
Shelocta part	0-15	0.6-2.0	0.16-0.22	4.5-5.5	Low	Low	High	0.32	4
	15-53	0.6-2.0	0.10-0.20	4.5-5.5	Low	Low	High	0.28	
	53-74	0.6-6.0	0.08-0.16	4.5-5.5	Low	Low	High	0.17	
[1]LsF:									
Latham part	0-11	0.6-2.0	0.15-0.19	3.6-5.5	Moderate	High	High	0.43	3
	11-38	<0.2	0.11-0.15	3.6-5.5	Moderate	High	High	0.28	
	38	---	---	---	---	---	---	---	
Shelocta part	0-15	0.6-2.0	0.16-0.22	4.5-5.5	Low	Low	High	0.32	4
	15-53	0.6-2.0	0.10-0.20	4.5-5.5	Low	Low	High	0.28	
	53-74	0.6-6.0	0.08-0.16	4.5-5.5	Low	Low	High	0.17	
Licking:									
LtA	0-13	0.6-2.0	0.14-0.18	4.5-6.0	Low	Moderate	High	0.43	3-2
	13-20	0.2-0.6	0.12-0.16	4.5-6.0	Moderate	High	High	0.28	
	20-43	0.06-0.2	0.10-0.14	5.6-7.3	Moderate	High	Moderate	0.28	
	43-68	0.06-0.2	0.10-0.16	5.6-7.3	Moderate	High	Moderate	0.28	
Lindside:									
Lu	0-64	0.6-2.0	0.18-0.26	5.6-7.3	Low	Moderate	Low	0.43	---
Markland:									
MkB, MlC, MlD	0-7	0.6-2.0	0.22-0.24	4.5-6.5	Low	Low	Moderate	0.43	3
	7-65	0.06-0.2	0.11-0.13	4.5-6.5	High	High	Moderate	0.28	
	65-74	0.06-0.2	0.09-0.11	6.1-7.8	High	High	Low	0.28	
McGary:									
Mm	0-14	0.6-2.0	0.22-0.24	4.5-6.5	Low	High	Low	0.43	3-2
	14-36	<0.2	0.11-0.13	4.5-6.5	High	High	Low	0.28	
	36-72	<0.2	0.14-0.16	6.1-7.8	High	High	Low	0.28	
Monongahela:									
MnB, MnC	0-11	0.6-2.0	0.18-0.24	4.5-5.5	Low	Moderate	Moderate	0.43	3
	11-30	0.6-2.0	0.14-0.18	4.5-5.5	Low	High	High	0.43	
	30-51	0.06-0.6	0.08-0.12	4.5-5.5	Low	High	High	0.43	
	51-65	0.2-0.6	0.08-0.12	4.5-5.5	Low	High	High	0.43	
Morehead:									
Mo	0-14	0.6-2.0	0.19-0.23	4.5-5.5	Low	Moderate	High	0.37	4
	14-50	0.6-2.0	0.18-0.22	4.5-5.5	Low	Moderate	High	0.43	
	50-72	0.6-2.0	0.15-0.22	4.5-5.5	Low	Moderate	High	0.43	
Newark:									
Nk	0-7	0.6-2.0	0.15-0.23	5.6-7.3	Low	High	Low	0.43	---
	7-34	0.6-2.0	0.18-0.23	5.6-7.3	Low	High	Low	0.43	
	34-72	0.6-2.0	0.15-0.22	5.6-7.3	Low	High	Low	0.43	
Nolin:									
No	0-9	0.6-2.0	0.18-0.23	5.6-7.3	Low	Low	Moderate	0.43	---
	9-70	0.6-2.0	0.18-0.23	5.6-7.3	Low	Low	Moderate	0.43	
Otwell:									
OtA	0-10	0.6-2.0	0.22-0.24	4.5-6.0	Low	Moderate	High	0.43	3-2
	10-25	0.6-2.0	0.18-0.22	5.1-6.0	Low	Moderate	High	0.32	
	25-56	<0.06	0.06-0.08	4.5-6.0	Low	Moderate	High	0.32	
	56-74	0.06-0.6	0.06-0.08	5.1-6.0	Low	Moderate	High	0.43	

