United States Department of Agriculture

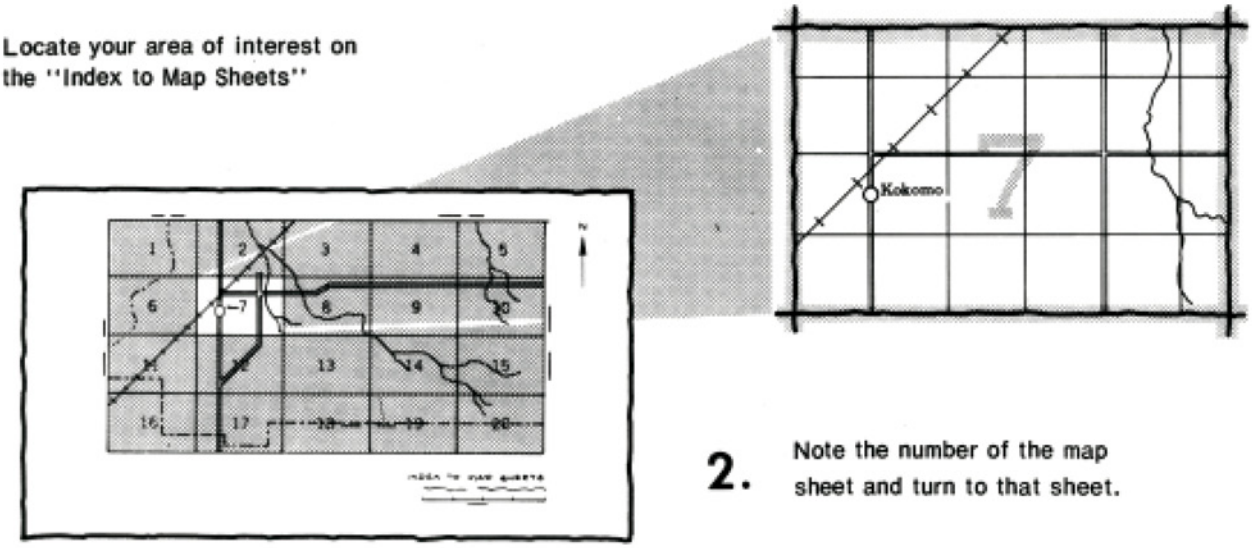
Soil Conservation Service

In Cooperation with Kentucky Natural Resources and Environmental Protection Cabinet and Kentucky Agricultural Experiment Station

Soil Survey of Carter County Kentucky

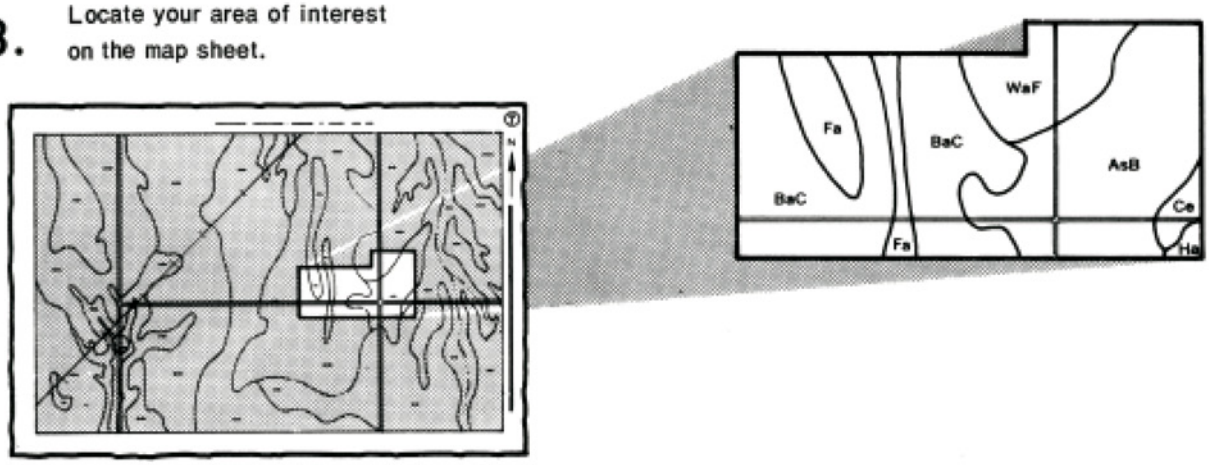
HOW TO USE

1. Locate your area of interest on the "Index to Map Sheets"

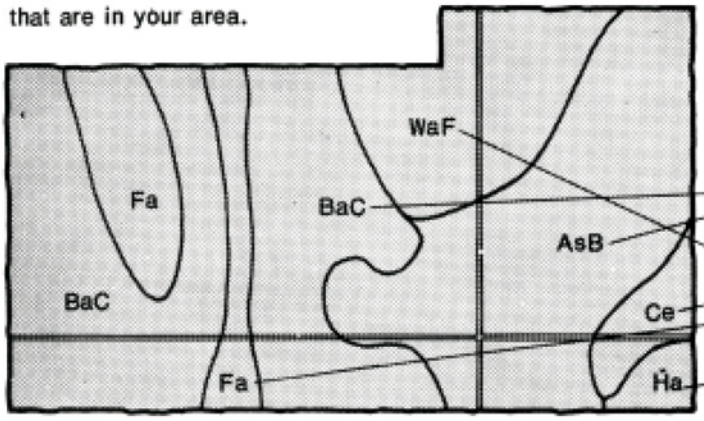


2. Note the number of the map sheet and turn to that sheet.

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



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



Symbols

AsB
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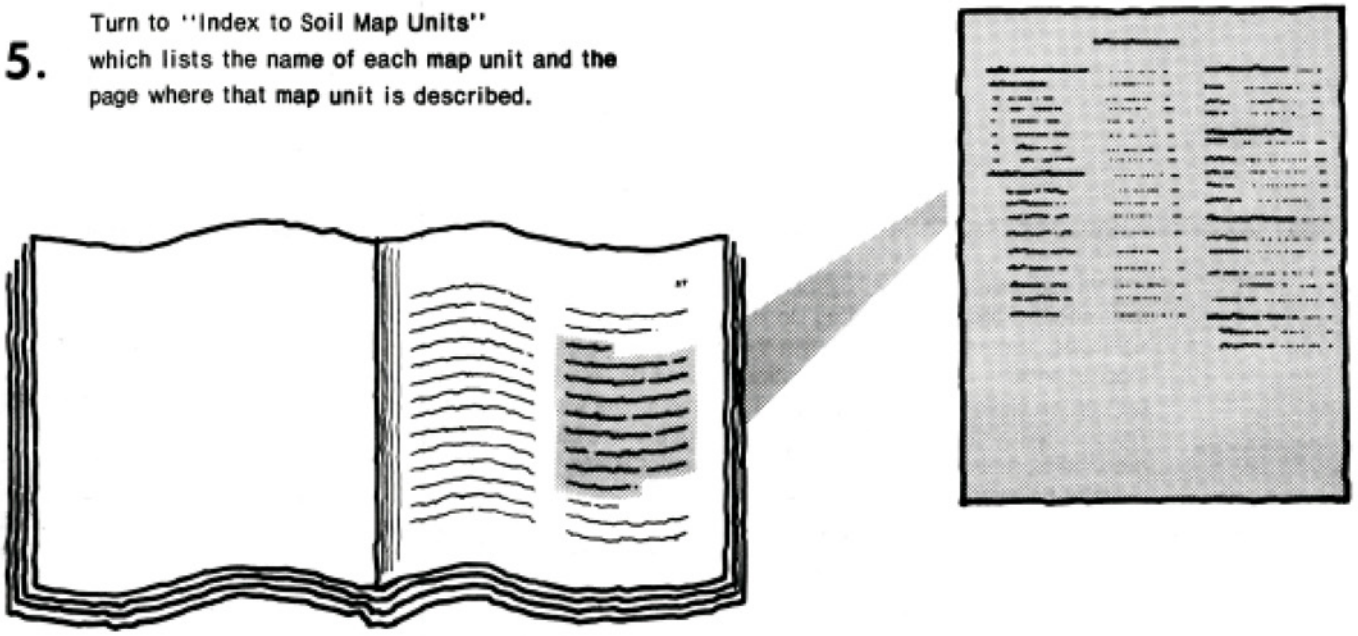
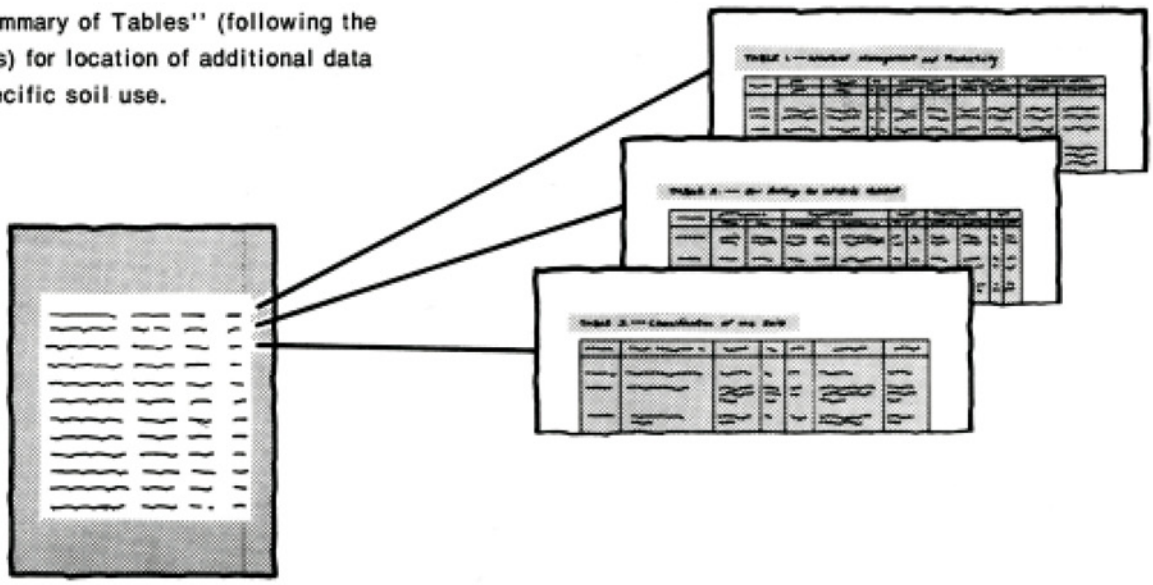
THIS SOIL SURVEY

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 soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. 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 performed in the period 1974-79. Soil names and descriptions were approved in 1979. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1979. This survey was made cooperatively by the Soil Conservation Service and the Kentucky Natural Resources and Environmental Protection Cabinet and the Kentucky Agricultural Experiment Station. It is part of the technical assistance furnished to the Carter County Conservation District.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: Fescue pasture in an area of Pope fine sandy loam. The soils on the hillsides in the background are in the Latham-Shelocta association, steep, and are used as permanent pasture and woodland.

contents

soil series

Issued April 1983

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summary of tables

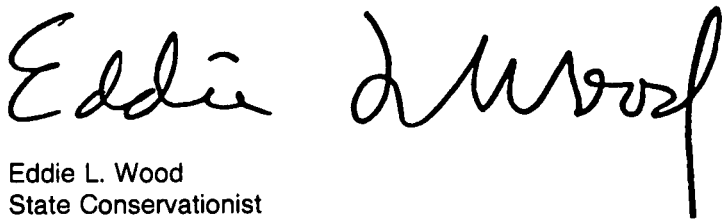
foreword

This soil survey contains information that can be used in land-planning programs in Carter County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

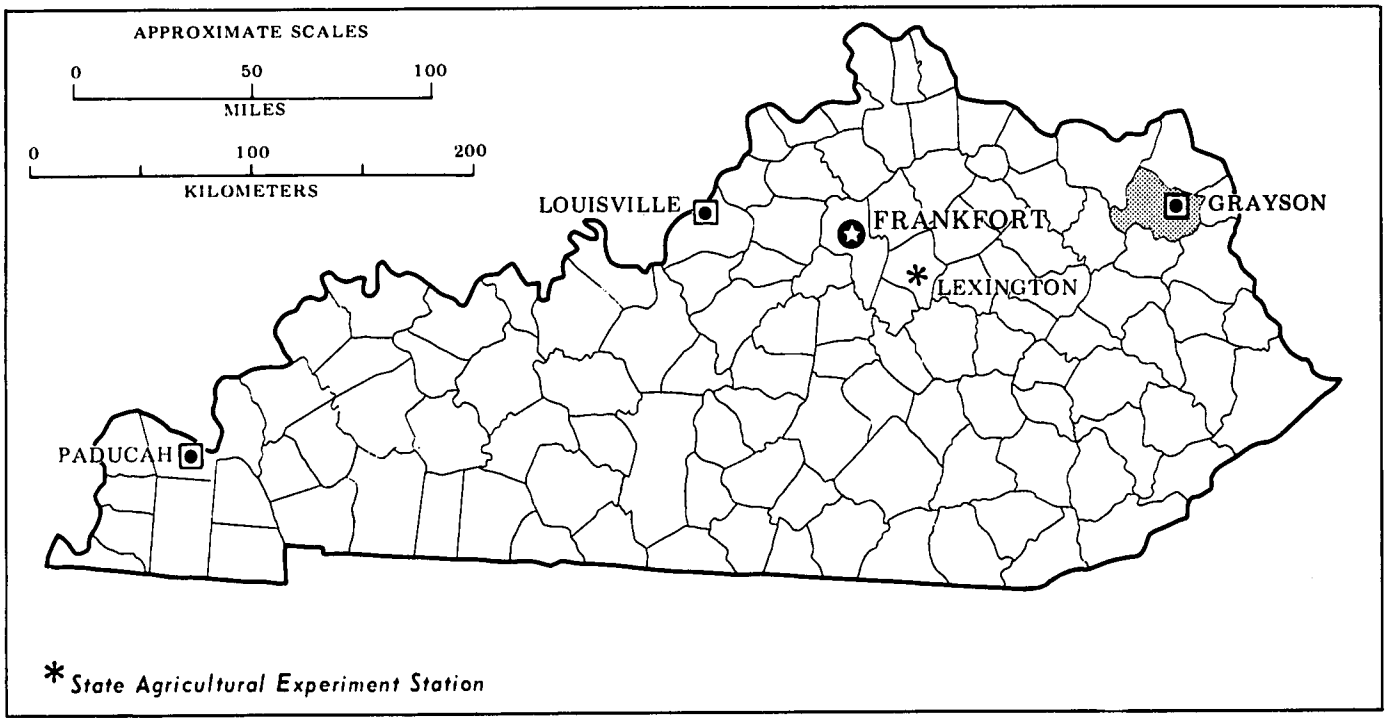
This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as 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 soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.



Eddie L. Wood
State Conservationist
Soil Conservation Service



Location of Carter County in Kentucky.

soil survey of
Carter County, Kentucky

By John A. Kelley and Darwin L. Newton, Soil Conservation Service

Fieldwork by Ronnie B. Froedge, Carl W. Hail, John A. Kelley,
Paul M. Love, and Darwin L. Newton, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service
in cooperation with
Kentucky Natural Resources and Environmental Protection Cabinet and
Kentucky Agricultural Experiment Station

CARTER COUNTY is in the northeastern part of Kentucky. The total land area is 254,080 acres, or about 397 square miles. Grayson is the county seat. It is in the eastern part of the county. In 1970, the population was 19,850, and the projected population for 1977 was 23,200. The major cities in the surrounding area are Ashland, Kentucky; Ironton, Ohio; and Huntington, West Virginia.

Carter County is in the Eastern Coalfields Physiographic Region. The topography generally consists of long and narrow ridgetops, steep hillsides, and narrow valleys. Most of the soils in the county formed in material that weathered from sandstone, siltstone, shale, or limestone. The county is dissected by 3 major drainage systems: Buffalo Creek in the northwestern part of the county, Tygarts Creek in the western part, and the Little Sandy River in the eastern part.

Most of the county is wooded, and farming is usually part-time. Manufacturing and industry in nearby towns provide most of the employment.

Farming is limited to the valleys and ridgetops. The areas are used for cultivated crops, hay, and pasture. The main crops are corn, tobacco, and small grains. Some of the hillsides are used for unimproved pasture that is low in productivity. About 2 percent of the county has been strip-mined for clay and coal.

general nature of the county

This section provides general information about Carter County. It briefly discusses climate; geology, relief, and drainage; and natural resources.

climate

Prepared by the National Climatic Center, Asheville, North Carolina.

Winters are cold and snowy in Carter County, but intermittent thaws preclude a long lasting snow cover. Summers are warm, and occasionally there are very hot days. Rainfall is evenly distributed throughout the year, but it is heavier on the windward, west-facing slopes than in the valleys. Rainfall usually is adequate for all crops normally grown in the area. Heavy rains, which can occur at any time of the year, and severe thunderstorms, which usually occur in summer, sometimes cause flash flooding.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Grayson in the period 1951 to 1977. 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 24 degrees. The lowest temperature on record, which occurred at Grayson on January 19, 1977, is -18 degrees. In summer the average temperature is 73

degrees, and the average daily maximum temperature is 86 degrees. The highest recorded temperature, which occurred at Grayson on July 14, 1954, is 105 degrees.

Growing degree days are shown in table 1. They 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.

The total annual precipitation is 43 inches. Of this, 24 inches, or 55 percent, usually falls in April through September. The growing season for most crops falls within this period. 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 3.21 inches at Grayson on September 20, 1954. Thunderstorms occur on about 50 days each year, and most occur in summer.

The average seasonal snowfall is 13 inches. The greatest snow depth at any one time during the period of record was 9 inches. On an average of 9 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 70 percent of the time possible in summer and 45 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 12 miles per hour, in winter.

geology, relief, and drainage

The soils in Carter County are underlain by interbedded shale, siltstone, sandstone, and limestone of the Pennsylvanian and Mississippian Periods.

The most extensive geologic formations in the county are the Breathitt and Lee Formations of the Lower and Middle Pennsylvanian System. These formations are dominant in the central part, but they are also in scattered areas throughout the rest of the county. Latham and Shelocta soils formed in material that weathered from sandstone, siltstone, and shale of these formations.

The soils in the southwestern part of the county are underlain by shale, siltstone, sandstone, and limestone of the Conemaugh Formation of Upper Pennsylvanian origin. Vandalia and Upshur soils formed in material that weathered from this formation. There are benches on some hillsides. These benches are formed by the slipping of steep clayey soils that are underlain by shale bedrock.

In the western part of the county, there are soils on ridgetops that formed in material from the Breathitt and Lee Formations and soils on steep hillsides that formed in material that weathered from Newman Limestone or from the Borden Formation of Upper Mississippian origin. Bledsoe and Caneyville soils formed in weathered limestone, and Berks and Cranston soils formed in siltstone of the Borden Formation.

The topography generally consists of steep hillsides, narrow ridgetops, and narrow valleys. The hillsides typically are smooth, but there are massive limestone and sandstone bluffs in some places. Approximately 72 percent of the county is steep hillsides, 13 percent is nearly level to gently sloping flood plains and low terraces, and 15 percent is gently sloping to moderately steep ridgetops and high stream terraces. The elevation ranges from about 560 feet, in the lowest valley, to more than 1,100 feet, on the highest ridges.

Carter County is dissected by a dendritic pattern of streams, which empty into tributaries flowing north to the Ohio River. The major tributaries are Buffalo Creek, Tygarts Creek, and the Little Sandy River.

natural resources

The major natural resources in the county are soil, water, timber, coal, and limestone. Of these, soil is the most important. It is the primary source of food and fiber, and its characteristics must by considered in constructing roads, dams, and buildings. The soils generally are suitable for most uses. The steep slopes are a limitation to some uses.

Large supplies of surface water are available from the Little Sandy River and Tygarts Creek. Ground water is also available along these streams and their tributaries. In other areas, wells have been dug. Grayson Reservoir and Olive Hill Reservoir also supply water and provide areas for recreation.

Woodland covers most of the county. Red oak, white oak, hickory, yellow-poplar, eastern redcedar, and Virginia pine are the common trees. Most of the county has been logged in the past, and logging continues to be a source of income.

Coal is the most profitable natural resource in the county. More than 330,000 tons of bituminous coal was mined in 1976 (*5*). The coal beds are in the Breathitt and Lee Formations, which underlie areas throughout the county.

There are large deposits of limestone in the western part of Carter County and moderate deposits in other areas. Near Olive Hill and Carter City there are active quarries that are a source of lime for agriculture and contruction.

how this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. 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; and the

kinds of rock. They dug many holes to study 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 plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management 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 can be used by farmers, rangeland and woodland managers, engineers, planners, developers and builders, home buyers, and others.

general soil map units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map 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 can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

soil descriptions

1. Latham-Shelocta

Moderately deep and deep, moderately well drained and well drained, sloping to steep soils that formed in materials weathered from sandstone, siltstone, and shale; on ridgetops and hillsides

This map unit consists of sloping to moderately steep soils on ridgetops and steep soils on hillsides (fig. 1). The landscape is dissected by many small drainageways and narrow valleys. Some ridgetops and hillsides have been reshaped by coal mining operations. Areas of this map unit are scattered throughout the county.