See footnotes at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion		Erosion factors	
						Uncoated steel	Concrete	K	T
	In	In/hr	In/in	pH					
Pope:									
Pf, Pg	0-16	2.0-6.0	0.07-0.14	4.5-5.5	Low	Low	High	0.28	---
	16-65	2.0-6.0	0.07-0.15	4.5-5.5	Low	Low	High	0.28	
Riney:									
RnC	0-13	2.0-6.0	0.12-0.18	4.5-5.5	Low	Moderate	High	0.28	4
	13-66	2.0-6.0	0.13-0.17	4.5-5.5	Low	Moderate	High	0.28	
	66-76	2.0-6.0	0.05-0.14	4.5-5.5	Low	Moderate	High	0.28	
Shelocta:									
ScB, ScC, ScD	0-7	0.6-2.0	0.10-0.18	4.5-5.5	Low	Low	High	0.28	4
	7-60	0.6-2.0	0.10-0.20	4.5-5.5	Low	Low	High	0.28	
Steinsburg:									
SgD, ShF	0-9	2.0-6.0	0.10-0.14	4.5-5.5	Low	Low	High	0.28	2
	9-14	2.0-6.0	0.10-0.14	4.5-5.5	Low	Low	High	0.24	
	14-29	2.0-6.0	0.04-0.08	4.5-5.5	Low	Low	High	0.17	
	29	---	---	---	---	---	---	---	
Stendal:									
Sm	0-10	0.6-2.0	0.22-0.24	4.5-5.5	Low	High	High	0.43	---
	10-68	0.6-2.0	0.20-0.22	4.5-5.5	Low	High	High	0.43	
Stokly:									
Sn	0-34	2.0-6.0	0.10-0.18	3.6-5.5	Low	Moderate	High	0.28	3
	34-76	2.0-6.0	0.10-0.18	3.6-5.5	Low	Moderate	High	0.28	
Strip mines:									
St	0-60	---	---	---	---	---	---	---	---
Tilsit:									
TlB, TlC	0-16	0.6-2.0	0.16-0.22	3.6-5.5	Low	High	High	0.43	3
	16-25	0.6-2.0	0.16-0.22	3.6-5.5	Low	High	High	0.43	
	25-58	<0.2	0.08-0.12	3.6-5.5	Low	High	High	0.43	
	58-72	0.06-0.6	0.08-0.12	3.6-5.5	Low	High	High	0.43	
Upshur:									
UpC, UpD	0-6	0.2-0.6	0.12-0.16	4.5-5.5	High	High	Moderate	0.43	3
	6-39	0.06-0.2	0.10-0.14	4.5-5.5	High	High	Moderate	0.28	
	39-49	0.06-0.2	0.08-0.12	4.5-5.5	High	High	Moderate	0.28	
	49	---	---	---	---	---	---	---	
Vandalia:									
VnD, VnE	0-5	0.6-2.0	0.12-0.18	4.5-6.0	Moderate	Moderate	Moderate	0.37	4
	5-42	0.2-0.6	0.12-0.15	4.5-6.0	High	Moderate	Moderate	0.28	
	42-65	0.06-0.2	0.08-0.12	5.6-7.8	High	High	Moderate	0.28	
[1]VuF:									
Vandalia part	0-5	0.6-2.0	0.12-0.18	4.5-6.0	Moderate	Moderate	Moderate	0.37	4
	5-42	0.2-0.6	0.12-0.15	4.5-6.0	High	Moderate	Moderate	0.28	
	42-65	0.06-0.2	0.08-0.12	4.5-6.0	High	High	Moderate	0.28	
Upshur part	0-6	0.2-0.6	0.12-0.16	4.5-5.5	High	High	Moderate	0.43	3
	6-39	0.06-0.2	0.10-0.14	4.5-5.5	High	High	Moderate	0.28	
	39-49	0.06-0.2	0.08-0.12	4.5-5.5	High	High	Moderate	0.28	
	49	---	---	---	---	---	---	---	
Weinbach:									
Wb	0-16	0.6-2.0	0.20-0.24	4.5-6.0	Low	High	High	0.49	3-2
	16-24	0.6-2.0	0.20-0.22	4.5-6.0	Low	High	High	0.49	
	24-50	<0.06	0.06-0.08	4.5-6.0	Low	High	High	0.49	
	50-70	0.2-0.6	0.06-0.08	4.5-6.0	Low	High	High	0.49	