This map unit makes up about 68 percent of Carter County. It is about 42 percent Latham soils, 31 percent Shelocta soils, and 27 percent minor soils.

Latham soils are moderately deep, moderately well drained, and sloping to steep. They are on ridgetops and the upper part of hillsides. They have a moderate shrink-swell potential. Latham soils formed in residuum of shale. The subsoil is silty clay.

Shelocta soils are deep, well drained, and moderately steep to steep. They are on the lower part of hillsides and in coves. These soils formed in colluvium from shale, siltstone, and sandstone. The subsoil is generally gravelly silty clay loam.

The minor soils are well drained Pope soils and somewhat poorly drained Stendal soils on flood plains; moderately well drained Cotaco and Monongahela soils on low stream terraces; and well drained Lily, Steinsburg, Wernock, Bethesda, and Fairpoint soils on ridgetops and the upper part of hillsides.

The soils in this map unit are used mainly as woodland. On some of the less sloping hillsides and ridgetops they are used as pasture. Cleared ridgetops and valleys commonly are used for cultivated crops, hay, or pasture or as sites for homes and gardens. Slope is a major limitation, and depth to rock is a limitation of Latham soils.

The soils in this map unit are poorly suited to farming. Most cleared areas are in hay or pasture. Pasture is difficult to establish and maintain on the steeper hillsides. Areas of cultivated crops are limited to wide ridgetops and valleys. Tobacco, corn, and small grains are the major crops.

These soils are well suited to use as woodland and are suited to use as habitat for woodland wildlife. Because of the steep slopes, however, erosion is a severe hazard, and the use of equipment is limited.

In most areas the soils are severely limited for urban development mainly because of the steep hillsides, the slow permeability of the soils, and the depth to bedrock on ridgetops. These soils are susceptible to landslides if they are undercut for construction of roads or buildings.

These soils are poorly suited to use as intensive recreation areas. The steep slopes limit their use as campsites and picnic areas. These soils are well suited to use as extensive recreation areas.

2. Pope-Shelocta-Whitley

Deep, well drained, nearly level to sloping soils that formed in alluvium and colluvium weathered from sandstone, siltstone, and shale; on flood plains, alluvial fans, low stream terraces, and foot slopes

This map unit consists of nearly level soils on flood plains and low stream terraces and gently sloping to sloping soils on alluvial fans (fig. 2). The soils are adjacent to major streams and their tributaries throughout the county.

This map unit makes up about 5 percent of Carter County. It is about 24 percent Pope soils, 20 percent Shelocta soils, 9 percent Whitley soils, and 47 percent minor soils.

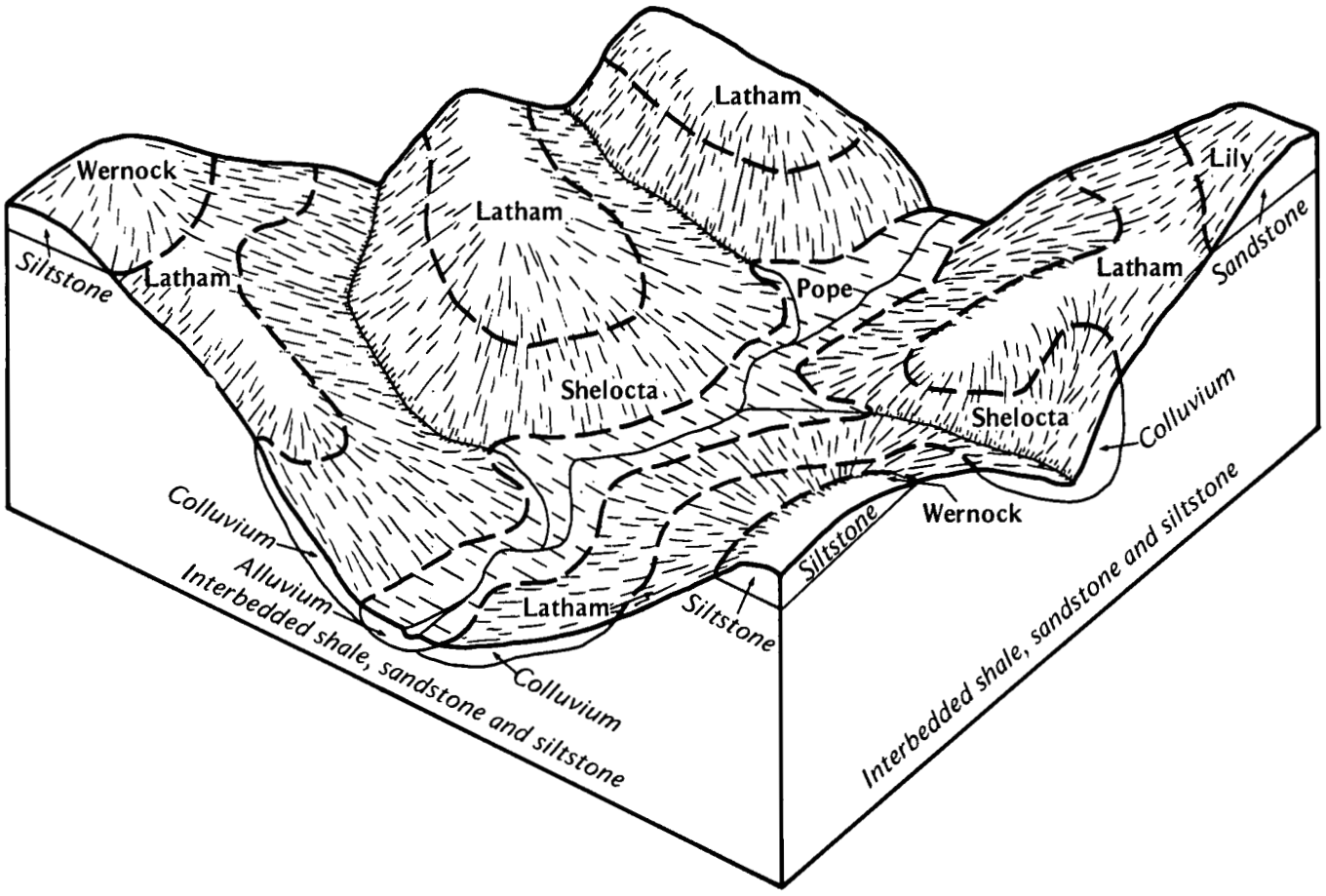


Figure 1.—Pattern of soils, topography, and underlying material in the Latham-Shelocta map unit.

Pope soils are deep, well drained, and nearly level. They formed in recently deposited alluvium on flood plains. The subsoil is fine sandy loam.

Shelocta soils are deep, well drained, and gently sloping to sloping. They formed in colluvium from shale and siltstone on alluvial fans and foot slopes. The subsoil is commonly gravelly silty clay loam.

Whitley soils are deep, well drained, and nearly level. They formed in old alluvium on low stream terraces. The subsoil is commonly silt loam.

The minor soils are well drained Cuba soils and somewhat poorly drained Stendal and Stokly soils on flood plains; and somewhat poorly drained McGary soils, moderately well drained Cotaco soils, and well drained Allegheny soils on low stream terraces.

In most areas the soils in this unit have been cleared and are used for farming (fig. 3). In some areas they are used as woodland or as sites for houses and gardens. Flooding is the major limitation for farming and most urban uses.

These soils are well suited to farming. Tobacco, corn, and small grains are the major crops. The productivity of the soils is good for hay and pasture, but tile drainage is necessary in many places to obtain adequate yields.

These soils are well suited to use as intensive recreation areas if they are protected from flooding. They are well suited to use as extensive recreation areas.

3. Caneyville-Bledsoe-Rock outcrop

Moderately deep and deep, well drained, sloping to steep soils that formed in materials weathered from limestone, and Rock outcrop; on ridgetops and hillsides

This map unit consists of sloping to steep soils on ridgetops, steep soils on hillsides, and outcrops of limestone (fig. 4). The landscape is dissected by many

small drainageways and narrow valleys. This map unit is in the northern and western parts of the county.

This map unit makes up about 10 percent of Carter County. It is about 37 percent Caneyville soils, 22 percent Bledsoe soils, 11 percent Rock outcrop, and 30 percent minor soils.

Caneyville soils are moderately deep, well drained, and sloping to steep. They are on ridgetops and the upper part of hillsides. They have a moderate shrink-swell potential. Caneyville soils formed in residuum of limestone. The subsoil is commonly clay or silty clay.

Bledsoe soils are deep, well drained, and steep. They are on the lower part of hillsides in coves. These soils formed in colluvium mainly from limestone but also from siltstone, sandstone, and shale.

Rock outcrop typically consists of limestone bluffs near the hilltops. The bluffs range in height from 10 to 50 feet. The outcrops are Newman limestone of the Upper Mississippian Period. Bedrock is also exposed in scattered areas above and below the bluffs.

The minor soils are the somewhat poorly drained Newark soils and the well drained Nolin and Skidmore soils on flood plains. Also included are the well drained Hagerstown and Wernock soils and the moderately well drained Latham soils on ridgetops. Areas of Pits and

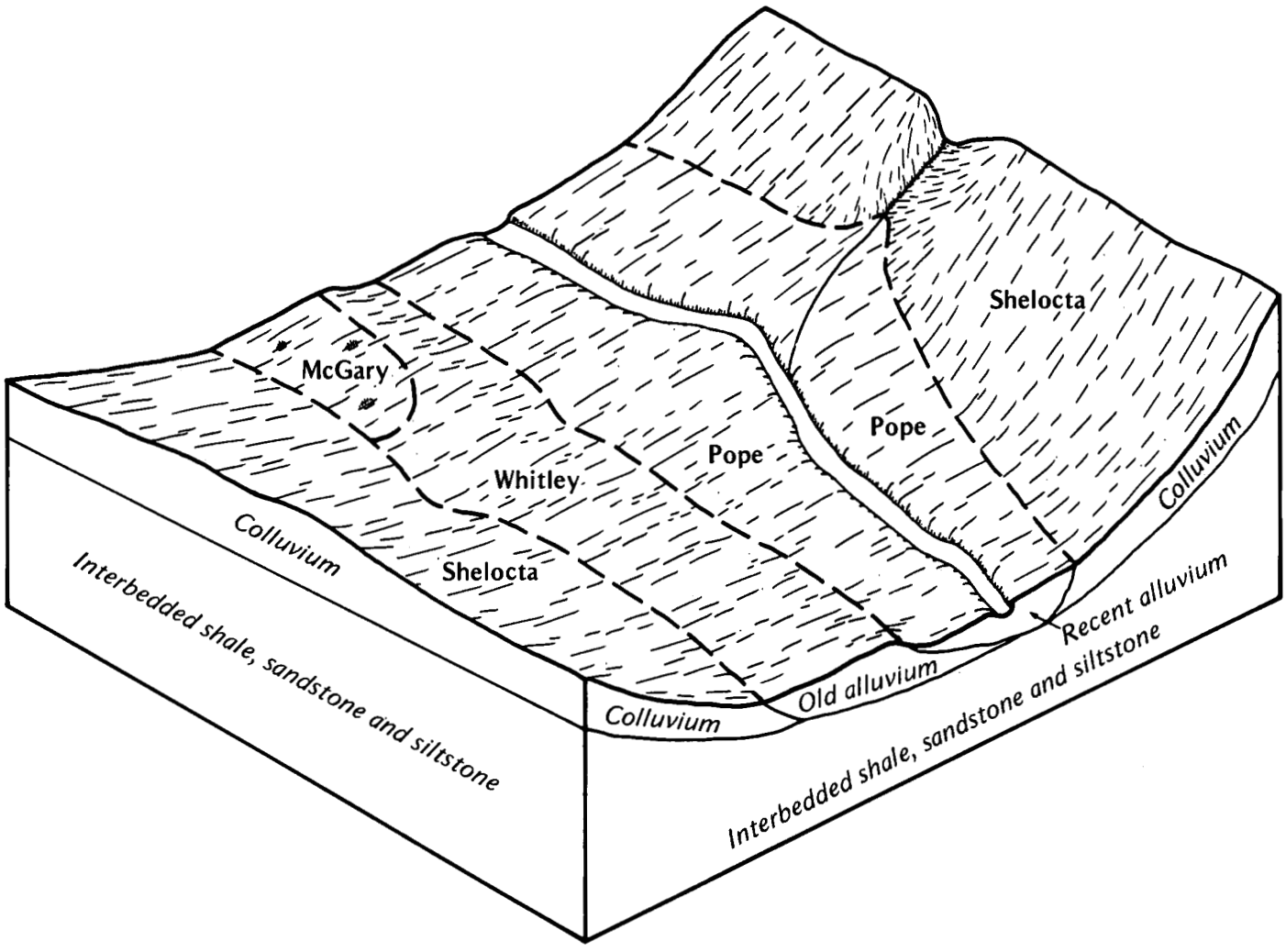


Figure 2.—Pattern of soils, topography, and underlying material in the Pope-Shelocta-Whitley map unit.

Figure 3.—Pasture and crops on soils in the Pope-Shelocta-Whitley map unit.

Dumps are scattered throughout and range from small isolated areas to large active quarries.

The soils in this map unit are used mainly as woodland. On some of the less sloping hillsides and ridgetops they are used as pasture. Cleared ridgetops and valleys commonly are used for cultivated crops, hay, or pasture or as sites for homes and gardens. Slope, rock outcrops, and the moderate depth to rock of the Caneyville soils are the major limitations.

The soils are poorly suited to farming. Most cleared areas are in hay or pasture. Pasture is difficult to establish and maintain on the steeper hillsides. Areas of cultivated crops are limited to wide ridgetops and valleys. Tobacco, corn, and small grains are the major crops.

These soils are well suited to use as woodland and are suited to use as habitat for woodland wildlife. The steep slopes, however, restrict the use of equipment and make erosion a severe hazard.

In most areas these soils are severely limited for urban development. Steep slopes, rock outcrops, and a clayey subsoil are the major limitations. These soils are susceptible to landslides if they are undercut for construction of roads or buildings.

These soils are poorly suited to use as intensive recreation areas. The steep slopes limit their use as campsites and picnic areas. These soils are well suited to use as extensive recreation areas.

4. Berks-Cranston-Latham

Moderately deep and deep, well drained and moderately well drained, sloping to steep soils that formed in

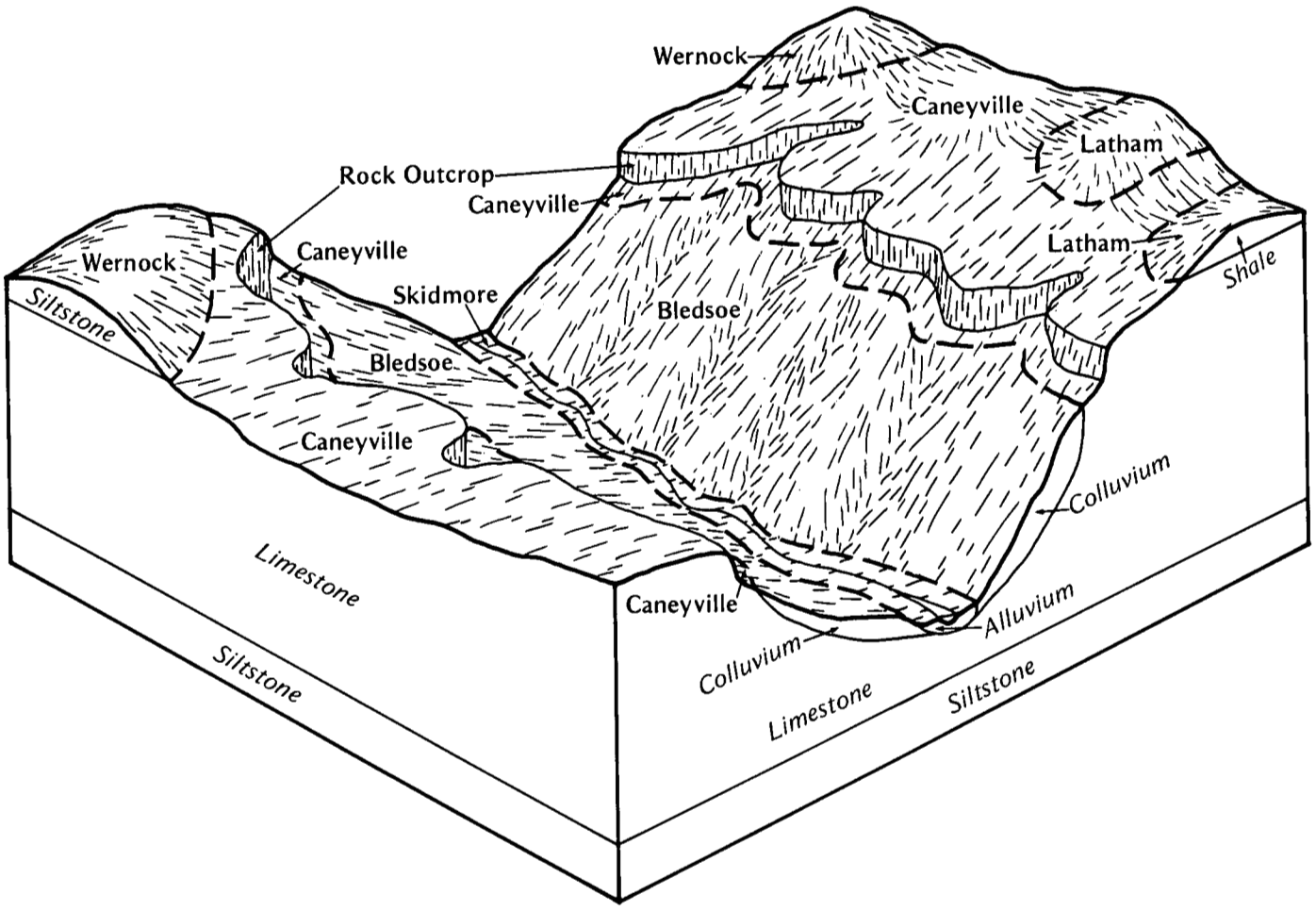


Figure 4.—Pattern of soils, topography, and underlying material in the Caneyville-Bledsoe-Rock outcrop map unit.

materials weathered from siltstone and shale; on ridgetops and hillsides

This map unit consists of sloping to steep soils on narrow ridgetops and steep soils on hillsides (fig. 5). The landscape is dissected by many small drainageways and narrow valleys. This map unit is in the northern and western parts of the county.

This map unit makes up about 9 percent of Carter County. It is about 35 percent Berks soils, 19 percent Cranston soils, 9 percent Latham soils, and 37 percent minor soils.

Berks soils are moderately deep, well drained, and steep. They formed in residuum of siltstone on narrow ridgetops and on the upper part of hillsides. The subsoil is very channery silt loam.

Cranston soils are deep, well drained, and steep. They formed in colluvium from siltstone on the lower part of hillsides and in coves. The subsoil is channery silt loam.

Latham soils are moderately deep, moderately well drained, and sloping to moderately steep. They formed in residuum of shale on ridgetops. The subsoil is silty clay loam or silty clay. Latham soils have a moderate shrink-swell potential.

The minor soils are somewhat poorly drained Stokly soils, moderately well drained Cotaco soils, and well drained Skidmore and Grigsby soils on flood plains and well drained Wernock and Lily soils on ridgetops.

The soils in this map unit are used mainly as woodland. On some of the less sloping hillsides and ridgetops they are used as pasture. Cleared ridgetops and valleys commonly are used for cultivated crops, hay, or pasture or as sites for homes and gardens. Slope and the moderate depth to rock of the Berks and Latham soils are the major limitations.

The soils in this map unit are poorly suited to farming. Most cleared areas are in hay or pasture. Pasture is difficult to establish and maintain on the steeper hillsides. Areas of cultivated crops are limited to the

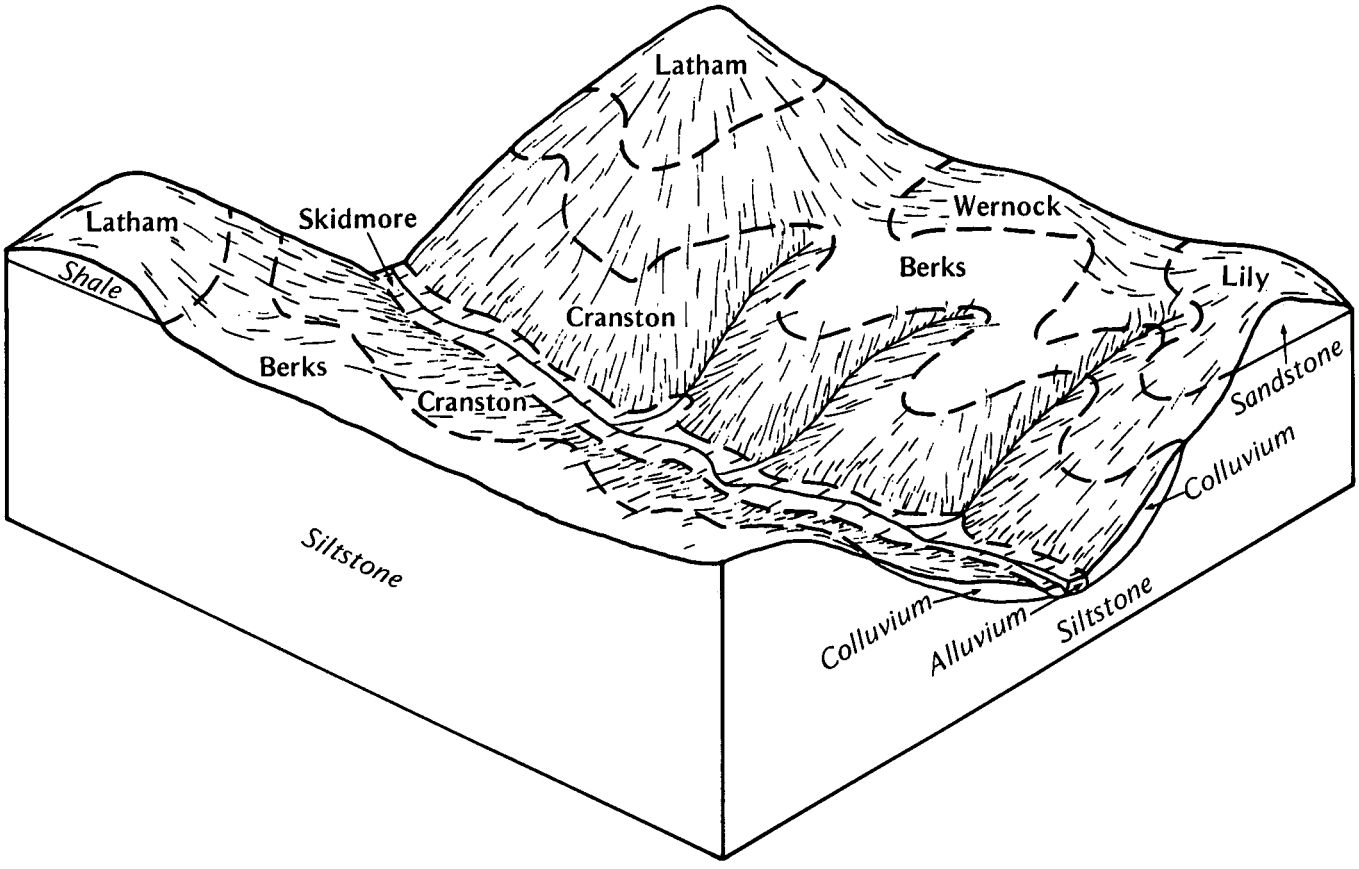


Figure 5.—Pattern of soils, topography, and underlying material in the Berks-Cranston-Latham map unit.

wider ridgetops and valleys. Tobacco, corn, and small grains are the major crops.

These soils are suited to use as woodland and as habitat for woodland wildlife. Because of the steep slopes, however, erosion is a severe hazard, and the use of equipment is limited.

In most areas the soils are severely limited for urban development because of the steep slopes and, in places, the depth to bedrock. These soils are susceptible to landslides if they are undercut for construction of roads or buildings.

These soils are poorly suited to use as intensive recreation areas. The steep slopes limit their use as campsites and picnic areas. The soils are well suited to use as extensive recreation areas.

5. Rigley-Lily-Rock outcrop

Deep and moderately deep, well drained, sloping to steep soils that formed in materials weathered from sandstone, and Rock outcrop; on ridgetops and hillsides

This map unit consists of moderately steep soils on ridgetops, steep soils on hillsides, and outcrops of sandstone. The landscape is dissected by many small drainageways and narrow valleys (fig. 6). This map unit is in the south-central and north-central parts of the county.

This map unit makes up about 3 percent of Carter County. It is about 38 percent Rigley soils, 22 percent Lily soils, 10 percent Rock outcrop, and 30 percent minor soils.

Rigley soils are deep, well drained, and steep. They formed in colluvium from sandstone on hillsides. The subsoil is gravelly sandy loam.

Lily soils are moderately deep, well drained, and sloping to moderately steep. They formed in residuum of sandstone on ridgetops and the upper part of hillsides. The subsoil is commonly gravelly sandy clay loam.

Rock outcrop consists of sandstone bluffs that range in height from 20 to 150 feet. Bedrock is also exposed in areas above the bluffs. In many areas large boulders and stones have broken off the bluffs and are widely scattered on the lower part of hillsides.

The minor soils are well drained Grigsby soils and somewhat poorly drained Stokly soils on flood plains; well drained Allegheny soils and moderately well drained Monongahela soils on high stream terraces; and moderately well drained Latham soils and well drained Wernock soils on ridgetops.

The soils in this map unit are used mainly as woodland. On some of the less sloping hillsides and ridgetops they are used as pasture. Cleared ridgetops and valleys commonly are used for cultivated crops, hay, or pasture or as sites for homes and gardens. Slope and the moderate depth to rock of the Lily soils are the major limitations.

The soils are poorly suited to farming. Most cleared areas are in hay or pasture. Pasture is difficult to establish and maintain on the steeper hillsides. Areas of cultivated crops are limited to the wider ridgetops and valleys. Tobacco, corn, and small grains are the major crops.

The soils are suited to use as woodland and are suited to use as habitat for woodland wildlife. The steep slopes, however, restrict the use of equipment and make erosion a severe hazard.

In most areas these soils are severely limited for urban development. Steep slopes, rock outcrops, and depth to bedrock of the Lily soils are the major limitations. The soils are susceptible to landslides if they are undercut for construction of roads or buildings.

These soils are poorly suited to use as intensive recreation areas. The steep slopes limit their use as campsites and picnic areas. The soils are well suited to use as extensive recreation areas.

6. Vandalia-Upshur

Deep, well drained, moderately steep and steep soils that formed in materials weathered mainly from shale and siltstone; on narrow ridgetops, benches, and hillsides

This map unit consists of moderately steep soils on ridgetops and steep soils on hillsides (fig. 7). The slopes are complex and include common benches, many small drainageways, deep ravines, and slips and slumps from landslides. This map unit is in the southeastern part of the county.

This map unit makes up about 5 percent of Carter County. It is about 47 percent Vandalia soils, 31 percent Upshur soils, and 22 percent minor soils.

Vandalia soils are deep, well drained, and steep. They formed in colluvium from shale, siltstone, and sandstone on the lower part of hillsides, on benches, and in coves. The subsoil is commonly silty clay.

Upshur soils are deep, well drained, and moderately steep to steep. They formed in residuum mainly of clay shale but also of limestone on ridgetops, benches, and the upper part of hillsides. The subsoil is clayey.

The minor soils are well drained Grigsby soils and somewhat poorly drained Stokly and Newark soils on flood plains, moderately well drained Cotaco soils on low stream terraces, well drained Shelocta soils on foot slopes, and well drained Steinsburg soils on ridgetops and the upper part of hillsides.

The soils in this map unit are used mainly as woodland. On some of the less sloping hillsides and ridgetops they are used as pasture. The soils in valleys commonly are used for cultivated crops, hay, or pasture or as sites for homes and gardens. Steep complex slopes and a clayey subsoil are the major limitations of these soils.

These soils are poorly suited to farming. Most cleared areas are in hay or pasture. Pasture is difficult to

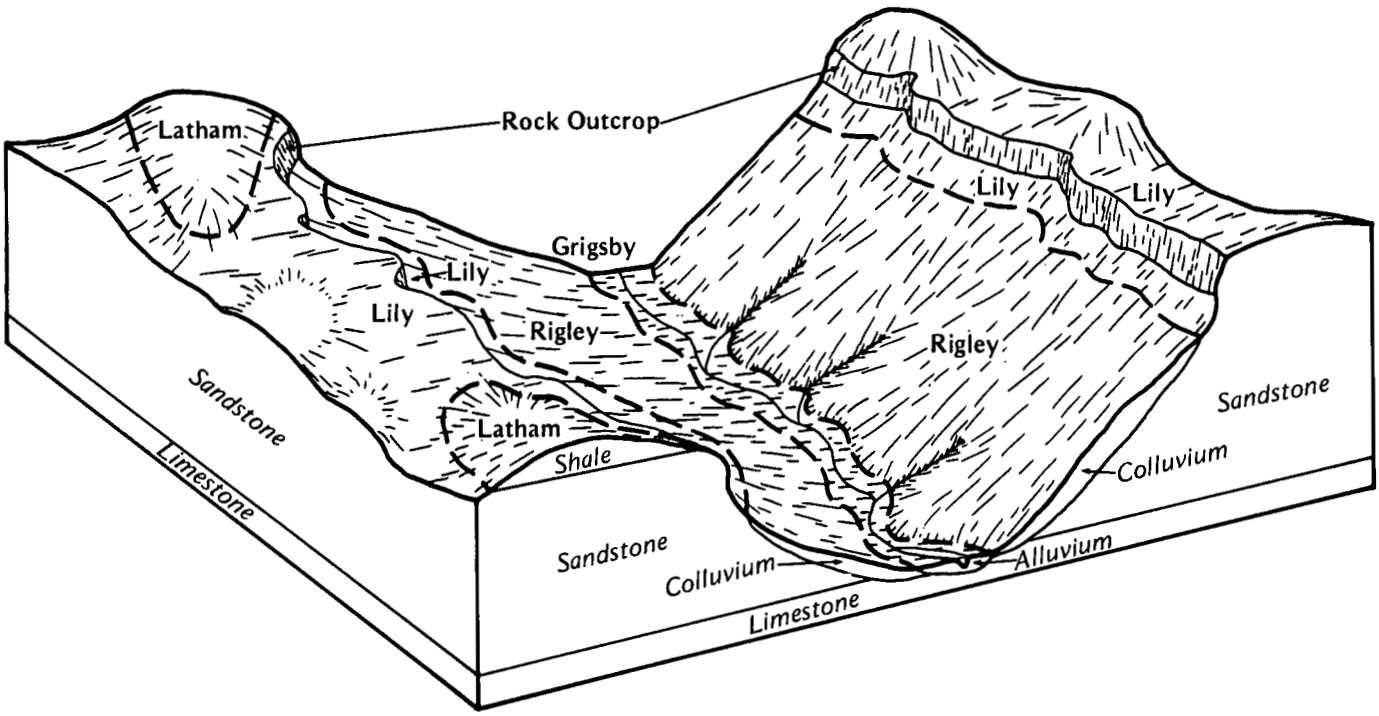


Figure 6.—Pattern of soils, topography, and underlying material in the Rigley-Lily-Rock outcrop map unit.

establish and maintain on hillsides because the steep complex slopes limit the use of machinery. Areas of cultivated crops are limited to valleys. Tobacco, corn, and small grains are the major crops.

The soils are suited to use as woodland and as habitat for woodland wildlife. The steep slopes, however, restrict the use of equipment and make erosion a severe hazard.

In most areas the soils are severely limited for urban development mainly because of the steep slopes, the clayey subsoil, and the high shrink-swell potential. These soils are susceptible to landslides if they are undercut for construction of roads or buildings.

The soils are poorly suited to use as intensive recreation areas. The steep slopes limit their use as campsites and picnic areas. These soils are well suited to use as extensive recreation areas.

broad land use considerations

The soils in Carter County vary widely in their suitability for various land uses. In some areas they are well suited to cultivated crops or use as homesites or gardens, but in other areas they are more suited to use as woodland or pasture. In general, soils that are well suited to urban development are used for farming. Decisions about land use should be based on present and future needs. The general soil map can be very helpful in selecting appropriate sites for various land uses.

The soils on flood plains, stream terraces, and foot slopes in the Pope-Shelocta-Whitley map unit are the best for cultivated crops. The soils in all the other general map units are poorly suited to row crops because the slopes are steep and erosion is a very severe hazard. Some of the gently sloping soils on ridgetops in map units 1 and 3 are used for cultivated crops, however, and moderately high yields can be obtained if the soils are properly managed. Some of the less sloping soils on hillsides are suited to hay and pasture, but good management practices are necessary to obtain adequate yields.

Map units 1, 3, 4, 5, and 6 are best suited to use as woodland or as habitat for wildlife. Moderate to high productivity can be expected if good woodland management practices are used. In most areas there is an adequate supply of food and cover for native wildlife.

The soils in map unit 2 are well suited to urban and

recreation development, except those soils along flood plains that are subject to occasional flooding. Map unit 2 generally consists of deep, well drained soils that have few limitations for urban development.

In general, the soils in map units 1, 3, 4, 5, and 6 are poorly suited to urban and recreation development because of their steep slopes. Furthermore, some soils are slowly permeable, and other soils are shallow or only moderately deep to rock. The gently sloping soils on the wider ridgetops in map units 1 and 3, however, may be suitable for urban development and recreation uses, and map unit 5 includes soils on high stream terraces in the southern part of the county that are well suited.

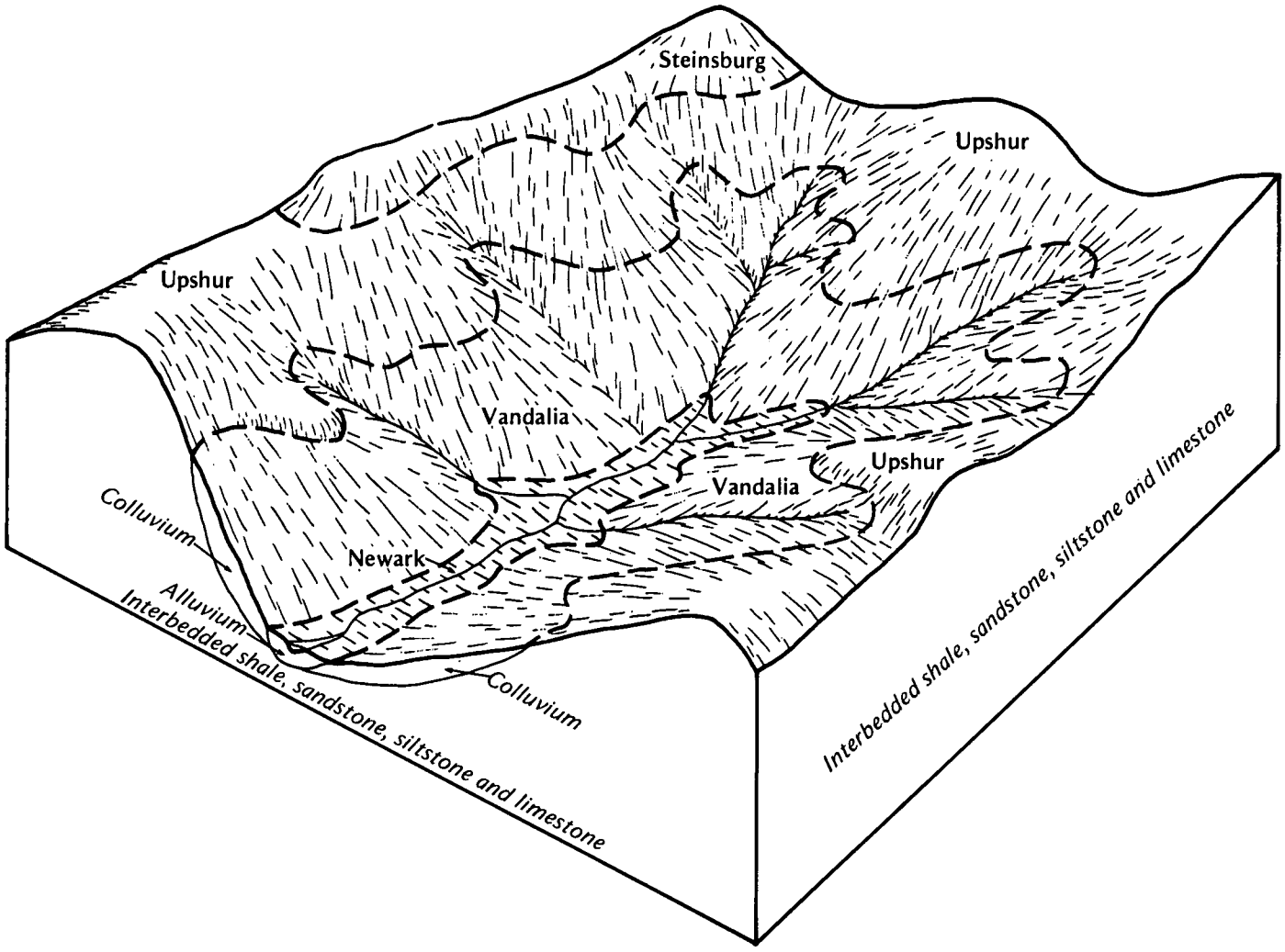


Figure 7.—Pattern of soils, topography, and underlying material in the Vandalia-Upshur map unit.

detailed soil map units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Allegheny loam, 0 to 2 percent slopes, is one of several phases in the Allegheny series.

Some map units are made up of two or more major soils. These map units are called soil complexes, soil associations, or undifferentiated groups.

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Bethesda-Fairpoint complex, 0 to 6 percent slopes, is an example.

A *soil association* is made up of two or more geographically associated soils that are shown as one unit on the maps. Because of present or anticipated soil uses in the survey area, it was not considered practical or necessary to map the soils separately. The pattern and relative proportion of the soils are somewhat similar. Vandalia-Upshur association, steep, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits-Dumps complex is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

soil descriptions

AlA—Allegheny loam, 0 to 2 percent slopes. This is a deep, well drained, nearly level soil on low stream terraces and alluvial fans of major streams and their tributaries. Areas of this soil are scattered throughout the county. The slopes are smooth or slightly convex. The mapped areas are 2 to 220 acres in size.

Typically, the surface layer is brown loam about 9 inches thick. The subsoil, which extends to a depth of about 48 inches, is yellowish brown loam in the upper part and yellowish brown and strong brown sandy clay loam in the lower part. The substratum to a depth of about 62 inches is strong brown sandy clay loam.

This soil is medium in natural fertility and moderate in organic matter content. It is strongly acid to extremely acid throughout except in areas that have been treated with lime. Permeability is moderate, and the available water capacity is high. This soil has good tilth and can be worked within a wide range of moisture content. It is subject to rare flooding. The root zone is deep and is easily penetrated by plant roots.

Included with this soil in mapping are small areas of Pope, Cotaco, and Whitley soils. Also included are areas

of a soil that has more sand in the subsoil than is typical for Allegheny soils. The included soils make up about 10 percent of this map unit, but individual areas generally are less than 2 acres in size.

This soil is used mainly for row crops, hay, and pasture. In many areas it is used as sites for homes and gardens.

This soil is well suited to row crops, and high yields can be obtained if the soil is properly managed. Corn, tobacco, and small grains are the major crops. Crops respond favorably to fertilizer and lime. Erosion is a slight hazard. Crop residue returned to the soil, cover crops, and grasses and legumes in the cropping system help maintain good tilth and the organic matter content.

This soil is well suited to hay and pasture, and high yields can be obtained if the soil is properly managed. Plants that produce adequate forage and provide satisfactory ground cover should be selected. The pasture should be renovated frequently enough to maintain the desired species. Applications of lime and fertilizer, proper stocking rates, rotation grazing, and control of undesirable vegetation are some of the chief management needs.

This soil is well suited to use as woodland, although most areas have been cleared. Yellow-poplar, northern red oak, and black walnut are suitable trees. Plant competition is a management concern.

This soil is suitable for some urban uses, but flooding is a rare hazard that limits the use of this soil as sites for dwellings and sanitary facilities.

This soil is in capability class I. The woodland suitability group is 2o.

AlB—Allegheny loam, 2 to 6 percent slopes. This is a deep, well drained, gently sloping soil on high stream terraces in the south-central part of the county. The slopes are smooth or convex. The mapped areas are 2 to 20 acres in size.

Typically, the surface layer is brown loam about 9 inches thick. The subsoil, which extends to a depth of about 48 inches, is yellowish brown loam in the upper part and yellowish brown and strong brown sandy clay loam in the lower part. The substratum to a depth of about 62 inches is strong brown sandy clay loam.

This soil is medium in natural fertility and moderate in organic matter content. It is strongly acid to extremely acid throughout except in areas that have been treated with lime. Permeability is moderate, and the available water capacity is high. This soil has good tilth and can be worked within a wide range of moisture content. The root zone is deep and is easily penetrated by plant roots.

Included with this soil in mapping are small areas of Monongahela, Lily, and Shelocta soils. The included soils make up about 10 percent of this map unit, but individual areas generally are less than 2 acres in size.

This soil is used mainly for row crops, hay, and pasture. In many areas, however, it is used as sites for homes and gardens.

This soil is well suited to row crops, and high yields can be obtained if the soil is properly managed. Corn and tobacco are the major crops. Crops respond favorably to fertilizer and lime. Erosion is a moderate hazard if cultivated crops are grown. Contour tillage, stripcropping, conservation tillage, crop residue returned to the soil, cover crops, and grasses and legumes in the cropping system help control erosion and maintain good tilth and the organic matter content.