See footnotes at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion		Erosion factors	
						Uncoated steel	Concrete	K	T
	In	In/hr	In/in	pH					
Wernock:									
WcB, WcC, WcD-----	0-5	0.6-2.0	0.19-0.23	3.6-5.5	Low-------	Low-------	High------	0.37	3
	5-27	0.6-2.0	0.18-0.22	3.6-5.5	Low-------	Moderate	High------	0.32	
	27-31	0.6-2.0	0.12-0.18	3.6-5.5	Low-------	Moderate	High------	0.28	
	31-38	---	---	---	----------	----------	----------	---	
Whitley:									
WhA, WhB, WhC-----	0-10	0.6-2.0	0.16-0.23	4.5-5.5	Low-------	Moderate	High------	0.32	4
	10-40	0.6-2.0	0.18-0.22	4.5-5.5	Low-------	Moderate	High------	0.32	
	40-74	0.6-2.0	0.10-0.18	4.5-5.5	Low-------	Moderate	High------	0.28	

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole map unit.

TABLE 16.--SOIL AND WATER FEATURES

[Absence of an entry indicates the feature is not a concern. See text for descriptions of symbols and such terms as "rare," "brief," and "perched." The symbol > means greater than]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness
					Ft			In	
Allegheny: AlB, AlC, AlD----	B	None--------	---	---	>6.0	---	---	>60	---
Ashton: As----------	B	Occasional--	Very brief	Jan-Apr	>6.0	---	---	>60	---
Berks: [1]BcF:									
Berks part------	C	None--------	---	---	>6.0	---	---	20-40	Hard
Cranston part---	B	None--------	---	---	>6.0	---	---	>60	---
Bonnie: Bo----------	C/D	Frequent----	Brief-----	Jan-Jun	0-1.0	Apparent	Jan-Jun	>60	---
Chavies: ChA----------	B	None--------	---	---	>6.0	---	---	>60	---
Cotaco: Co----------	C	None--------	---	---	1.5-2.5	Apparent	Dec-May	>48	Hard
Cuba: Cu----------	B	Frequent----	Brief-----	Jan-May	>6.0	---	---	>60	---
Elk: EkA----------	B	None--------	---	---	>6.0	---	---	>60	---
Gilpin: GlC, GlD, GlE----	C	None--------	---	---	>6.0	---	---	20-40	Rippable
Hayter: HsB, HsC, HtE----	B	None--------	---	---	>6.0	---	---	>60	---
Huntington: Hu----------	B	Frequent----	Brief-----	Jan-Apr	3.0-6.0	Apparent	Dec-Apr	>60	---
Lakin: LkB----------	A	None--------	---	---	>6.0	---	---	>60	---
Latham: LmC, LmD---------	D	None--------	---	---	1.5-3.0	Perched	Jan-Apr	20-40	Rippable
[1]LsE:									
Latham part-----	D	None--------	---	---	1.5-3.0	Perched	Jan-Apr	20-40	Rippable
Shelocta part---	B	None--------	---	---	>6.0	---	---	>60	---
[1]LsF:									
Latham part-----	D	None--------	---	---	1.5-3.0	Perched	Jan-Apr	20-40	Rippable
Shelocta part---	B	None--------	---	---	---	---	---	>60	---
Licking: LtA----------	C	None--------	---	---	1.5-3.0	Perched	Jan-Apr	>60	---
Lindside: Lu----------	C	Frequent----	Brief-----	Jan-Apr	1.5-3.0	Apparent	Dec-Apr	>60	---
Markland: MkB, MlC, MlD----	C	None--------	---	---	3.0-6.0	Perched	Jan-Apr	>60	---