This soil is well suited to hay and pasture, and high yields can be obtained if the soil is properly managed. Plants that produce adequate forage and provide satisfactory ground cover should be selected. The pasture should be renovated frequently enough to maintain the desired species. Applications of lime and fertilizer, proper stocking rates, rotation grazing, and control of undesirable vegetation are some of the chief management needs.

This soil is well suited to use as woodland, although most areas have been cleared. Yellow-poplar, northern red oak, and black walnut are the most suitable trees. Plant competition is a management concern.

This soil is well suited to most urban uses.

This soil is in capability subclass IIe. The woodland suitability group is 2o.

AlC—Allegheny loam, 6 to 12 percent slopes. This is a deep, well drained, sloping soil on high stream terraces in the south-central part of the county. The slopes are smooth or convex. The mapped areas are 2 to 25 acres in size.

Typically, the surface layer is brown loam about 9 inches thick. The subsoil, which extends to a depth of about 48 inches, is yellowish brown loam in the upper part and yellowish brown and strong brown sandy clay loam in the lower part. The substratum to a depth of about 62 inches is strong brown sandy clay loam.

This soil is medium in natural fertility and moderate in organic matter content. It is strongly acid to extremely acid throughout except in areas that have been treated with lime. Permeability is moderate, and the available water capacity is high. This soil has good tilth and can be worked within a wide range of moisture content. The root zone is deep and is easily penetrated by plant roots.

Included with this soil in mapping are small areas of Monongahela, Lily, and Shelocta soils. The included soils make up about 10 percent of this map unit, but individual areas generally are less than 2 acres in size.

This soil is used mainly for pasture and hay. In some small areas it is used for row crops.

This soil is suitable for cultivated crops. Crops respond favorably to fertilizer and lime. Erosion is a severe hazard if cultivated crops are grown. Contour tillage, stripcropping, conservation tillage, crop residue returned

to the soil, cover crops, and grasses and legumes in the cropping system help control erosion and maintain good tilth and the organic matter content.

This soil is well suited to hay and pasture, and high yields can be obtained if the soil is properly managed. Plants that produce adequate forage and provide satisfactory ground cover should be selected. The pasture should be renovated frequently enough to maintain the desired species. Applications of lime and fertilizer, proper stocking rates, rotation grazing, and control of undesirable vegetation are some of the chief management needs.

This soil is well suited to use as woodland, although most areas have been cleared. Yellow-poplar, northern red oak, and black walnut are the most suitable trees. Plant competition is a management concern.

This soil is suitable for most urban uses, but slope is a limitation. Good design and proper installation can overcome this limitation.

This soil is in capability subclass IIIe. The woodland suitability group is 2o.

BCF—Berks-Cranston association, steep. This association consists of moderately deep and deep, well drained, steep soils on hillsides and ridgetops in the northern and western parts of the county. The Berks soil is moderately deep. It is on the upper part of convex hillsides, on narrow ridgetops, and on the lower part of steeper hillsides. The Cranston soil is deep. It is on the lower part of concave hillsides and in coves. The slopes are complex and range from 30 to 50 percent.

Berks channery silt loam makes up about 55 percent of each mapped area, Cranston channery silt loam makes up 30 percent, and other soils and areas of rock outcrop make up the rest. The Berks and Cranston soils are in a regular pattern, but they were not mapped separately because of present and anticipated uses. The mapped areas are 10 to several hundred acres in size and commonly include entire hillsides.

Typically, the surface layer of the Berks soil is dark grayish brown channery silt loam about 3 inches thick. The subsoil, which extends to a depth of about 28 inches, is yellowish brown channery and very channery silt loam. Interbedded sandstone and siltstone are at a depth of 28 inches.

Berks soil is low in natural fertility and in organic matter content. It is extremely acid to slightly acid. Permeability is moderate to moderately rapid, and the available water capacity is low. The root zone is moderately deep, but root penetration is restricted by the coarse fragments. Depth to bedrock ranges from 20 to 40 inches.

Typically, the surface layer of the Cranston soil is dark grayish brown channery silt loam about 6 inches thick. The subsoil, which extends to a depth of about 54 inches, is dark yellowish brown channery silt loam in the upper part and yellowish brown and strong brown channery silt loam in the lower part. The substratum to a depth of about 84 inches is yellowish brown very channery silt loam.

Cranston soil is medium in natural fertility and low in organic matter content. It is strongly acid to extremely acid. Permeability is moderately rapid, and the available water capacity is high. The root zone is deep and is easily penetrated by plant roots.

Included in mapping are small areas of Latham, Caneyville, and Wernock soils on ridgetops and Shelocta, Rigley, and Bledsoe soils on the lower part of hillsides, on alluvial fans, and on foot slopes. Also included are areas of a very shallow soil on narrow ridges and steep breaks, areas of soils that have clayey subhorizons or are stony, a few areas where the slope is 20 to 30 percent, and areas where rock outcrops. The areas of the included soils and of rock outcrop generally are less than 10 acres in size.

The soils in this association are used mainly as woodland. In some areas they are in pasture.

These soils are not suited to row crops because of the steep slopes. The use of machinery is limited, and the hazard of erosion is very severe.

These soils are poorly suited to hay and pasture. In most areas the steep slopes limit the use of machinery in establishing and maintaining adequate pasture cover. Overgrazing should be avoided in areas that are used for pasture because it reduces the stand of desirable grasses and legumes and causes soil erosion. If pasture renovation is necessary, grasses and legumes that produce good plant cover and require the least amount of maintenance should be selected.

The soils are suitable for use as woodland. Productivity is moderately high or high on north- and east-facing slopes and moderate or moderately high on south- and west-facing slopes. For the north and east aspects of the slope, yellow-poplar, eastern white pine, and northern red oak are suitable trees. Virginia pine and shortleaf pine are the most suitable trees for the south and west aspects. Erosion is a severe hazard, and equipment use is severely limited. On the Cranston soil, plant competition is a management concern on north-facing slopes.

The soils are suited to use as habitat for woodland wildlife.

The soils are poorly suited to most urban uses because of the steep slopes.

The soils are in capability subclass VIIe. The woodland suitability group for the Berks soil is 3f on the north aspect and 4f on the south aspect. The woodland suitability group for the Cranston soil is 2r on the north aspect and 3r on the south aspect.

BeB—Bethesda-Fairpoint complex, 0 to 6 percent slopes. The soils in this complex are deep, well drained, and nearly level to gently sloping. They are on broad benches that were formed by the reshaping of spoil

material from surface coal mining. They are on hillsides and ridgetops throughout the county. Slopes generally are linear or convex.

Bethesda shaly silt loam makes up about 50 percent of each mapped area, Fairpoint shaly silt loam makes up 40 percent, and other soils make up the rest. The Bethesda and Fairpoint soils are in areas so intermingled that it was not practical to map them separately. The mapped areas range in size from 5 to 250 acres.

Typically, the surface layer of the Bethesda soil is brown shaly silt loam about 4 inches thick. The substratum to a depth of about 65 inches is yellowish brown very shaly silty clay loam.

This soil is low in natural fertility and in content of organic matter. It is strongly acid to extremely acid throughout except in areas that have been treated with lime. Permeability is moderately slow, and the available water capacity is low. Tilth is poor in some areas because of coarse fragments on the surface. The root zone is deep, but root penetration is restricted by the coarse fragments.

Typically, the surface layer of the Fairpoint soil is dark grayish brown shaly silt loam about 6 inches thick. The substratum to a depth of about 62 inches is dark grayish brown very shaly silty clay loam.

This soil is low in natural fertility and in content of organic matter. It is medium acid to neutral. Permeability is moderately slow, and the available water capacity is low. Tilth is poor in some areas because of coarse fragments on the surface. The root zone is deep, but root penetration is restricted by the coarse fragments.

Included in mapping are small areas of soils that have a high concentration of acid in the surface layer and soils that have subhorizons that range to moderately alkaline. Also included are areas where the slope is more than 6 percent, areas that are severely eroded and gullied, and some recently reclaimed areas.

The soils making up this complex are not suited to cultivated crops. They have moderate to severe limitations for urban development because of large stones, differential settlement potential, moderate shrink-swell potential, and slow permeability.

The soils are suited to pasture and hay. They are suited to most of the grasses and legumes grown in the area. Coarse fragments and large stones restrict the use of equipment, and differential settlement is a hazard in places. The vegetation on these soils should provide a fast-growing, protective, and permanent cover. Before seeding the areas, the spoil should be smoothed so that equipment can be used without interference in planting and harvesting. Good quality seed should be used, and adequate fertilizer and lime should be applied.

These soils are suited to use as woodland. Eastern white pine, black locust, yellow-poplar, shortleaf pine, and Virginia pine are the most suitable trees. Good quality planting stock is required for maximum survival and growth. Seedling mortality is a management concern. In the steeper included areas erosion is a severe hazard, and equipment use is limited.

Areas that are graded, reseeded, and planted to herbaceous or woody plants have potential as a source of food or cover for wildlife. Any planting that provides food and enough vegetative cover to control soil erosion is beneficial to wildlife. Wildlife areas require applications of fertilizer and reseeding and replanting where the vegetation fails to become established.

These soils are in capability subclass VIs; they were not assigned to a woodland suitability group.

BeF—Bethesda-Fairpoint complex, 6 to 60 percent slopes. The soils in this complex are deep, well drained, and sloping to steep. They are on narrow benches and outslopes that were formed by the reshaping of spoil material from surface coal mining, and they are on ridgetops and hillsides throughout the county. Slopes are smooth to irregular.

Bethesda shaly silt loam makes up about 50 percent of each mapped area, Fairpoint shaly silt loam makes up 40 percent, and other soils make up the rest. The Bethesda and Fairpoint soils are in areas so intermingled that it was not practical to map them separately.

Areas of this complex consist of long bands or entire hillsides that include a vertical highwall that ranges from 50 to 150 feet in height, a sloping bench that ranges from 50 to 150 feet in width, and a steep outslope that ranges to several hundred feet in length. The mapped areas range in size from 5 to 300 acres.

Typically, the surface layer of the Bethesda soil is brown shaly silt loam about 4 inches thick. The substratum to a depth of about 65 inches is yellowish brown very shaly silty clay loam.

This soil is low in natural fertility and organic matter content. It is strongly acid to extremely acid throughout except in areas that have been treated with lime. Permeability is moderately slow, and the available water capacity is low. The root zone is deep, but root penetration is restricted by the coarse fragments.

Typically, the surface layer of the Fairpoint soil is dark grayish brown shaly silt loam about 6 inches thick. The substratum to a depth of about 62 inches is dark grayish brown very shaly silty clay loam.

This soil is low in natural fertility and in organic matter content. It is medium acid to neutral. Permeability is moderately slow, and the available water capacity is low. The root zone is deep, but root penetration is restricted by the coarse fragments.

Included in mapping are small areas of Latham, Shelocta, Lily, and Wernock soils. Also included are small areas of a soil that has a high concentration of acid in the surface layer, areas of soils that have subhorizons that range to moderately alkaline, areas that are severely eroded and have deep gullies, and some recently reclaimed areas. The areas of included soils generally are less than 5 acres in size.

In most of the recently disturbed areas, the soils have been reshaped and seeded to grasses and legumes or planted to black locust or pines. In some of the older disturbed areas, the soils have become revegetated by natural processes.

The soils are suited to most of the grasses and legumes grown in the county; however, in some areas grasses and legumes are difficult to plant and maintain. Steep slopes and coarse fragments restrict the use of equipment. The steep outslopes, created by the removal of soil, parent material, and coal, commonly are unstable and are subject to slides. Differential settling is a hazard in places.

The vegetation on these soils should provide a fast-growing, protective, permanent cover. In seeding the smoother areas, the spoil should be graded until it is smooth so that equipment can be used in planting and harvesting. Adequate amounts of seed, fertilizer, and lime should be applied.

In the steep areas, herbaceous plants should be planted at the same time as the seedlings because trees do not control erosion in their first 5 to 10 years of life. Good quality seed or planting stock is required for maximum survival and growth. Black locust, eastern white pine, Virginia pine, yellow-poplar, and shortleaf pine are suited to these soils, especially the cooler aspects of the slope. Seedling mortality is a management concern.

These soils have mixed potential as a source of food or cover for wildlife. Plantings for wildlife should consist of herbaceous plants, trees, and shrubs.

These soils have severe limitations for most urban uses because of their steep slopes, slow permeability, shrink-swell potential, differential settlement potential, and slippage.

These soils are in capability subclass VIIe; they were not assigned to a woodland suitability group.

BRF—Bledsoe-Caneyville-Rock outcrop association, steep. This association consists of deep and moderately deep, well drained, steep soils and Rock outcrop on hillsides in the northern and western parts of the county (fig. 8). Rock fragments, flagstones, or boulders or a combination of these make up 0 to 25 percent of the surface layer. The percentage varies within short distances. The Bledsoe soil is deep. It is on the lower part of hillsides and in coves. The Caneyville soil is moderately deep. It is on short steep convex slopes above and below outcrops of limestone. The slopes range from 30 to 60 percent.

Bledsoe silt loam makes up about 50 percent of each mapped area, Caneyville silt loam makes up 25 percent, and Rock outcrop makes up 15 percent. Other soils make up the rest. The Bledsoe and Caneyville soils and Rock outcrop are in a regular pattern, but they were not mapped separately because of present and anticipated uses. The mapped areas are long, winding bands on hillsides and are 10 to several hundred acres in size.

Typically, the surface layer of the Bledsoe soil is dark brown silt loam about 5 inches thick. The subsoil, which extends to a depth of about 52 inches, is brown silty clay loam in the upper part and brown silty clay, clay, and gravelly silty clay in the middle and lower parts. The substratum to a depth of about 70 inches is brown gravelly silty clay loam.

The Bledsoe soil is high in natural fertility and moderate in organic matter content. It is medium acid to mildly alkaline. Permeability is moderately slow, and the available water capacity is high. The root zone is deep and is easily penetrated by plant roots. Depth to limestone bedrock is more than 5 feet. The subsoil is plastic and has a moderate shrink-swell potential.

Typically, the surface layer of the Caneyville soil is dark grayish brown silt loam about 2 inches thick. The subsurface layer is brown silt loam about 3 inches thick. The subsoil, which extends to a depth of about 26 inches, is strong brown silty clay loam in the upper part and yellowish red and dark yellowish brown clay in the lower part. Limestone bedrock is at a depth of 26 inches.

The Caneyville soil is medium in natural fertility and low in organic matter content. It is strongly acid to neutral in the A horizon and in the upper part of the subsoil and medium acid to mildly alkaline in the lower part of the subsoil and in the substratum. Permeability is moderately slow, and the available water capacity is moderate. The root zone is moderately deep, but penetration by some plant roots may be restricted by the clayey subsoil. Depth to bedrock ranges from 20 to 40 inches.

Rock outcrop typically consists of limestone bluffs near the hilltops. The bluffs range in height from 10 to 50 feet. Limestone bedrock is also exposed in scattered areas above and below the bluffs, and in some areas there are small bands of sandstone outcrop above the limestone bluffs.

Included in mapping are small areas of Berks, Lily, Steinsburg, Rigley, and Cranston soils and areas of deep colluvial soils that have a redder subsoil than is typical for Bledsoe soils. In some areas, at the head of drainageways, there are few or no limestone bluffs, and the soil material is mostly limestone flagstones and exposed bedrock. The areas of included soils generally are less than 10 acres in size.

The soils in this association are used mainly as woodland, and in some areas they are in pasture. These soils are not suited to row crops because the steep slopes and rock outcrops limit the use of equipment. Erosion is a very severe hazard.

These soils are poorly suited to hay and pasture. Rock outcrops and the steep slopes limit the use of machinery in establishing and maintaining adequate pasture cover. Overgrazing should be avoided in areas used for pasture because it reduces the stand of desirable grasses and legumes and results in excessive soil erosion. If pasture renovation is necessary, grasses and legumes that

Figure 8.—Typical landscape in the Bledsoe-Caneyville-Rock outcrop association, steep.

provide good cover and require the least amount of maintenance should be selected.

These soils are well suited to use as woodland. Productivity is very high on the Bledsoe soil; it is high on the north aspect of the Caneyville soil and moderately high on the south aspect. Yellow-poplar, black walnut, eastern white pine, white ash, and northern red oak are the most suitable trees for Bledsoe soil; eastern redcedar, Virginia pine, and eastern white pine are suitable for Caneyville soil on the south aspect of the slope; and yellow-poplar, black walnut, and Virginia pine are suited to Caneyville soil on the north aspect. Erosion is a severe hazard, and equipment use is severely limited. Plant competition on Bledsoe soil is a management concern.

These soils are suited to use as habitat for woodland wildlife.

These soils are poorly suited to most urban uses because of their steep slopes, rock outcrops, and clayey subsoil.

These soils are in capability subclass VIIe. The woodland suitability group for the Bledsoe soil is 1r. The woodland suitability group for the Caneyville soil is 2x on the north aspect and 3x on the south aspect.

CaC—Caneyville silt loam, 6 to 20 percent slopes. This is a moderately deep, well drained, sloping to moderately steep soil on ridgetops and hillsides in the northern and western parts of the county. The slopes are

linear or convex. Some sloping areas are karst. The mapped areas are 2 to 150 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 2 inches thick. The subsurface layer, which extends to a depth of about 5 inches, is brown silt loam. The subsoil, which extends to a depth of about 26 inches, is strong brown silty clay loam in the upper part and yellowish red and dark yellowish brown clay in the lower part. Limestone bedrock is at a depth of 26 inches.

This soil is medium in natural fertility and moderate in organic matter content. It is strongly acid to neutral in the upper part of the subsoil and medium acid to mildly alkaline in the lower part. Permeability is moderately slow, and the available water capacity is moderate. This soil has good tilth and can be worked within a moderate range of moisture content. The root zone is moderately deep, but penetration by some plant roots may be restricted by the clayey subsoil. Depth to bedrock ranges from 20 to 40 inches. This soil has a moderate shrink-swell potential.

Included with this soil in mapping are small areas of Hagerstown, Latham, and Wernock soils. Also included are areas of soils that have a red or olive subsoil and soils that are severely eroded and have a clayey surface layer. The included soils make up about 10 percent of this map unit, but individual areas generally are less than 2 acres in size.

This soil is used mainly for pasture and hay and as woodland. In some small areas it is used for row crops.

This soil is suited to row crops, but it is subject to severe erosion if it is cultivated. Crops respond favorably to lime and fertilizer.

This soil is suitable for hay and pasture, and moderate yields can be obtained if it is properly managed. Plants that provide adequate forage and satisfactory ground cover should be selected. The pasture should be renovated frequently enough to maintain the desired species. Applications of fertilizer, proper stocking rates, rotation grazing, and control of undesirable vegetation are some of the chief management needs.

This soil is suited to use as woodland, and productivity is moderately high. Yellow-poplar, black oak, and eastern redcedar are the most suitable species. The hazard of erosion, equipment limitations, seedling mortality, and plant competition are management concerns.

This soil is suited to use as habitat for wildlife.

This soil is poorly suited to most urban uses because of its slow permeability, slope, moderate depth to bedrock, low strength, moderate shrink-swell potential, and clayey subsoil. Good design and careful installation can overcome some of these limitations.

This soil is in capability subclass IVe. The woodland suitability group is 3c.

CbD—Caneyville-Rock outcrop complex, 12 to 30 percent slopes. This complex consists of moderately deep, well drained Caneyville soil and limestone Rock outcrop on sloping to steep ridgetops and hillsides in the northern and western parts of the county. The slopes are linear or convex. Caneyville silt loam makes up about 70 percent of each mapped area, Rock outcrop makes up 20 percent, and other soils make up the rest. The Caneyville soil and Rock outcrop are in areas so intermingled that it was not practical to map them separately. The mapped areas are 5 to 300 acres in size.

Typically, the surface layer of the Caneyville soil is dark grayish brown silt loam about 2 inches thick. The subsurface layer is brown silt loam about 3 inches thick. The subsoil, which extends to a depth of about 26 inches, is strong brown silty clay loam in the upper part and yellowish red and dark yellowish brown clay in the lower part. Limestone bedrock is at a depth of 26 inches.

This soil is medium in natural fertility and moderate in organic matter content. It is strongly acid to neutral in the upper part of the subsoil and medium acid to moderately alkaline in the lower part of the subsoil and in the substratum. Permeability is moderately slow, and the available water capacity is moderate. Tilth is poor because of the scattered rock outcrops. The root zone is moderately deep, and root penetration may be restricted by the clayey subsoil. Depth to bedrock ranges from 20 to 40 inches.

Typically, Rock outcrop is exposed limestone bedrock. Areas of Rock outcrop are scattered throughout the map unit.

Included in mapping are small areas of Latham and Wernock soils. Also included are small areas of soils that have a red or olive subsoil and areas of soils that are severely eroded and have a clayey surface layer. The areas of included soils generally are less than 5 acres in size.

The Caneyville soil is used mainly as woodland. In some of the less sloping areas it is used as pasture (fig. 9). The soil is poorly suited to row crops because of the severe hazard of erosion and the rock outcrops.