See footnotes at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness
					Ft			In	
McGary: Mm	C	None	---	---	1.0-3.0	Perched	Jan-Apr	>60	---
Monongahela: MnB, MnC	C	None	---	---	1.5-3.0	Perched	Jan-Apr	>60	---
Morehead: Mo	C	Rare	---	---	1.0-2.0	Apparent	Jan-Apr	>60	---
Newark: Nk	C	Frequent	Brief	Jan-Apr	0.5-1.5	Apparent	Dec-Apr	>60	---
Nolin: No	B	Frequent	Brief	Jan-Apr	3.0-6.0	Apparent	Dec-Apr	>60	---
Otwell: OtA	C	None	---	---	1.5-2.5	Perched	Jan-Apr	>60	---
Pope: Pf, Pg	B	Frequent	Brief	Dec-Apr	>6.0	---	---	>60	---
Riney: RnC	B	None	---	---	>6.0	---	---	>60	---
Shelocta: ScB, ScC, ScD	B	None	---	---	>6.0	---	---	>60	---
Steinsburg: SgD, ShF	C	None	---	---	>6.0	---	---	20-40	Rippable
Stendal: Sm	C	Frequent	Brief	Jan-Apr	0.5-1.5	Apparent	Dec-Apr	>60	---
Stokly: Sn	B	Frequent	Very brief	Jan-May	0.5-1.5	Apparent	Dec-Apr	>60	---
Strip mines: St	B/D	None	---	---	>6.0	---	---	>60	---
Tilsit: TlB, TlC	C	None	---	---	1.5-2.5	Perched	Jan-Apr	>40	Hard
Upshur: UpC, UpD	C	None	---	---	>6.0	---	---	40-60	Rippable
Vandalia: VnD, VnE	C	None	---	---	>6.0	---	---	>60	---
[1]VuF:									
Vandalia part	C	None	---	---	>6.0	---	---	>60	---
Upshur part	C	None	---	---	>6.0	---	---	40-60	Rippable
Weinbach: Wb	C	None	---	---	0.5-1.5	Perched	Jan-Apr	>60	---
Wernock: WcB, WcC, WcD	B	None	---	---	>6.0	---	---	30-40	Rippable
Whitley: WhA, WhB, WhC	B	None	---	---	>6.0	---	---	>60	Hard

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole map unit.

TABLE 17.--ENGINEERING TEST DATA

[Tests performed by the Commonwealth of Kentucky Department of Transportation, Bureau of Highways, Division of Research, in accordance with standard procedures of the American Association of State Highway and Transportation Officials (AASHTO). Absence of an entry indicates no determination was made]

Soil name and location	Parent material	Report No.	Depth	Moisture density [1]		Percentage passing sieve-- [2]				Percentage smaller than-- [2]				Liquid limit [3]	Plasticity index [4]	Classification	
				Maximum	Optimum	No. 4	No. 10	No. 40	No. 200	0.05 mm	0.02 mm	0.005 mm	0.002 mm			AASHTO [5]	Unified [6]
			In	Lb/cu ft	Pct									Pct			
Cranston channery silt loam (modal):																	
Greenup County, Kentucky, 10 feet north of road on Loder Fork $1\frac{1}{2}$ miles upstream from White Oak Creek and $\frac{1}{4}$ mile east of County line.	Colluvium from siltstone.	45-39-3	14-37	111	16	85	85	79	71	63	47	23	18	31	08	A-4	CL-ML
		45-39-4	37-52	114	14	73	73	61	49	46	31	14	09	25	05	A-4	GC-GM
Elk silt loam (modal):																	
Greenup County, Kentucky, $\frac{1}{2}$ mile east of Tygarts Creek and 1,700 feet south of Ohio River.	Mixed Ohio River alluvium.	45-38-3	12-28	106	17	100	100	100	97	82	75	43	33	40	19	A-6	CL
		45-38-6	45-54	118	14	100	100	100	45	36	28	18	14	21	05	A-4	SC-SM
Latham silt loam (modal):																	
Greenup County, Kentucky, about 15 miles west of Greenup, 1,000 feet southwest of County Road on Zion Ridge, between Whiteoak Creek and Mill Hollow; $12/_{10}$ miles east of Lewis County line.	Residuum from acid clayey shale.	45-35-3	6-15	104	19	100	100	89	86	81	74	47	36	43	19	A-7-6	CL
		45-35-6	25-37	---	---	100	100	97	95	91	86	77	61	55	18	A-7-5	MH
Upshur silty clay loam (modal):																	
Boyd County, Kentucky, Head of Jack Fork on a ridge 175 yards northeast of Ross Cemetary.	Red shale residuum.	10-41-4	26-40	96	20	100	100	100	98	90	87	77	62	70	40	A-7-5	CH
		10-41-6	46-60	102	21	100	100	100	99	88	85	72	57	49	13	A-7-5	ML

See footnotes at end of table.