The soil is not suited to pasture and hay because of the severe hazard of erosion and the rock outcrops. However, in areas where the rock outcrops are widely spaced, the soil is used for hay and pasture. Maintenance of the desired grasses and legumes is extremely difficult. Grasses and legumes that produce good plant cover and require the least amount of maintenance should be selected for use in areas that are suited to pasture.

The soil is suited to use as woodland, and productivity is high to moderately high. Yellow-poplar, black walnut, and Virginia pine are the most suitable trees for the north aspect of the slope. Eastern redcedar, Virginia pine, and eastern white pine are suited to the south aspect. The severe erosion hazard, equipment limitations, and seedling mortality are management concerns.

Figure 9.—Pasture and woodland in an area of Caneyville-Rock outcrop complex, 12 to 30 percent slopes.

The soil is suited to use as habitat for woodland wildlife.

The soil is poorly suited to most urban uses because of the moderate depth to bedrock, rock outcrops, the clayey subsoil, and low strength.

This soil is in capability subclass VIs. The woodland suitability group is 2x on the north aspect and 3x on the south aspect.

Co—Cotaco loam. This is a deep, moderately well drained, nearly level soil on stream terraces and alluvial fans throughout the county. The slopes range from 0 to 4 percent and are smooth or slightly convex. The mapped areas are 2 to 95 acres in size.

Typically, the surface layer is brown loam about 10 inches thick. The subsoil, which extends to a depth of about 38 inches, is brown and light yellowish brown loam in the upper part and brownish yellow sandy clay loam in the lower part. The substratum to a depth of about 60 inches is yellowish brown clay loam that has mottles in shades of brown and gray.

This soil is medium in natural fertility and low in organic matter content. It is strongly acid to extremely acid throughout except in areas that have been treated with lime. Permeability is moderate, and the available water capacity is high. This soil has good tilth and can be worked within a wide range of moisture content. The root zone is deep and is easily penetrated by plant roots. This soil is subject to rare flooding. It is saturated in

winter and spring because it has a seasonal high water table at a depth of 1.5 to 2.5 feet.

Included in mapping are small areas of Morehead and Stokly soils. The included soils make up about 10 percent of this map unit, but individual areas generally are less than 2 acres in size.

This soil is used mainly for pasture and hay. In some small areas it is used for row crops.

This soil is suited to row crops, and moderate yields can be obtained if the soil is drained. Crops respond favorably to fertilizer and lime. Erosion is a slight hazard. Tile drainage is commonly used to reduce wetness. Conservation tillage, crop residue returned to the soil, cover crops, and grasses and legumes in the cropping system help maintain good tilth and the organic matter content.

This soil is suitable for hay and pasture. Plants that are adapted to wetness should be selected, and high yields can be obtained if the soil is properly managed. The pasture should be renovated frequently enough to maintain the desired species. Applications of lime and fertilizer, artificial drainage, proper stocking rates, rotation grazing, and control of undesirable vegetation are some of the chief management needs.

This soil is well suited to use as woodland, although most of it is cleared. Yellow-poplar, northern red oak, black walnut, and eastern white pine are the most suitable trees.

This soil is poorly suited to most urban uses because of wetness and the hazard of flooding. The seasonal high water table limits the use of this soil for sanitary facilities.

This soil is in capability subclass IIw. The woodland suitability group is 2o.

Cu—Cuba silt loam. This is a deep, well drained, nearly level soil on flood plains in the central and eastern parts of the county. The slopes range from 0 to 2 percent. The mapped areas are 2 to 60 acres in size.

Typically, the surface layer is brown silt loam about 10 inches thick. The subsoil, which extends to a depth of about 46 inches, is dark yellowish brown silt loam. The substratum to a depth of about 70 inches is dark yellowish brown silt loam in the upper part and dark yellowish brown stratified silt loam and fine sandy loam in the lower part.

This soil is medium in natural fertility and moderate in organic matter content. It is strongly acid or very strongly acid throughout except in areas that have been treated with lime. Permeability is moderate, and the available water capacity is high. This soil is subject to occasional flooding during the growing season, but crops are seldom damaged. The soil has good tilth and can be worked within a wide range of moisture content. The root zone is deep and is easily penetrated by plant roots.

Included with this soil in mapping are small areas of Pope, Stendal, and Whitley soils. The included soils make up about 5 percent of this map unit, but individual areas generally are less than 2 acres in size.

This soil is used mainly for pasture and hay. In many areas it is used for row crops.

This soil is well suited to row crops, and high yields can be obtained if the soil is properly managed. This soil is subject to occasional flooding, but crops are seldom damaged. Crops respond favorably to lime and fertilizer. Erosion is not a hazard. The soil can be cropped repeatedly if management practices that maintain good tilth and the organic matter content are used.

This soil is well suited to hay and pasture. Grasses and legumes are seldom damaged by flooding. Maintenance of the desired species, control of weeds, proper stocking rates, rotation grazing, and applications of lime and fertilizer are the management needs.

This soil is well suited to use as woodland, although most of it is cleared. Yellow-poplar, eastern white pine, and black walnut are the trees most suited to this soil. Plant competition is a management concern.

This soil is poorly suited to urban uses because flooding is a hazard.

This soil is in capability subclass IIw. The woodland suitability group is 1o.

Gr—Grigsby fine sandy loam. This is a deep, well drained, nearly level soil on flood plains in the north-central and south-central parts of the county. The slopes range from 0 to 2 percent. The mapped areas are 2 to 150 acres in size.

Typically, the surface layer is brown fine sandy loam about 7 inches thick. The subsoil, which extends to a depth of about 34 inches, is brown and dark yellowish brown fine sandy loam. The substratum to a depth of about 60 inches is stratified dark yellowish brown and yellowish brown fine sandy loam and loamy fine sand.

This soil is high in natural fertility and moderate in organic matter content. It is medium acid to neutral in the surface layer and subsoil and strongly acid to neutral in the substratum except in areas that have been treated with lime. Permeability is moderate or moderately rapid, and the available water capacity is high. The soil is subject to frequent flooding; however, it is generally not flooded during the growing season. It has good tilth and can be worked within a wide range of moisture content. The root zone is deep and is easily penetrated by plant roots.

Included with this soil in mapping are small areas of Pope, Nolin, and Skidmore soils. The included soils make up about 5 percent of this map unit, but individual areas generally are less than 2 acres in size.

This soil is used mainly for pasture and hay. In many areas it is in row crops.

This soil is well suited to row crops, and high yields can be obtained if the soil is properly managed. This soil is subject to frequent flooding, but crops are seldom

damaged. Crops respond favorably to lime and fertilizer. Erosion is not a hazard. This soil can be cropped year after year if management practices that maintain soil fertility and the organic matter content are used.

This soil is well suited to hay and pasture. Grasses and legumes are seldom damaged by flooding. Maintenance of the desired species, control of weeds, proper stocking rates, rotation grazing, and applications of lime and fertilizer are the management needs.

This soil is well suited to use as woodland, although most of it is cleared. Yellow-poplar, eastern white pine, and black walnut are the most suitable trees. Plant competition is a management concern.

This soil is poorly suited to most urban uses because flooding is a hazard.

This soil is in capability subclass IIw. The woodland suitability group is 1o.

HaB—Hagerstown silt loam, 2 to 6 percent slopes. This is a deep, well drained, gently sloping soil on ridgetops in the northern and western parts of the county. The slopes are smooth or convex. The mapped areas are 2 to 30 acres in size.

Typically, the surface layer is dark brown silt loam about 10 inches thick. The subsoil, which extends to a depth of 48 inches, is strong brown silty clay loam in the upper part and yellowish red clay in the lower part. The substratum, which extends to a depth of about 50 inches, is mottled, strong brown and light brownish gray clay. Limestone bedrock is at a depth of 50 inches.

This soil is high in natural fertility and moderate in organic matter content. It is strongly acid to neutral. Permeability is moderate, and the available water capacity is high. The soil has good tilth and can be worked within a wide range of moisture content. The root zone is deep and is easily penetrated by plant roots. Depth to bedrock is 40 to 54 inches or more. The shrink-swell potential is moderate.

Included with this soil in mapping are small areas of Caneyville soils and small rock outcrops or sinkholes. Also included are soils that have gray mottles in the lower part of the subsoil. The included soils make up about 10 percent of this map unit, but individual areas generally are less than 2 acres in size.

This soil is used mainly for pasture and hay. In some areas it is used for row crops.

This soil is well suited to row crops. Crops respond favorably to lime and fertilizer. Erosion is a moderate hazard if the soil is used for row crops. Contour tillage, stripcropping, conservation tillage, crop residue returned to the soil, cover crops, and grasses and legumes in the cropping system help control erosion and maintain good tilth and the organic matter content.

This soil is well suited to hay and pasture. Plants that provide adequate forage and satisfactory ground cover should be selected. The pasture should be renovated frequently enough to maintain the desired species. Applications of fertilizer, proper stocking rates, rotation grazing, and control of undesirable vegetation are some of the chief management needs.

This soil is well suited to use as woodland, although most of it is cleared. Black walnut, yellow-poplar, and eastern white pine are the most suitable trees. Plant competition is a management concern.

This soil is suitable for most urban uses. Depth to rock limits its use for sanitary facilities, and low strength limits its use for roads and streets. Good design and proper installation can overcome these limitations.

This soil is in capability subclass IIe. The woodland suitability group is 1c.

LaC—Latham silt loam, 6 to 12 percent slopes. This is a moderately deep, moderately well drained, sloping soil on ridgetops throughout the county. The slopes are linear or convex. The mapped areas are 2 to 40 acres in size.

Typically, the surface layer is brown silt loam about 6 inches thick. The subsoil, which extends to a depth of about 28 inches, is yellowish brown silty clay loam in the upper part and strong brown silty clay in the lower part. There are mottles in shades of red and gray in the lower part of the subsoil. The substratum, which extends to a depth of about 35 inches, is yellowish brown very shaly silty clay that has strong brown and light brownish gray mottles. Soft shale is at a depth of 35 inches.

This soil is low in natural fertility and organic matter content. It is strongly acid to extremely acid throughout except in areas that have been treated with lime. Permeability is slow or very slow, and the available water capacity is moderate. This soil has good tilth and can be worked within a wide range of moisture content. The root zone is moderately deep and is easily penetrated by plant roots. This soil has a seasonal high water table at a depth of 1.5 to 3.0 feet. The shrink-swell potential is moderate. Depth to bedrock ranges from 20 to 40 inches.

Included with this soil in mapping are small areas of Lily, Wernock, and Upshur soils. Also included are small areas of a soil that has a red subsoil and soils that are severely eroded and have a clayey surface layer. The included soils make up about 10 percent of this map unit, but individual areas are less than 2 acres in size.

This soil is used mainly for pasture and hay and as woodland. In some areas it is used for row crops.

This soil is suited to row crops, but it is subject to severe erosion if it is cultivated. Crops respond favorably to lime and fertilizer. If this soil is cultivated, contour tillage, stripcropping, conservation tillage, crop residue returned to the soil, cover crops, and grasses and legumes in the cropping system help control erosion and maintain good tilth and the organic matter content.

This soil is suitable for hay and pasture, and moderate yields can be obtained if the soil is properly managed.

The moderate depth of the root zone and the lack of moisture in dry seasons limit production. Plants that are adapted to dry conditions, produce adequate forage, and provide satisfactory ground cover should be selected. The pasture should be renovated frequently enough to maintain the desired species. Applications of lime and fertilizer, proper stocking rates, rotation grazing, and control of undesirable vegetation are some of the chief management needs.

This soil is suited to use as woodland, and moderate yields can be obtained if proper management practices are used. Black oak, eastern white pine, and Virginia pine are suitable species. Plant competition is a management concern.

This soil is poorly suited to most urban uses because of its slow permeability, depth to rock, and slope. Good design and proper installation can overcome some of these limitations.

This soil is in capability subclass IIIe. The woodland suitability group is 3c.

LaD—Latham silt loam, 12 to 20 percent slopes. This is a moderately deep, moderately well drained, moderately steep soil on ridgetops and the upper part of hillsides throughout the county. The slopes are smooth or convex. The mapped areas are 2 to 75 acres in size.

Typically, the surface layer is brown silt loam about 6 inches thick. The subsoil, which extends to a depth of about 28 inches, is yellowish brown silty clay loam in the upper part and strong brown silty clay in the lower part. There are mottles in shades of red and gray in the lower part of the subsoil. The substratum, which extends to a depth of about 35 inches, is yellowish brown very shaly silty clay that has strong brown and light brownish gray mottles. Soft shale is at a depth of 35 inches.

This soil is low in natural fertility and organic matter content. It is strongly acid to extremely acid throughout except in areas that have been treated with lime. Permeability is slow or very slow, and the available water capacity is moderate. This soil has good tilth and can be worked within a wide range of moisture content. The root zone is moderately deep and is easily penetrated by plant roots. This soil has a seasonal high water table at a depth of 1.5 to 3.0 feet. The shrink-swell potential is moderate. Depth to bedrock ranges from 20 to 40 inches.

Included with this soil in mapping are small areas of Lily, Wernock, and Upshur soils. Also included are soils that have a red subsoil and soils that are severely eroded and have a clayey surface layer. The included soils make up about 10 percent of this map unit, but individual areas are less than 2 acres in size.

In most areas this soil is used as woodland. In some areas it is in hay and pasture, or it is used for row crops.

This soil is poorly suited to row crops. Erosion is a very severe hazard if the soil is cultivated. Crops respond favorably to lime and fertilizer. If this soil is cultivated, contour tillage, stripcropping, conservation tillage, crop residue returned to the soil, cover crops, and grasses and legumes in the cropping system help control erosion and maintain good tilth and the organic matter content.

This soil is suitable for hay and pasture, and moderate yields can be obtained if the soil is properly managed. The moderate depth of the root zone and the lack of moisture in dry seasons limit production. Plants that are adapted to dry conditions, produce adequate forage, and provide satisfactory ground cover should be selected. The pasture should be renovated frequently enough to maintain the desired species. Applications of lime and fertilizer, proper stocking rates, rotation grazing, and control of undesirable vegetation are some of the chief management needs.

This soil is suited to use as woodland, and moderate yields can be obtained if proper management practices are used. Eastern white pine, shortleaf pine, white oak, and Virginia pine are suitable trees. The erosion hazard, equipment limitations, and plant competition are management concerns.

This soil is poorly suited to most urban uses because of its slow permeability, depth to bedrock, and slope. The moderately steep slope is a difficult limitation to overcome. The slow permeability of the subsoil limits the use of this soil as septic tank absorption fields.

This soil is in capability subclass IVe. The woodland suitability group is 3c.

LsE—Latham-Shelocta silt loams, 20 to 30 percent slopes. The soils in this complex are moderately deep and deep, moderately well drained and well drained, and steep. They are on hillsides throughout the county. The Latham soil is on the upper part of convex slopes, and the Shelocta soil is on the lower part of linear slopes and in coves. Latham silt loam makes up 45 percent of each mapped area, Shelocta silt loam makes up 40 percent, and other soils make up the rest. The Latham and Shelocta soils are in areas so intermingled that it was not practical to map them separately. The mapped areas are 5 to several hundred acres in size and range from narrow bands to areas that include entire hillsides.

Typically, the surface layer of the Latham soil is brown silt loam about 6 inches thick. The subsoil, which extends to a depth of about 28 inches, is yellowish brown silty clay loam in the upper part and strong brown silty clay in the lower part. There are mottles in shades of gray and red in the lower part of the subsoil. The substratum, which extends to a depth of about 35 inches, is yellowish brown very shaly silty clay that has strong brown and light brownish gray mottles. Soft shale is at a depth of 35 inches.

The Latham soil is low in natural fertility and in content of organic matter. It is strongly acid to extremely acid throughout except in areas that have been treated with

lime. Permeability is slow or very slow, and the available water capacity is moderate. The root zone is moderately deep and is easily penetrated by plant roots. This soil has a seasonal high water table at a depth of 1.5 to 3.0 feet. The shrink-swell potential is moderate. Depth to soft bedrock ranges from 20 to 40 inches.

Typically, the surface layer of the Shelocta soil is dark brown silt loam about 6 inches thick. The subsoil, which extends to a depth of about 64 inches, is strong brown and yellowish brown silty clay loam and gravelly silty clay loam. The substratum to a depth of about 76 inches is yellowish brown very gravelly silty clay loam that has light gray mottles.

The Shelocta soil is medium in natural fertility and moderate in organic matter content. It is strongly acid or very strongly acid throughout except in areas that have been treated with lime. Permeability is moderate, and the available water capacity is high. The root zone is deep and is easily penetrated by plant roots.

Included in mapping are small areas of Lily, Steinsburg, Upshur, and Wernock soils on ridgetops and the upper part of hillsides and Cranston and Vandalia soils on the lower part of hillsides. Also included is a deep colluvial soil that has more sand than is typical for Shelocta soils and soils that are severely eroded and have a silty clay loam surface layer. The areas of the included soils generally are less than 5 acres in size.

In most areas these soils are used as woodland, but in many areas they are in pasture. These soils are poorly suited to row crops because the steep slopes limit the use of machinery, and the hazard of erosion is very severe.

These soils are suitable for pasture, and moderate yields can be obtained if they are properly managed. Grasses and legumes that produce good plant cover and require the least amount of maintenance should be selected. Overgrazing should be avoided because it reduces the stand of desirable grasses and legumes and results in excessive soil erosion.

These soils are well suited to use as woodland. The productivity of Latham soil is moderately high on the north- and east-facing slopes and moderate on the south- and west-facing slopes. The productivity of Shelocta soil is high on the north- and east-facing slopes and moderately high on the south- and west-facing slopes. The most suitable trees for the Latham soil on all aspects and for the Shelocta soil on the south aspect of the slope are eastern white pine, shortleaf pine, Virginia pine, and white oak. Yellow-poplar, black walnut, northern red oak, eastern white pine, and Virginia pine are suitable for the Shelocta soil on the north aspect. Erosion is a hazard, and the use of equipment is restricted. Plant competition is a management concern. Seedling mortality is a management concern on the south aspect.

These soils are suited to use as habitat for wildlife.

The soils are poorly suited to urban uses. Steep slopes are a difficult limitation to overcome.

These soils are in capability subclass VIe. The woodland suitability group of the Latham soil is 3c on the north aspect and 4c on the south aspect. The woodland suitability group of the Shelocta soil is 2r on the north aspect and 3r on the south aspect.

LTF—Latham-Shelocta association, steep. The soils in this association are moderately deep and deep, moderately well drained and well drained, and steep. They are on hillsides throughout the county (fig. 10). The Latham soil is moderately deep. It is on the upper part of convex slopes and on narrow ridgetops. The Shelocta soil is deep. It is on the lower part of hillsides and in coves. The slopes range from 30 to 50 percent.

Latham silt loam makes up about 45 percent of each mapped area, Shelocta silt loam makes up about 40 percent, and other soils and rock outcrops make up the rest. The Latham and Shelocta soils are in a regular pattern, but they were not mapped separately because of present and anticipated uses. The mapped areas are 10 to several hundred acres in size and commonly include entire hillsides.

Typically, the surface layer of the Latham soil is brown silt loam about 6 inches thick. The subsoil, which extends to a depth of about 28 inches, is yellowish brown silty clay loam in the upper part and strong brown silty clay in the lower part. There are mottles in shades of gray and red in the lower part of the subsoil. The substratum, which extends to a depth of 35 inches, is yellowish brown very shaly silty clay that has strong brown and light brownish gray mottles. Soft shale is at a depth of 35 inches.

The Latham soil is low in natural fertility and organic matter content. It is strongly acid to extremely acid. Permeability is slow or very slow, and the available water capacity is moderate. The root zone is moderately deep and is easily penetrated by plant roots. This soil has a seasonal high water table at a depth of 1.5 to 3.0 feet. The subsoil is plastic, and it has a moderate shrink-swell potential. Depth to soft bedrock ranges from 20 to 40 inches.

Typically, the surface layer of the Shelocta soil is brown silt loam about 6 inches thick. The subsoil, which extends to a depth of about 64 inches, is strong brown and yellowish brown silty clay loam and gravelly silty clay loam. The substratum to a depth of about 76 inches is yellowish brown very gravelly silty clay loam that has light gray mottles.

The Shelocta soil is medium in natural fertility and moderate in organic matter content. It is strongly acid or very strongly acid. Permeability is moderate, and the available water capacity is high. The root zone is deep and is easily penetrated by plant roots.

Included in mapping are small areas of Lily, Steinsburg, Upshur, and Wernock soils on ridgetops and on the upper part of hillsides and Cranston and Vandalia

Figure 10.—Typical landscape in the Latham-Shelocta association, steep.

soils on the lower part of hillsides and in coves. Also included are areas of a deep colluvial soil that has more sand than is typical for Shelocta soil and areas of a soil that is severely eroded and has a silty clay loam surface layer. In some included areas the soils are stony and in other areas there are rock outcrops. The areas of the included soils and rock outcrops generally are less than 10 acres in size.

The soils making up this association are used mainly as woodland, but in some areas they are in pasture. The soils are not suited to row crops. The steep slopes restrict the use of machinery and make erosion a very severe hazard.