TABLE 17.--ENGINEERING TEST DATA--Continued

Soil name and location	Parent material	Report No.	Depth	Moisture density [1]		Percentage passing sieve-- [2]				Percentage smaller than-- [2]				Liquid limit [3]	Plasticity index [4]	Classification	
				Maximum	Optimum	No. 4	No. 10	No. 40	No. 200	0.05 mm	0.02 mm	0.005 mm	0.002 mm			AASHTO [5]	Unified [6]
			In	Lb/cu ft	Pct									Pct			
Vandalia silt loam (modal):																	
Boyd County, Kentucky, 250 yards south of Durbin Road and 350 yards west of U. S. 23.	Colluvium from red shales.	10-31-3	16-34	109	14	90	90	82	72	67	59	38	27	33	11	A-6	CL-ML
		10-31-5	42-50	100	18	100	100	98	90	83	77	58	42	49	22	A-7-6	CL-ML
Whitley silt loam (modal):																	
Greenup County, Kentucky, 1,000 feet west of KY #7 and 1/2 mile south of junction of KY #7 and KY #827.	Old alluvium from soils of acid siltstone and shale.	45-33-1	0-10	104	16	100	100	100	83	81	52	24	18	31	09	A-4	CL-ML
		45-33-3	18-28	110	15	100	100	100	72	71	49	29	22	30	06	A-4	CL-ML
		45-33-6	52-68	113	13	100	100	100	72	47	29	19	15	24	02	A-4	ML

[1]Maximum dry density and optimum moisture based on AASHTO (1) Designation T 99-74, Method A.

[2]Mechanical analyses according to the AASHTO (1) Designation T 88-72. Results by this procedure frequently may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Coservation Service (SCS). In the AASHTO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for use in naming textural classes for soil.

[3]Based on AASHTO (1) Designation T 89-68.

[4]Based on AASHTO (1) Designation T 90-70.

[5]Based on AASHTO (1) Designation M 145-73.

[6]Based on the Unified Soil Classification System (2) A.S.T.M. Designation D2487. Soil Conservation Service and the Federal Highway Administration have agreed to consider that all soils having plasticity indexes within 2 points of the A line are to be given a borderline classification. An example of a borderline classification obtained by this use is CL-ML.

TABLE 18.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates a taxadjunct to the series. See text for a description of those characteristics of this taxadjunct that are outside the range of the series]

Soil name	Family or higher taxonomic class
Allegheny	Fine-loamy, mixed, mesic Typic Hapludults
Ashton	Fine-silty, mixed, mesic Mollic Hapludalfs
Berks	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
Bonnie	Fine-silty, mixed, acid, mesic Typic Fluvaquents
Chavies	Coarse-loamy, mixed, mesic Ultic Hapludalfs
Cotaco	Fine-loamy, mixed, mesic Aquic Hapludults
Cranston	Coarse-loamy, mixed, mesic Ultic Hapludalfs
Cuba	Fine-silty, mixed, mesic Fluventic Dystrochrepts
Elk	Fine-silty, mixed, mesic Ultic Hapludalfs
Gilpin	Fine-loamy, mixed, mesic Typic Hapludults
Hayter	Fine-loamy, mixed, mesic Ultic Hapludalfs
Huntington	Fine-silty, mixed, mesic Fluventic Hapludolls
Lakin	Mixed, mesic Alfic Udipsamments
Latham	Clayey, mixed, mesic Aquic Hapludults
Licking	Fine, mixed, mesic Aquic Hapludalfs
Lindside	Fine-silty, mixed, mesic Fluvaquentic Eutrochrepts
*Markland	Fine, mixed, mesic Typic Hapludalfs
*McGary	Fine, mixed, mesic Aeric Ochraqualfs
Monongahela	Fine-loamy, mixed, mesic Typic Fragiudults
Morehead	Fine-silty, mixed, mesic Aquic Hapludults
Newark	Fine-silty, mixed, nonacid, mesic Aeric Fluvaquents
Nolin	Fine-silty, mixed, mesic Dystric Fluventic Eutrochrepts
Otwell	Fine-silty, mixed, mesic Typic Fragiudalfs
Pope	Coarse-loamy, mixed, mesic Fluventic Dystrochrepts
Riney	Fine-loamy, siliceous, mesic Typic Hapludults
Shelocta	Fine-loamy, mixed, mesic Typic Hapludults
*Steinsburg	Coarse-loamy, mixed, mesic Typic Dystrochrepts
Stendal	Fine-silty, mixed, acid, mesic Aeric Fluvaquents
Stokly	Coarse-loamy, mixed, acid, mesic Aeric Fluvaquents
Strip mines	Orthents
*Tilsit	Fine-silty, mixed, mesic Typic Fragiudults
Upshur	Fine, mixed, mesic Typic Hapludalfs
Vandalia	Fine, mixed, mesic Typic Hapludalfs
*Weinbach	Fine-silty, mixed, mesic Aeric Fragiaqualfs
Wernock	Fine-silty, mixed, mesic Typic Hapludults
Whitley	Fine-silty, mixed, mesic Typic Hapludults

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