These soils are poorly suited to hay and pasture. In most areas, the steep slopes limit the use of machinery in establishing and maintaining adequate pasture cover. Overgrazing should be avoided in areas that are used for pasture because it reduces the stand of desirable grasses and legumes and results in excessive soil erosion. If renovation is necessary, grasses and legumes that produce good cover and require the least amount of maintenance should be selected.

The soils are suited to use as woodland. The productivity of the Latham soil is moderately high on north- and east-facing slopes and moderate on south- and west-facing slopes. The productivity of the Shelocta soil is high on the north aspect of the slope and moderately high on the south aspect. The most suitable trees for the Latham soil on all aspects and for the Shelocta soil on the south aspect are eastern white pine,

shortleaf pine, Virginia pine, and white oak. Yellow-poplar, black walnut, eastern white pine, and northern red oak are suitable for the Shelocta soil on the north aspect. Erosion is a hazard, and the use of equipment is restricted. Plant competition is a management concern. Seedling mortality is a management concern on the south aspect.

These soils are suited to use as habitat for woodland wildlife.

The soils are poorly suited to urban uses because of the steep slopes.

The soils are in capability subclass VIIe. The woodland suitability group of the Latham soil is 3c on the north aspect and 4c on the south aspect. The woodland suitability group of the Shelocta soil is 2r on the north aspect and 3r on the south aspect.

LyD—Lily fine sandy loam, 6 to 20 percent slopes. This is a moderately deep, well drained, sloping to moderately steep soil on ridgetops throughout the county. The slopes are smooth or convex. The mapped areas are long and narrow and range in size from 2 to 50 acres.

Typically, the surface layer is dark grayish brown fine sandy loam about 3 inches thick. The subsurface layer, to a depth of about 8 inches, is light yellowish brown fine sandy loam. The subsoil, which extends to a depth of about 32 inches, is light yellowish brown loam in the upper part and yellowish brown sandy clay loam, clay loam, and gravelly sandy clay loam in the lower part. Sandstone is at a depth of 32 inches.

This soil is low in natural fertility and organic matter content. It is strongly acid to extremely acid throughout except in areas that have been treated with lime. Permeability is moderately rapid, and the available water capacity is moderate. The soil has good tilth and can be worked within a wide range of moisture content. The root zone is moderately deep and is easily penetrated by plant roots. Depth to bedrock ranges from 20 to 40 inches.

Included in mapping are small areas of Wernock, Latham, and Steinsburg soils. Also included are areas of soils that are less than 20 inches deep to bedrock and areas that include sandstone outcrops. The included soils and rock outcrops make up about 10 percent of this map unit, but individual areas generally are less than 2 acres in size.

This soil is used mainly as woodland and for pasture and hay. In a few small areas it is used for row crops.

This soil is poorly suited to row crops. Erosion is a very severe hazard. Crops respond favorably to lime and fertilizer. Controlling erosion and reducing runoff are necessary if this soil is cultivated. Contour tillage, stripcropping, conservation tillage, crop residue returned to the soil, cover crops, and grasses and legumes in the cropping system help control erosion and maintain good tilth and the organic matter content.

This soil is suited to pasture and hay, and moderate yields can be obtained if the soil is properly managed. The moderately deep root zone and lack of moisture in dry seasons limit production. Plants that are adapted to dry conditions, produce adequate forage, and provide satisfactory ground cover should be selected. The pasture should be renovated frequently enough to maintain the desired species. Applications of lime and fertilizer, proper stocking rates, rotation grazing, and control of undesirable species are some of the chief management needs.

This soil is suited to use as woodland, and productivity is moderate. Shortleaf pine, Virginia pine, and white oak are the most suitable trees. Erosion is a hazard, and the use of equipment is limited.

This soil is suitable for some urban uses, but the moderate depth to rock severely limits its use as septic tank absorption fields and as sites for dwellings with basements. The moderately steep slope is a difficult limitation to overcome.

This soil is in capability subclass IVe. The woodland suitability group is 4r.

Mc—McGary silt loam. This is a deep, somewhat poorly drained, nearly level soil on low, broad terraces of major streams in the county. The slopes range from 0 to 2 percent and are smooth to slightly concave. The mapped areas are 2 to 200 acres in size.

Typically, the surface layer is brown silt loam about 9 inches thick. The subsoil, which extends to a depth of about 42 inches, is yellowish brown silty clay loam in the upper part and mottled, light brownish gray and yellowish brown silty clay loam and silty clay in the lower part. The substratum to a depth of about 62 inches is gray and yellowish brown silty clay.

This soil is low in natural fertility and in organic matter content. It is medium acid or strongly acid in the solum and medium acid to neutral in the C horizon. Permeability is slow, and the available water capacity is high. This soil can be worked within a moderate range of moisture content. The subsoil is plastic and sticky and has a high shrink-swell potential. This soil is subject to rare flooding. A seasonal high water table is at a depth of 1 foot to 3 feet. The root zone is deep and is easily penetrated by plant roots.

Included with this soil in mapping are small areas of Morehead and Stendal soils. The included soils make up about 10 percent of this map unit, but individual areas generally are less than 2 acres in size.

This soil is used mainly for pasture and hay. In some areas it is used for row crops.

This soil is suitable for row crops if it is drained, and moderate yields can be obtained. Crops respond to fertilizer and lime. Erosion is a slight hazard. Open ditch drainage, grassed waterways, and tile drainage are used

to reduce wetness, which is caused by slow surface runoff and slow permeability. In areas that are drained the soil is used mainly for soybeans, corn, and small grains. Crops may be damaged by wetness in some years. Conservation tillage, crop residue returned to the soil, cover crops, and grasses and legumes in the cropping system help maintain good tilth and the organic matter content.

This soil is suited to hay and pasture. Plants that are adapted to wetness should be selected, and moderate yields can be obtained if the soil is properly managed. The pasture should be renovated frequently enough to maintain the desired species. Applications of lime and fertilizer, drainage, proper stocking rates, rotation grazing, and control of undesirable vegetation are some of the chief management needs.

This soil is suited to use as woodland although most of it is cleared. Yellow-poplar, sweetgum, eastern white pine, and red maple are suitable trees. Use of equipment is limited, and plant competition is a management concern.

This soil is poorly suited to urban uses because of wetness, the shrink-swell potential, the clayey subsoil, and the hazard of flooding.

This soil is in capability subclass IIIw. The woodland suitability group is 3w.

MoA—Monongahela loam, 0 to 2 percent slopes. This is a deep, moderately well drained, nearly level soil on low stream terraces throughout the county. The slopes are smooth or slightly convex. The mapped areas are 2 to 50 acres in size.

Typically, the surface layer is brown loam about 11 inches thick. The subsoil, which extends to a depth of about 48 inches, is yellowish brown loam in the upper part. The lower part is a firm, brittle, compact fragipan that is light yellowish brown loam and clay loam that has mottles in shades of brown and gray. The substratum to a depth of about 62 inches is mottled, yellowish brown and light gray clay loam.

This soil is low in natural fertility and in organic matter content. It is strongly acid or very strongly acid throughout except in areas that have been treated with lime. Permeability is moderate above the fragipan and moderately slow or slow in the fragipan. The available water capacity is moderate. This soil is subject to rare flooding. The soil is seasonally saturated because of a perched water table above the fragipan at a depth of 1.5 to 3.0 feet. The soil has good tilth and can be worked within a moderate range of moisture content. The thickness of the root zone and depth to the fragipan range from 24 to 30 inches.

Included with this soil in mapping are small areas of Allegheny, Whitley, Morehead, and McGary soils. Also included are areas at the base of foot slopes where the slope is more than 2 percent. The included areas make up about 5 percent of this map unit, but individual areas generally are less than 2 acres in size.

This soil is used mainly for pasture and hay. In some small areas it is used for row crops.

This soil is suited to row crops, but the fragipan restricts drainage and rooting depth. Crops respond favorably to fertilizer and lime. Crop residue returned to the soil, cover crops, and grasses and legumes in the cropping system help maintain good tilth and the organic matter content.

This soil is suited to pasture and hay, and moderate yields can be obtained if the soil is properly managed. The fragipan restricts the depth of the rooting zone and limits production during dry seasons. Plants that produce adequate forage and provide satisfactory ground cover should be selected. The pasture should be renovated frequently enough to maintain the desired species. Applications of lime and fertilizer, proper stocking rates, rotation grazing, and control of undesirable vegetation are some of the chief management needs.

This soil is suited to use as woodland, although most areas have been cleared. Eastern white pine, shortleaf pine, black oak, and white oak are the most suitable trees. Plant competition is a management concern.

This soil is suitable for some urban uses, but wetness, low strength, and the hazard of rare flooding restrict the use of the soil. The brittle, compact fragipan percs slowly and limits the use of this soil as septic tank absorption fields.

This soil is in capability subclass IIw. The woodland suitability group is 3o.

MoB—Monongahela loam, 2 to 6 percent slopes. This is a deep, moderately well drained, gently sloping soil on high stream terraces in the south-central part of the county. The slopes are smooth or slightly convex. The mapped areas are 2 to 50 acres in size.

Typically, the surface layer is brown loam about 11 inches thick. The subsoil, which extends to a depth of about 48 inches, is yellowish brown loam in the upper part. The lower part is a firm, brittle, compact fragipan that is light yellowish brown loam and clay loam that has mottles in shades of brown and gray. The substratum to a depth of about 62 inches is mottled, yellowish brown and light gray clay loam.

This soil is low in natural fertility and in organic matter content. It is strongly acid or very strongly acid throughout except in areas that have been treated with lime. Permeability is moderate above the fragipan and moderately slow or slow in the fragipan. The available water capacity is moderate. The soil is seasonally saturated because of a perched water table above the fragipan at a depth of 1.5 to 3.0 feet. It has good tilth and can be worked within a moderate range of moisture content. The thickness of the root zone and depth to the fragipan range from 24 to 30 inches.

Included with this soil in mapping are small areas of Allegheny and Tilsit soils. The included soils make up about 5 percent of this map unit, but individual areas generally are less than 2 acres in size.

This soil is used mainly for pasture and hay. In some small areas it is used for row crops.

This soil is suited to row crops, but the fragipan restricts drainage and the rooting depth. Crops respond favorably to fertilizer and lime. Erosion is a moderate hazard if this soil is used for cultivated crops. Contour tillage, stripcropping, conservation tillage, crop residue returned to the soil, cover crops, and grasses and legumes in the cropping system help control erosion and maintain tilth and the organic matter content.

This soil is suited to pasture and hay, and moderate yields can be obtained if the soil is properly managed. The fragipan restricts the rooting depth and limits production during dry seasons. Plants that produce adequate forage and provide satisfactory ground cover should be selected. The pasture should be renovated frequently enough to maintain the desired species. Applications of lime and fertilizer, proper stocking rates, rotation grazing, and control of undesirable vegetation are some of the chief management needs.

This soil is suited to use as woodland although most areas have been cleared. Eastern white pine, shortleaf pine, black oak, and white oak are the most suitable trees. Plant competition is a management concern.

This soil is suitable for some urban uses, but wetness, slow permeability, and low strength are severe limitations. The brittle, compact fragipan percs slowly and limits the use of this soil as septic tank absorption fields.

This soil is in capability subclass IIe. The woodland suitability group is 3o.

Mr—Morehead silt loam. This is a deep, somewhat poorly drained to moderately well drained, nearly level soil on stream terraces and alluvial fans throughout the county. The slopes range from 0 to 40 percent and are smooth to slightly concave. The mapped areas are 2 to 25 acres in size.

Typically, the surface layer is yellowish brown silt loam about 10 inches thick. The subsoil, which extends to a depth of about 48 inches, is yellowish brown silt loam in the upper part and yellowish brown silty clay loam in the lower part. There are mottles in shades of brown and gray. The substratum to a depth of about 72 inches is mottled, brownish yellow, yellowish brown, and light gray silty clay loam.

This soil is medium in natural fertility and low in organic matter content. It is strongly acid or very strongly acid throughout except in areas that have been treated with lime. Permeability is moderate, and the available water capacity is high. This soil has good tilth and can be worked within a moderate range of moisture content. It is saturated in winter and spring because of a seasonal high water table at a depth of 0.5 foot to 1.5 feet. The soil is subject to rare flooding. The root zone is deep and is easily penetrated by plant roots.

Included with this soil in mapping are small areas of Cotaco, Monongahela, and McGary soils. Also included are small areas of a soil that has more clay in the subsoil than is typical for Morehead soils. The included soils make up about 10 percent of this map unit, but individual areas generally are less than 2 acres in size.

This soil is used mainly for pasture and hay. In some areas it is used for row crops.

This soil is suitable for row crops if it is drained, and moderately high yields can be obtained if the soil is properly managed. Crops respond favorably to fertilizer and lime. Erosion is a slight hazard. Tile drainage is used commonly to reduce wetness. Conservation tillage, crop residue returned to the soil, cover crops, and grasses and legumes in the cropping system help maintain the organic matter content.

This soil is suited to hay and pasture. Plants that are adapted to wetness should be selected, and high yields can be obtained if the soil is properly managed. The pasture should be renovated frequently enough to maintain the desired species. Applications of lime and fertilizer, artificial drainage, proper stocking rates, rotation grazing, and control of undesirable vegetation are some of the chief management needs.

This soil is well suited to use as woodland, although most areas have been cleared. Yellow-poplar, shortleaf pine, sweetgum, and pin oak are the most suitable trees. The use of equipment is limited, and plant competition is a management concern.

This soil is poorly suited to most urban uses because of wetness and the hazard of flooding. The high water table limits the use of this soil as septic tank absorption fields.

This soil is in capability subclass IIw. The woodland suitability group is 2w.

Ne—Newark silt loam. This is a deep, somewhat poorly drained, nearly level soil on flood plains along major streams and their tributaries in the western and eastern parts of the county. The slopes range from 0 to 2 percent. The mapped areas are 2 to 45 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. The subsoil extends to a depth of about 32 inches. In the upper part it is brown silt loam, and in the lower part it is grayish brown silt loam that has light brownish gray and yellowish brown mottles. The substratum to a depth of about 60 inches is light brownish gray silt loam that has grayish brown and yellowish brown mottles.

This soil is high in natural fertility and moderate in organic matter content. It is medium acid to mildly alkaline. Permeability is moderate, and the available water capacity is high. The soil is saturated in winter and spring because of a seasonal high water table at a depth

of 0.5 foot to 1.5 feet. It is subject to frequent flooding, but crops are seldom damaged by floodwater. The root zone is deep and is easily penetrated by plant roots.

Included with this soil in mapping are small areas of Nolin and Grigsby soils. Also included are small areas of a soil that has a loamy subsoil and substratum. The included soils make up about 10 percent of this map unit, but individual areas generally are less than 2 acres in size.

This soil is used mainly for pasture and hay. In some areas it is used for row crops.

This soil is suited to row crops if it is drained, and high yields can be obtained if it is properly managed. Flooding and wetness may limit crop production. Tile drainage is used commonly to reduce wetness. Crops respond favorably to lime and fertilizer. Erosion is not a hazard. This soil can be cropped year after year if management practices that maintain soil fertility, tilth, and the organic matter content are used.

This soil is suitable for hay and pasture. Some crops may be damaged by flooding. Plants that are adapted to wetness should be selected. The pasture should be renovated frequently enough to maintain the desired species. Applications of lime and fertilizer, artificial drainage, proper stocking rates, rotation grazing, and control of undesirable vegetation are some of the chief management needs.

This soil is well suited to use as woodland, although most areas have been cleared. Eastern cottonwood, sweetgum, and eastern white pine are the most suitable trees. Equipment use is limited, and plant competition is a management concern.

This soil is poorly suited to urban uses because of wetness and the hazard of flooding.

This soil is in capability subclass 2w. The woodland suitability group is 1w.

No—Nolin silt loam. This is a deep, well drained, nearly level soil on flood plains along major streams in the western part of the county. The slopes range from 0 to 2 percent. The mapped areas are 2 to 65 acres in size.

Typically, the surface layer is dark brown silt loam about 10 inches thick. The subsoil to a depth of about 55 inches is brown and dark yellowish brown silt loam. The substratum to a depth of about 65 inches is dark yellowish brown silt loam.

This soil is high in natural fertility and moderate in organic matter content. It is medium acid to moderately alkaline. Permeability is moderate, and the available water capacity is high. The soil is subject to occasional flooding, but crops are seldom damaged. This soil has good tilth and can be worked within a wide range of moisture content. The root zone is deep and is easily penetrated by plant roots.

Included with this soil in mapping are small areas of Newark and Grigsby soils. The included soils make up about 10 percent of this map unit, but individual areas generally are less than 2 acres in size.

This soil is used mainly for pasture and hay. In many areas it is in row crops.

This soil is well suited to row crops, and high yields can be obtained if the soil is properly managed. Crops are seldom damaged by flooding. Crops respond favorably to lime and fertilizer. Erosion is not a hazard. This soil can be cropped year after year if management practices that maintain soil fertility, tilth, and the organic matter content are used.

This soil is well suited to hay and pasture. Crops are seldom damaged by flooding. Maintenance of the desired species, control of weeds, proper stocking rates, rotation grazing, and applications of lime and fertilizer are management needs.

This soil is well suited to use as woodland. Yellow-poplar, eastern white pine, eastern cottonwood, and black walnut are the most suitable trees. Plant competition is a management concern.

This soil is poorly suited to urban uses because flooding is a hazard.

This soil is in capability subclass IIw. The woodland suitability group is 1o.

Pm—Pits-Dumps complex. This complex consists of small, nearly level to steep areas in the northwestern part of the county. Pits make up about 50 to 75 percent of each mapped area, Dumps make up 25 to 50 percent, and included soils make up the rest. Pits and Dumps are in areas so intermingled that it was not practical to map them separately at the scale selected for mapping. The mapped areas vary in shape and are 2 to 150 acres in size.

Typically, Pits are quarries or open excavations from which the soil and commonly the underlying material have been removed, exposing limestone bedrock. The excavations are 10 to 200 feet deep and have vertical walls. There are large active quarries near Carter City and Olive Hill.

Typically, Dumps range from nearly level areas to steep piles of waste rock or general refuse from limestone mining. They are incapable of supporting plants without major reclamation.

Included in mapping are small areas of Bledsoe and Caneyville soils. The included soils make up about 10 percent of this map unit, but the individual areas generally are less than 2 acres in size.

This unit was not assigned to a capability class or to a woodland suitability group.

Po—Pope fine sandy loam. This is a deep, well drained, nearly level soil on flood plains of major streams and their tributaries throughout the county. The slopes range from 0 to 2 percent. The mapped areas are 2 to 150 acres in size.

Typically, the surface layer is brown fine sandy loam about 8 inches thick. The subsoil, which extends to a depth of about 32 inches, is brown and dark yellowish brown loam and fine sandy loam. The substratum to a depth of about 62 inches is yellowish brown sandy loam.

This soil is medium in natural fertility and moderate in organic matter content. It is strongly acid to extremely acid throughout except in areas that have been treated with lime. Permeability is moderate or moderately rapid, and the available water capacity is high. The soil is subject to frequent flooding, but crops are seldom damaged. The soil has good tilth and can be worked within a wide range of moisture content. The root zone is deep and is easily penetrated by plant roots.

Included with this soil in mapping are small areas of Cuba, Stendal, and Stokly soils. Also included are areas where the slope is more than 2 percent and areas adjacent to stream banks where the soils have more sand throughout the profile than is typical for Pope soils. The included soils make up about 10 percent of this map unit, but individual areas generally are less than 2 acres in size.

This soil is used mainly for pasture and hay. In some areas it is used for row crops.

This soil is well suited to row crops, and high yields can be obtained if the soil is properly managed. Crops are seldom damaged by flooding. Crops respond favorably to lime and fertilizer. Erosion is not a hazard on this soil. The soil can be cropped year after year if management practices that maintain soil fertility, tilth, and the organic matter content are used.

This soil is well suited to hay and pasture. Crops occasionally may be damaged by flooding. Management for this soil includes maintenance of the desired species, control of weeds, proper stocking rates, rotation grazing, and applications of lime and fertilizer.

This soil is well suited to use as woodland, although most of it is cleared. Yellow-poplar, eastern white pine, and black walnut are the most suitable species. Plant competition is a management concern.

This soil is poorly suited to urban uses because flooding is a hazard.

This soil is in capability subclass IIw. The woodland suitability group is 1o.

RSF—Rigley-Rock outcrop association, steep. This association consists of deep, well drained, steep Rigley soil and Rock outcrop on hillsides in the south-central and north-central parts of the county. The Rigley soil is on concave slopes below sandstone bluffs. Pebbles, cobbles, stones, and boulders make up 0 to 25 percent of the surface layer. The percentage varies within short distances. The slopes range from 30 to 60 percent. The Rigley soil makes up about 70 percent of each mapped area, Rock outcrop makes up about 18 percent, and other soils make up the rest. The Rigley soil and Rock outcrop are in a regular pattern, but they were not mapped separately because of present and anticipated uses. The mapped areas are 10 to several hundred acres in size and commonly include entire hillsides.

Typically, the surface layer of the Rigley soil is dark brown stony fine sandy loam about 4 inches thick. The subsoil, which extends to a depth of about 60 inches, is yellowish brown gravelly and very gravelly sandy loam. The substratum to a depth of about 73 inches is strong brown very gravelly sandy clay loam.

The Rigley soil is medium in natural fertility and low in organic matter content. It is strongly acid to extremely acid. Permeability is moderately rapid, and the available water capacity is moderate to high. The root zone is deep and is easily penetrated by plant roots.

Rock outcrop typically consists of sandstone bluffs ranging in height from 20 to 150 feet and areas of exposed bedrock above the bluffs. In many areas, large boulders and stones have broken off the bluff and are scattered on the hillside below.

Included in mapping are small areas of Latham and Lily soils on ridgetops, Bledsoe soils on the lower part of colluvial slopes, and a soil that is similar to the Rigley soil except that it has more clay than is typical for Rigley soils. Also included are areas where the slope is less than 30 percent and, in the north-central part of the county, areas of Steinsburg soils directly above and below the sandstone bluffs. The areas of included soils generally are less than 10 acres in size.

The soils in this association are used mainly as woodland, but in some areas they are used as pasture. The soils are not suited to row crops because of the steep slopes, rock outcrops, and large stones and boulders. Erosion is a very severe hazard.

The Rigley soil is poorly suited to hay and pasture. The steep slopes, rock outcrops, and large stones and boulders on the surface limit the use of machinery in establishing and maintaining adequate pasture cover. Overgrazing should be avoided in areas that are used as pasture because it reduces the stand of desirable grasses and legumes and causes excessive soil erosion. If pasture renovation is necessary, grasses and legumes that produce satisfactory plant cover and require the least amount of maintenance should be selected.

The soil is suited to use as woodland. Productivity is moderately high on south- and west-facing slopes and high on north- and east-facing slopes. Yellow-poplar, white ash, black walnut, eastern white pine, and northern red oak are suitable trees for the north aspect of the slope, and shortleaf pine, Virginia pine, black oak, and white oak are suitable for the south aspect. The very severe hazard of erosion, plant competition, and equipment limitations are management concerns. Seedling mortality is a management concern on the south aspect.

The soil is suited to use as habitat for woodland wildlife.

The soil is poorly suited to most urban uses. The steep slopes, rock outcrops, and stony surface layer limit its use for urban development.

The Rigley soil is in capability subclass VIIs. The woodland suitability group is 2r on the north aspect and 3r on the south aspect.

SaB—Shelocta silt loam, 2 to 6 percent slopes. This is a deep, well drained, gently sloping soil on alluvial fans and foot slopes throughout the county. The slopes are smooth or convex. The mapped areas are 2 to 30 acres in size.

Typically, the surface layer is brown silt loam about 6 inches thick. The subsoil, which extends to a depth of about 64 inches, is strong brown and yellowish brown silty clay loam and gravelly silty clay loam. The substratum to a depth of about 76 inches is yellowish brown very gravelly silty clay loam that has light gray mottles.

This soil is medium in natural fertility and moderate in organic matter content. It is strongly acid or very strongly acid throughout except in areas that have been treated with lime. Permeability is moderate, and the available water capacity is high. This soil has good tilth and can be worked within a wide range of moisture content. The root zone is deep and is easily penetrated by plant roots.

Included with this soil in mapping are small areas of Allegheny, Bledsoe, Vandalia, and Cranston soils. Also included are small areas of a soil similar to Shelocta soil except that it has a darker surface layer. The included soils make up about 10 percent of this map unit, but individual areas generally are less than 2 acres in size.

This soil is used mainly for row crops, hay, and pasture. In many small areas it is used as sites for houses and gardens (fig. 11).

This soil is well suited to most row crops. Crops respond favorably to fertilizer and lime. Erosion is a moderate hazard if cultivated crops are grown. Contour tillage, stripcropping, conservation tillage, crop residue returned to the soil, cover crops, and grasses and legumes in the cropping system help control erosion and maintain good tilth and the content of organic matter.

This soil is well suited to hay and pasture, and high yields can be obtained if the soil is properly managed. Plants that provide adequate forage and satisfactory ground cover should be selected. The pasture should be renovated frequently enough to maintain the desired species. Applications of lime and fertilizer, proper stocking rates, rotation grazing, and control of undesirable vegetation are some of the chief management needs.

This soil is well suited to use as woodland. Yellow-poplar, eastern white pine, and black walnut are the most suitable trees. Plant competition is a management concern.

This soil is well suited to most urban uses.

This soil is in capability subclass IIe. The woodland suitability group is 2o.

SaC—Shelocta silt loam, 6 to 12 percent slopes. This is a deep, well drained, sloping soil on small alluvial fans and colluvial foot slopes throughout the county. The slopes are smooth or convex. The mapped areas are 2 to 30 acres in size.

Typically, the surface layer is brown silt loam about 6 inches thick. The subsoil, which extends to a depth of about 64 inches, is strong brown and yellowish brown silty clay loam and gravelly silty clay loam. The substratum to a depth of about 76 inches is yellowish brown very gravelly silty clay loam that has light gray mottles.

This soil is medium in natural fertility and moderate in organic matter content. It is strongly acid or very strongly acid throughout except in areas that have been treated with lime. Permeability is moderate, and the available water capacity is high. This soil has good tilth and can be worked within a wide range of moisture content. The root zone is deep and is easily penetrated by plant roots.

Included with this soil in mapping are small areas of Bledsoe, Vandalia, Cranston, and Rigley soils. Also included is a soil similar to Shelocta soil except that it has a darker surface layer. The included soils make up about 10 percent of the map unit, but individual areas generally are less than 2 acres in size.

This soil is used mainly for pasture and hay. In some small areas it is used for row crops.

This soil is suited to row crops, but erosion is a severe hazard. Crops respond favorably to fertilizer and lime. If this soil is cultivated, contour tillage, stripcropping, conservation tillage, crop residue returned to the soil, cover crops, and grasses and legumes in the cropping system help control erosion and maintain good tilth and the organic matter content.

This soil is suited to hay and pasture, and high yields can be obtained if the soil is properly managed. Plants that produce adequate forage and provide satisfactory ground cover should be selected. The pasture should be renovated frequently enough to maintain the desired species. Applications of lime and fertilizer, proper stocking rates, rotation grazing, and control of undesirable vegetation are some of the chief management needs.

The soil is well suited to use as woodland. Yellow-poplar, eastern white pine, and black walnut are suitable trees. Plant competition is a management concern.

This soil is suitable for most urban uses. Slope is a limitation, but good design and proper installation can overcome this.

This soil is in capability subclass IIIe. The woodland suitability group is 2o.

Figure 11.—Garden crops in an area of Shelocta silt loam, 2 to 6 percent slopes.

SaD—Shelocta silt loam, 12 to 20 percent slopes. This is a deep, well drained, moderately steep soil on colluvial foot slopes and on the lower part of hillsides throughout the county. The slopes are smooth or slightly concave. The mapped areas are 2 to 40 acres in size.

Typically, the surface layer is brown silt loam about 6 inches thick. The subsoil, which extends to a depth of about 64 inches, is strong brown and yellowish brown silty clay loam and gravelly silty clay loam. The substratum to a depth of about 76 inches is yellowish brown very gravelly silty clay loam that has light gray mottles.

This soil is medium in natural fertility and moderate in organic matter content. It is strongly acid or very strongly acid throughout except in areas that have been treated with lime. Permeability is moderate, and the available water capacity is high. This soil has good tilth and can be worked within a wide range of moisture content. The root zone is deep and is easily penetrated by plant roots.

Included with this soil in mapping are small areas of Vandalia, Cranston, and Rigley soils and small areas of a soil that has a darker surface layer than that of this Shelocta soil. The included soils make up about 10 percent of this map unit, but individual areas are generally less than 2 acres in size.

This soil is used mainly for pasture and hay. In a few small areas it is used for row crops.

This soil is poorly suited to row crops. Erosion is a severe hazard. Crops respond favorably to fertilizer. If this soil is cultivated, contour tillage, stripcropping, conservation tillage, crop residue returned to the soil, cover crops, and grasses and legumes in the cropping system help control erosion and maintain good tilth and the organic matter content.

This soil is suitable for hay and pasture, and moderate yields can be obtained if the soil is properly managed. Plants that produce adequate forage and provide satisfactory ground cover should be selected. The pasture should be renovated frequently enough to maintain the desired species. Applications of lime and fertilizer, proper stocking rates, rotation grazing, and control of undesirable vegetation are some of the chief management needs.

This soil is well suited to use as woodland. Productivity is high on north- and east-facing slopes and moderately high on south- and west-facing slopes. Yellow-poplar, eastern white pine, black walnut, and shortleaf pine are suitable trees for the north aspect of the slope, and eastern white pine, white oak, and shortleaf pine are suitable for the south aspect. Plant competition and equipment limitations are management concerns.

This soil is poorly suited to most urban uses because of the moderately steep slopes.

This soil is in capability subclass IVe. The woodland suitability group is 2r on the north aspect and 3r on the south aspect.

Sd—Skidmore gravelly loam. This is a deep, well drained, nearly level soil on flood plains along major streams and their tributaries in the northwestern part of the county. The slopes range from 0 to 2 percent. The mapped areas are 2 to 200 acres in size.

Typically, the surface layer is brown gravelly loam about 7 inches thick. The subsoil, which extends to a depth of about 24 inches, is brown gravelly sandy loam. The substratum to a depth of about 60 inches is brown very gravelly sandy loam.

The soil is moderate in natural fertility and low in organic matter content. It is medium acid to moderately alkaline. Permeability is moderately rapid, and the available water capacity is moderate. Most areas are difficult to till because of scattered rock fragments on the surface. The soil has a seasonal high water table at a depth of 3 to 4 feet. It is subject to frequent flooding. The root zone is moderately deep.

Included with this soil in mapping are small areas of Nolin, Grigsby, Stokly, and Shelocta soils. The included soils make up about 15 percent of the map unit, but individual areas generally are less than 2 acres in size.

This soil is used mainly for pasture and hay. It is suited to row crops, but crops may be damaged by flooding in winter and spring, and droughtiness limits plant growth in summer. Crops respond favorably to lime and fertilizer. Erosion is not a hazard, but continuous cropping is difficult because of coarse fragments in the surface layer.

This soil is suited to hay and pasture. The pasture should be renovated frequently enough to maintain the desired species. Applications of lime and fertilizer, proper stocking rates, rotation grazing, and control of undesirable vegetation are some of the chief management needs.

This soil is suited to use as woodland. Yellow-poplar, black walnut, white ash, eastern white pine, and northern red oak are suitable trees. Plant competition is a management concern.

This soil is poorly suited to urban uses because flooding is a hazard.

This soil is in capability subclass IIs. The woodland suitability group is 1o.

SNF—Steinsburg-Latham association, steep. This association consists of moderately deep, well drained and moderately well drained, steep soils in the central and eastern parts of the county. The Steinsburg soil is on summits and long narrow points of ridgetops. The Latham soil is in saddles and on the upper part of side slopes. The slopes range from 30 to 50 percent and are smooth or convex. Steinsburg sandy loam makes up about 70 percent of each mapped area, Latham silt loam makes up about 15 percent, and other soils and areas of rock outcrops make up the rest. The Steinsburg and Latham soils are in a regular pattern, but they were not mapped separately because of present and anticipated uses. The mapped areas are long bands on narrow ridgetops and are 10 to 300 acres in size.

Typically, the surface layer of the Steinsburg soil is dark grayish brown sandy loam about 5 inches thick. The subsoil, which extends to a depth of about 18 inches, is yellowish brown sandy loam and gravelly sandy loam. The substratum, which extends to a depth of about 30 inches, is yellowish brown gravelly sandy loam. Sandstone bedrock is at a depth of 30 inches.

The Steinsburg soil is low in natural fertility and in organic matter content. It is strongly acid or very strongly acid. Permeability is moderately rapid, and the available water capacity is low. The root zone is moderately deep and is easily penetrated by plant roots. Depth to bedrock ranges from 24 to 40 inches.

Typically, the surface layer of the Latham soil is brown silt loam about 6 inches thick. The subsoil, which extends to a depth of about 28 inches, is yellowish brown silty clay loam in the upper part and strong brown silty clay in the lower part. There are mottles in shades of gray and red in the lower part of the subsoil. The substratum, which extends to a depth of about 35 inches, is yellowish brown very shaly silty clay that has strong brown and light brownish gray mottles. Soft shale is at a depth of 35 inches.

The Latham soil is low in natural fertility and in content of organic matter. It is strongly acid to extremely acid.

Permeability is slow or very slow, and the available water capacity is moderate. The root zone is moderately deep and is easily penetrated by plant roots. The soil has a seasonal high water table at a depth of 1.5 to 3.0 feet. The shrink-swell potential is moderate.

Included in mapping are small areas of Rigley, Lily, and Wernock soils and small areas of sandstone boulders and rock outcrops. The areas of the included soils and rock outcrops generally are less than 10 acres in size.

The soils in this association are used mainly as woodland, but in some areas they are in pasture. These soils are not suited to row crops. The steep slopes limit the use of machinery, and erosion is a very severe hazard.

These soils are poorly suited to hay and pasture. The steep slopes limit the use of machinery in establishing and maintaining adequate pasture cover. Overgrazing should be avoided in areas that are in pasture because it reduces the stand of desirable grasses and legumes and results in excessive soil erosion. If pasture renovation is necessary, grasses and legumes that provide good cover and require the least amount of maintenance should be selected.

The soils are suitable for use as woodland. Productivity is moderately high. Eastern white pine, white oak, black oak, shortleaf pine, and Virginia pine are suitable trees. Erosion is a hazard, and equipment limitations and plant competition are management concerns.

These soils are suited to use as habitat for wildlife.

The soils are poorly suited to urban uses because of the moderate depth to bedrock and steep slopes.

These soils are in capability subclass VIIe. The woodland suitability group for the Steinsburg soil is 3f. The woodland suitability group for the Latham soil is 3c on the north aspect and 4c on the south aspect.

St—Stendal silt loam. This is a deep, somewhat poorly drained, nearly level soil on flood plains of small streams throughout the county. The slopes range from 0 to 2 percent. The mapped areas are 2 to 50 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. The substratum to a depth of about 60 inches is grayish brown silt loam in the upper part and grayish brown silty clay loam that has yellowish brown and gray mottles in the lower part.

This soil is low in natural fertility and in content of organic matter. It is strongly acid or very strongly acid throughout except in areas that have been treated with lime. Permeability is moderate, and the available water capacity is high. This soil has good tilth and can be worked within a moderate range of moisture content. It is saturated during the winter and spring because of a seasonal high water table at a depth of 1 to 3 feet. The soil is subject to frequent flooding. The root zone is deep and is easily penetrated by plant roots.

Included with this soil in mapping are small areas of Morehead, McGary, and Stokly soils. The included soils make up about 10 percent of the map unit, but individual areas generally are less than 2 acres in size.

This soil is used mainly for pasture and hay. In some small areas it is used for row crops.

This soil is suited to row crops if it is drained. Moderately high yields can be obtained if it is properly managed. Flooding and wetness may limit crop production. Tile drainage commonly is used to reduce wetness. Crops respond favorably to lime and fertilizer. Erosion is not a hazard on this soil. The soil can be cropped year after year if management practices that maintain soil fertility, good tilth, and the organic matter content are used.

This soil is suited to hay and pasture. Crops are seldom damaged by flooding. Plants that are adapted to wetness should be selected. The pasture should be renovated frequently enough to maintain the desired species. Applications of lime and fertilizer, artificial drainage, proper stocking rates, rotation grazing, and control of undesirable vegetation are some of the chief management needs.

This soil is well suited to use as woodland. Eastern white pine, sweetgum, and white ash are suitable trees. Plant competition and equipment limitations are management concerns.

This soil is poorly suited to urban uses because of wetness and the hazard of flooding.

This soil is in capability subclass IIw. The woodland suitability group is 1w.

Sv—Stokly fine sandy loam. This is a deep, somewhat poorly drained, nearly level soil on flood plains of small streams throughout the county. The slopes range from 0 to 2 percent. The mapped areas are 2 to 50 acres in size.

Typically, the surface layer is grayish brown fine sandy loam about 5 inches thick. The subsoil, which extends to a depth of about 34 inches, is brown fine sandy loam in the upper part and light brownish gray fine sandy loam in the lower part. The substratum to a depth of about 62 inches is mottled, olive gray, yellowish brown, and brown fine sandy loam.

This soil is low in natural fertility and in organic matter content. It is strongly acid or extremely acid throughout except in areas that have been treated with lime. Permeability is moderately rapid, and the available water capacity is moderate. This soil has good tilth and can be worked within a moderate range of moisture content. It is saturated during the winter and spring because of a seasonal high water table at a depth of 0.5 to 1.0 foot. The soil is subject to frequent flooding. The root zone is deep and is easily penetrated by plant roots.

Included with this soil in mapping are small areas of Cotaco, Pope, and Stendal soils. The included soils make up about 5 percent of the map unit, but individual areas generally are less than 2 acres in size.

This soil is used mainly for pasture and hay. In some small areas it is used for row crops.

This soil is suitable for row crops if it is drained, and high yields can be obtained if the soil is properly managed. Flooding and wetness limit crop production. Tile drainage commonly is used to reduce wetness. Crops respond favorably to lime and fertilizer. Erosion is not a hazard on this soil. The soil can be cropped year after year if management practices that maintain fertility, tilth, and the organic matter content are used.

This soil is suited to hay and pasture. Some crops may be damaged by flooding. Plants that are adapted to wetness should be selected. The pasture should be renovated frequently enough to maintain the desired species. Applications of lime and fertilizer, artificial drainage, proper stocking rates, rotation grazing, and control of undesirable vegetation are some of the chief management needs.

This soil is well suited to use as woodland. Eastern white pine and sweetgum are suitable trees. Plant competition and equipment limitations are management concerns.

This soil is poorly suited to urban uses because of wetness and the hazard of flooding.

This soil is in capability subclass IIw. The woodland suitability group is 1w.

TlB—Tilsit silt loam, 2 to 6 percent slopes. This is a deep, moderately well drained, gently sloping soil on broad upland ridgetops in the central and western parts of the county. The slopes are smooth or slightly convex. The mapped areas are 2 to 45 acres in size.

Typically, the surface layer is brown silt loam about 9 inches thick. The subsoil, which extends to a depth of about 50 inches, is yellowish brown silt loam in the upper part. The lower part is a firm, brittle, compact fragipan that is yellowish brown silt loam and silty clay loam. There are mottles in shades of brown and gray in the fragipan. The substratum to a depth of 65 inches is mottled yellowish brown and grayish brown silty clay loam.

This soil is low in natural fertility and in organic matter content. It is strongly acid to extremely acid throughout except in areas that have been treated with lime. Permeability is moderate above the fragipan and slow or very slow in the fragipan. The available water capacity is moderate. This soil has a seasonal perched water table above the fragipan at a depth of 1.5 to 2.5 feet. The soil has good tilth and can be worked within a moderate range of moisture content. The thickness of the root zone and the depth to the fragipan range from 18 to 28 inches.

Included with this soil in mapping are small areas of Monongahela and Wernock soils. Also included are small areas of eroded soils where the slope is more than 6 percent. The included soils make up about 10 percent of the map unit, but individual areas generally are less than 2 acres in size.

This soil is used mainly for pasture and hay. In some areas it is used for row crops.

This soil is suited to row crops, but the fragipan restricts drainage and root penetration. Crops respond favorably to lime and fertilizer. Erosion is a moderate hazard if cultivated crops are grown. Contour tillage, stripcropping, conservation tillage, crop residue returned to the soil, cover crops, and grasses and legumes in the cropping system help to control erosion and to maintain good tilth and the organic matter content.

This soil is suited to pasture and hay, and moderate yields can be obtained if the soil is properly managed. The fragipan restricts root penetration and limits production during dry seasons. Plants that produce adequate forage and provide satisfactory ground cover should be selected. The pasture should be renovated frequently enough to maintain the desired species. Applications of lime and fertilizer, proper stocking rates, rotation grazing, and control of undesirable vegetation are some management needs.

This soil is suited to use as woodland. Most areas, however, have been cleared. Yellow-poplar, eastern white pine, shortleaf pine, and white oak are suitable trees.

This soil is suited to some urban uses, but wetness, low strength, and slow permeability are severe limitations. The compact, brittle fragipan percs slowly and limits the use of this soil as septic tank absorption fields.

This soil is in capability subclass IIe. The woodland suitability group is 3o.

UpD—Upshur silty clay loam, 12 to 30 percent slopes. This is a deep, well drained, moderately steep to steep soil on ridgetops, benches, and the upper part of slopes in the southeastern part of the county. The slopes are irregular or convex. The mapped areas are 2 to 75 acres in size.

Typically, the surface layer is brown silty clay loam about 4 inches thick. The subsoil, which extends to a depth of about 38 inches, is reddish brown silty clay in the upper part and dark reddish brown and dark red clay in the lower part. The substratum, which extends to a depth of about 47 inches, is yellowish brown silty clay that has light brownish gray mottles. Soft shale and siltstone are at a depth of 47 inches.

This soil is medium in natural fertility and low in organic matter content. It is very strongly acid to slightly acid in the surface layer and in the upper part of the subsoil and very strongly acid to moderately alkaline in the lower part. The substratum is strongly acid to

moderately alkaline. Permeability is slow, and the available water capacity is moderate. The subsoil is plastic and has a high shrink-swell potential. This soil is difficult to till if it is wet because of the clay content of the surface layer. The soils in the steeper areas are subject to landslides. The root zone is deep and is easily penetrated by plant roots.

Included with this soil in mapping are small areas of Latham and Wernock soils on ridgetops. Also included are areas of Vandalia soils on benches and areas of a severely eroded soil that has a clayey surface layer. The included soils make up about 10 percent of this map unit, but individual areas generally are less than 2 acres in size.

This soil is used mainly for pasture and hay and as woodland. It is poorly suited to row crops because erosion is a very severe hazard and because of the clayey subsoil. Crops respond favorably to lime and fertilizer.

This soil is suited to pasture and hay, and moderate yields can be obtained if the soil is properly managed. The surface layer compacts easily when it is wet and cracks when it is dry. Overgrazing causes increased runoff and excessive soil erosion. Grasses and legumes that produce satisfactory forage, provide adequate ground cover, and require the least amount of maintenance should be selected. Applications of lime and fertilizer, proper stocking rates, rotation grazing, restricted grazing during wet periods, and control of undesirable vegetation are some of the chief management needs.

This soil is suited to use as woodland. Most areas, however, have been cleared. Productivity is moderately high. Virginia pine, eastern white pine, shortleaf pine, and white oak are suitable trees. The very severe erosion hazard, equipment limitations, and plant competition are management concerns. The steep slopes and clayey subsoil are limitations.

This soil is suited to use as habitat for wildlife.

This soil is poorly suited to most urban uses because of the slope, shrink-swell potential, slow permeability, and clayey subsoil.

This soil is in capability subclass VIe. The woodland suitability group is 3c.

VUF—Vandalia-Upshur association, steep. This association consists of deep, well drained, steep soils in the southeastern part of the county. The Vandalia soil is on benches, on the lower part of colluvial slopes, and in coves. The Upshur soil is on ridgetops and on the upper part of convex slopes. The slopes range from 30 to 50 percent. They are irregular and are dissected by deep ravines, many small drainageways, and many breaks and landslides. Vandalia silt loam makes up about 55 percent of each mapped area, Upshur silty clay loam makes up 30 percent, and other soils and areas of rock outcrops make up the rest. The pattern of Vandalia and Upshur soils is regular, but they were not separated in mapping. The mapped areas are several hundred acres in size and commonly include entire hillsides.

Typically, the surface layer of the Vandalia soil is dark brown silt loam about 7 inches thick. The subsoil, which extends to a depth of about 55 inches, is yellowish red silty clay in the upper part and reddish brown silty clay in the lower part. The substratum to a depth of about 68 inches is yellowish brown silty clay that has strong brown and gray mottles.

The Vandalia soil is medium in natural fertility and low in organic matter content. It is medium acid to very strongly acid in the surface layer and upper part of the subsoil and strongly acid to neutral in the lower part and in the substratum. Permeability is moderately slow or slow, and the available water capacity is high. The root zone is deep and is easily penetrated by plant roots. The subsoil is plastic and has a high shrink-swell potential.

Typically, the surface layer of the Upshur soil is brown silty clay loam about 4 inches thick. The subsoil, which extends to a depth of about 38 inches, is reddish brown silty clay in the upper part and dark red clay in the lower part. The substratum, which extends to a depth of about 47 inches, is yellowish brown silty clay that has light brownish gray mottles. Soft shale and siltstone are at a depth of 47 inches.

The Upshur soil is medium in natural fertility and low in organic matter content. It is very strongly acid to slightly acid in the surface layer and in the upper part of the subsoil and very strongly acid to moderately alkaline in the lower part. The substratum is strongly acid to moderately alkaline. Permeability is slow, and the available water capacity is moderate. The root zone is deep and is easily penetrated by plant roots. The subsoil is plastic and has a high shrink-swell potential.

Included in mapping are small areas of Latham and Steinsburg soils on narrow ridgetops and Shelocta soils on the lower part of hillsides. Also included are areas of massive outcrops of sandstone and limestone, areas of soils that have stones and boulders on the surface, and areas of soils that are severely eroded. The areas of the included soils and rock outcrops generally are less than 10 acres in size.

The soils in this association are used mainly as woodland, but in some areas they are used for pasture. The soils are not suited to row crops. The steep slopes limit the use of machinery, and erosion is a very severe hazard.

The soils are poorly suited to hay and pasture. Grasses and legumes are difficult to establish and maintain because of landslides. The resulting cracks, bulges, scarps, and springs limit the use of machinery. If these soils are used for pasture, grasses and legumes that produce good cover and require the least amount of maintenance should be selected. Overgrazing should be avoided because it reduces the stand of desirable

grasses and legumes and results in excessive soil erosion.

The soils are suited to use as woodland. The Vandalia soil has high productivity on the north aspect of the slope and moderately high productivity on the south aspect. The Upshur soil has moderately high productivity on the north aspect of the slope and moderate productivity on the south aspect. Eastern white pine, yellow-poplar, black walnut, and northern red oak are suitable trees on the north aspect of the Vandalia soil, and eastern white pine, shortleaf pine, Virginia pine, and white oak are suitable on the south aspect. On Upshur soils, eastern white pine, Virginia pine, shortleaf pine, white oak, and black oak are suitable trees on north-facing slopes, and Virginia pine, shortleaf pine, eastern redcedar, white oak, and black oak are suitable on south-facing slopes. Erosion is a hazard, the use of equipment is limited, and plant competition is a management concern. Seedling mortality is a management concern on the south aspect of both soils.

These soils are suited to use as habitat for woodland wildlife.

The soils are poorly suited to most urban uses. The steep slopes, high shrink-swell potential, and clayey subsoil limit their use for urban development. The soils are very susceptible to landslides if they are undercut for construction of buildings or roads.

These soils are in capability subclass VIIe. The woodland suitability group for the Vandalia soil is 2c on the north aspect and 3c on the south aspect. The woodland suitability group for the Upshur soil is 3c on the north aspect and 4c on the south aspect.

WeB—Wernock silt loam, 2 to 6 percent slopes. This is a moderately deep, well drained, gently sloping soil on ridgetops throughout the county. The slopes are smooth or convex. The mapped areas are 2 to 40 acres in size.

Typically, the surface layer is brown silt loam about 6 inches thick. The subsoil, which extends to a depth of about 34 inches, is strong brown silty clay loam in the upper part and yellowish brown silty clay loam in the lower part. The substratum, which extends to a depth of 40 inches, is yellowish brown shaly silty clay loam. Interbedded shale and sandstone are at a depth of 40 inches.

This soil is low in natural fertility and in organic matter content. It is strongly acid to extremely acid throughout except in areas that have been treated with lime. Permeability and the available water capacity are moderate. This soil has good tilth and can be worked within a wide range of moisture content. The root zone is moderately deep and is easily penetrated by plant roots. Depth to soft bedrock ranges from 20 to 40 inches.

Included with this soil in mapping are small areas of Latham, Lily, and Tilsit soils. The included soils make up about 10 percent of this map unit, but individual areas generally are less than 2 acres in size.

This soil is used mainly for pasture and hay and as woodland. In some areas it is used for row crops.

This soil is suited to row crops. Crops respond favorably to lime and fertilizer. Erosion is a moderate hazard if cultivated crops are grown. Contour tillage, stripcropping, conservation tillage, crop residue returned to the soil, cover crops, and grasses and legumes in the cropping system help control erosion and maintain good tilth and the organic matter content.

This soil is well suited to hay and pasture, and high yields can be obtained if the soil is properly managed. The moderately deep root zone and lack of moisture in dry seasons limit production. Plants that are adapted to dry conditions, produce adequate forage, and provide satisfactory ground cover should be selected. The pasture should be renovated frequently enough to maintain the desired species. Applications of lime and fertilizer, proper stocking rates, rotation grazing, and control of undesirable species are some of the chief management needs.

This soil is suited to use as woodland, and high yields can be obtained if the soil is properly managed. Northern red oak, eastern white pine, yellow-poplar, and Virginia pine are suitable trees. Plant competition is a management concern.

This soil is suitable for some urban uses, but the moderate depth to rock and low strength are severe limitations. Good design and proper installation can help overcome these limitations.

This soil is in capability subclass IIe. The woodland suitability group is 2o.

WeC—Wernock silt loam, 6 to 12 percent slopes. This is a moderately deep, well drained, sloping soil on ridgetops throughout the county. The slopes are smooth or convex. The mapped areas are 2 to 45 acres in size.

Typically, the surface layer is brown silt loam about 6 inches thick. The subsoil, which extends to a depth of 34 inches, is strong brown silty clay loam in the upper part and yellowish brown silty clay loam in the lower part. The substratum, which extends to a depth of 40 inches, is yellowish brown shaly silty clay loam. Interbedded shale and sandstone are at a depth of 40 inches.

This soil is low in natural fertility and organic matter content. It is strongly acid to extremely acid throughout except in areas that have been treated with lime. Permeability and the available water capacity are moderate. The soil has good tilth and can be worked within a wide range of moisture content. The root zone is moderately deep and is easily penetrated by plant roots. Depth to soft bedrock ranges from 20 to 40 inches.

Included with this soil in mapping are small areas of Latham and Lily soils. Also included are areas where sandstone outcrops. The included soils and the areas of

rock outcrops make up about 10 percent of this map unit, but individual areas are less than 2 acres in size.

This soil is used mainly as woodland and pasture and for hay. In some areas it is used for row crops.

This soil is suited to row crops, but erosion is a severe hazard. Crops respond favorably to lime and fertilizer. If this soil is cultivated, erosion control is necessary. Contour tillage, stripcropping, conservation tillage, crop residue returned to the soil, cover crops, and grasses and legumes in the cropping system help control erosion and maintain good tilth and the organic matter content.

This soil is suited to hay and pasture, and high yields can be obtained if the soil is properly managed. The moderately deep root zone and lack of moisture in dry seasons limit production. Plants that are adapted to dry conditions, produce adequate forage, and provide satisfactory ground cover should be selected. The pasture should be renovated frequently enough to maintain the desired species. Applications of lime and fertilizer, proper stocking rates, rotation grazing, and control of undesirable species are some of the chief management needs.

This soil is suited to use as woodland, and high yields can be obtained. Northern red oak, eastern white pine, yellow-poplar, and Virginia pine are suitable trees. Plant competition is a management concern.

This soil is suited to some urban uses, but the moderate depth to rock and low strength are severe limitations. Good design and proper installation can help overcome these limitations.

This soil is in capability subclass IIIe. The woodland suitability group is 2o.

WeD—Wernock silt loam, 12 to 20 percent slopes. This is a moderately deep, well drained, moderately steep soil on ridgetops throughout the county. The slopes are smooth or convex. The mapped areas are 2 to 50 acres in size.

Typically, the surface layer is brown silt loam about 6 inches thick. The subsoil, which extends to a depth of 34 inches, is strong brown silty clay loam in the upper part and yellowish brown silty clay loam in the lower part. The substratum, which extends to a depth of 40 inches, is yellowish brown shaly silty clay loam. Interbedded shale and sandstone are at a depth of 40 inches.

This soil is low in natural fertility and organic matter content. It is strongly acid to extremely acid throughout except in areas that have been treated with lime. Permeability and the available water capacity are moderate. The soil has good tilth and can be worked within a wide range of moisture content. The root zone is moderately deep and is easily penetrated by plant roots. Depth to soft bedrock ranges from 20 to 40 inches.

Included with this soil in mapping are small areas of Latham and Lily soils. Also included are areas where sandstone outcrops. The included soils and the areas of rock outcrops make up about 10 percent of this map unit, but individual areas generally are less than 2 acres in size.

This soil is used mainly as woodland and for pasture and hay. In some small areas it is used for row crops.

This soil is poorly suited to row crops mainly because erosion is a very severe hazard. Crops respond favorably to lime and fertilizer. If this soil is cultivated, contour tillage, stripcropping, conservation tillage, crop residue returned to the soil, cover crops, and grasses and legumes in the cropping system help to control erosion and to maintain good tilth and the organic matter content.

This soil is suitable for hay and pasture, and moderate yields can be obtained if the soil is properly managed. The moderately deep root zone and lack of moisture in dry seasons limit production. Plants that are adapted to dry conditions, produce adequate forage, and provide satisfactory ground cover should be selected. The pasture should be renovated frequently enough to maintain the desired species. Applications of lime and fertilizer, proper stocking rates, rotation grazing, and control of undesirable species are some of the chief management needs.

This soil is suited to use as woodland. Northern red oak, eastern white pine, yellow-poplar, and Virginia pine are suitable trees. Plant competition, the erosion hazard, and equipment limitations are management concerns.

This soil is poorly suited to most urban uses because of the moderate depth to rock and the moderately steep slopes. These limitations are difficult to overcome.

This soil is in capability subclass IVe. The woodland suitability group is 2r.

WhA—Whitley silt loam, 0 to 4 percent slopes. This is a deep, well drained, nearly level soil on stream terraces and alluvial fans of major streams and their tributaries throughout the county. The slopes are smooth or slightly convex. The mapped areas are 5 to 50 acres in size.

Typically, the surface layer is dark brown silt loam about 9 inches thick. The subsoil, which extends to a depth of about 70 inches, is dark brown silt loam in the upper part and dark yellowish brown silt loam in the lower part. The substratum to a depth of about 80 inches is dark yellowish brown silt loam.

This soil is medium in natural fertility and moderate in organic matter content. It is strongly acid or very strongly acid throughout except in areas that have been treated with lime. Permeability is moderate, and the available water capacity is high. This soil has good tilth and can be worked within a wide range of moisture content. It is subject to rare flooding. The root zone is deep and is easily penetrated by plant roots.

Included with this soil in mapping are small areas of Allegheny, Cuba, and Morehead soils. Also included are soils in the western part of the county that range to neutral in reaction. The included soils make up about 10

percent of the map unit, but individual areas generally are less than 2 acres in size.

This soil is used mainly for row crops, but in some areas it is used for hay and pasture. Corn, tobacco, and small grains are the major crops. In many areas the soil is used as a site for houses and gardens.

This soil is well suited to row crops. High yields can be obtained if the soil is properly managed. Crops respond favorably to fertilizer and lime. Erosion is a slight hazard. This soil can be cropped year after year if management practices that maintain fertility and the organic matter content are used. Crop residue returned to the soil, cover crops, and grasses and legumes in the cropping system help maintain soil structure, tilth, and organic matter content.

This soil is well suited to hay and pasture. Plants that produce adequate forage and provide satisfactory ground cover should be selected. The pasture should be renovated frequently enough to maintain the desired species. Applications of lime and fertilizer, proper stocking rates, rotation grazing, and control of undesirable vegetation are some of the chief management needs.

This soil is well suited to use as woodland. In most areas, however, it has been cleared. Yellow-poplar, northern red oak, eastern white pine, and shortleaf pine are suitable trees. Plant competition is a management concern.

This soil is suited to some urban uses, but the hazard of rare flooding limits its use as a site for dwellings and sanitary facilities.

This soil is in capability class I. The woodland suitability group is 2o.

prime farmland

In this section, prime farmland is defined and discussed, and the prime farmland soils in Carter County are listed.

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in providing the nation's short- and long-range needs for food and fiber. The acreage of high-quality farmland is limited, and the U.S. Department of Agriculture recognizes that government at local, state, and federal levels, as well as individuals, must encourage and facilitate the wise use of our nation's prime farmland.

Prime farmland soils, as defined by the U.S. Department of Agriculture, are soils that are best suited to producing food, feed, forage, fiber, and oilseed crops. Such soils have properties that are favorable for the economic production of sustained high yields of crops. The soils need only to be treated and managed using acceptable farming methods. The moisture supply, of course, must be adequate, and the growing season has to be sufficiently long. Prime farmland soils produce the highest yields with minimal inputs of energy and economic resources, and farming these soils results in the least damage to the environment.

Prime farmland soils may presently be in use as cropland, pasture, or woodland, or they may be in other uses. They either are used for producing food or fiber or are available for these uses. Urban or built-up land and water areas cannot be considered prime farmland.

Prime farmland soils usually get an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The acidity or alkalinity level of the soils is acceptable. The soils have few or no rocks and are permeable to water and air. They are not excessively erodible or saturated with water for long periods and are not flooded during the growing season. The slope ranges mainly from 0 to 6 percent.

Soils that have a high water table, are subject to flooding, or are droughty may qualify as prime farmland soils if the limitations or hazards are overcome by drainage, flood control, or irrigation. Onsite evaluation is necessary to determine the effectiveness of corrective measures. More information on the criteria for prime farmland soils can be obtained at the local office of the Soil Conservation Service.

About 30,000 acres, or nearly 12 percent of the county, is prime farmland. Areas of prime farmland are scattered throughout the county. Most areas are in map unit 2 on the general soil map. Approximately 4,524 acres of the prime farmland in the county is used for crops, mainly corn, tobacco, and hay and pasture.

A recent trend in land use has been the conversion of some prime farmland to urban and industrial uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are wet, more erodible, droughty, or difficult to cultivate and less productive than prime farmland.

The following map units, or soils, make up prime farmland in Carter County. On some soils included in the list, appropriate measures have been applied to overcome a hazard or limitation, such as flooding or wetness. The location of each map unit is shown on the detailed soil maps at the back of this publication. The extent of each unit is given in table 4. The soil qualities that affect use and management are described in the section "Detailed soil map units." This list does not constitute a recommendation for a particular land use.

AlA	Allegheny loam, 0 to 2 percent slopes
AlB	Allegheny loam, 2 to 6 percent slopes
Co	Cotaco loam (where artificially drained)
Cu	Cuba silt loam
Gr	Grigsby fine sandy loam (where protected from flooding)
HaB	Hagerstown silt loam, 2 to 6 percent slopes
Mc	McGary silt loam (where artificially drained)
MoA	Monongahela loam, 0 to 2 percent slopes
MoB	Monongahela loam, 2 to 6 percent slopes
Mr	Morehead silt loam (where artificially drained)
Ne	Newark silt loam (where artificially drained and protected from flooding)
No	Nolin silt loam
Po	Pope fine sandy loam (where protected from flooding)
SaB	Shelocta silt loam, 2 to 6 percent slopes
Sd	Skidmore gravelly loam
St	Stendal silt loam (where artificially drained and protected from flooding)
Sv	Stokly fine sandy loam (where artificially drained and protected from flooding)
TlB	Tilsit silt loam, 2 to 6 percent slopes
WeB	Wernock silt loam, 2 to 6 percent slopes
WhA	Whitley silt loam, 0 to 4 percent slopes

Some areas of the prime farmland soils in Carter County are urban or built-up land, which is defined as any contiguous unit of land 10 acres or more in size that is used for nonfarm uses including housing, industrial, and commercial sites, sites for institutions or public buildings, small parks, golf courses, cemeteries, railroad yards, airports, sanitary landfills, sewage treatment plants, and water control structures.

use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

crops and pasture

Roscoe Isaacs, state resource conservationist, and Eudis Singleton, district conservationist, Soil Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; 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 listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

In 1967 about 65,650 acres in Carter County was used as cropland or pasture, according to the 1970 Kentucky Soil and Water Conservation Needs Inventory. Of this, 39,650 acres was used for permanent pasture and 26,000 acres for corn, small grains, tobacco and other crops and for hay and rotated hay and pasture.

Soil erosion is a primary concern in the management of soils that are used for cultivated crops and forage in Carter County. Controlling erosion increases yields; reduces the sedimentation of ponds, lakes, and streams; and improves water quality for municipal, recreation, and wildlife use.

Soils that slope more than 2 percent are susceptible to excessive erosion. Erosion not only removes surface soil material but also vitally needed organic matter, plant nutrients, and micro-organisms. Loss of the surface layer is especially critical on soils that have a clayey subsoil, for example, the Caneyville and Latham soils. The production potential of soils that have a restricted rooting zone is greatly impaired if the surface layer is washed away. Tilsit and Monongahela soils have a fragipan that restricts the rooting zone, and Berks soils are shallow to bedrock.

Soil that is exposed during crop production is vulnerable to erosion. Because erosion is so damaging, a cropping system should be selected that keeps the loss of soil to an acceptable level. A cropping system is most effective if it is used with other erosion controls, such as conservation tillage, contour farming, grasses and legumes in the crop rotation, crop residue left on the surface, cover crops, grassed waterways, diversions, and terraces. Good pasture management is necessary to obtain quality forage and provide adequate ground cover to prevent erosion. Some of the more common grasses and legumes in the county are Kentucky bluegrass, tall fescue orchardgrass, timothy, red clover, alfalfa, ladino clover, and annual lespedeza. Plant mixtures that are hardy and tolerant of drought are suited to some severely eroded soils, and they provide forage and a

good ground cover. Technical information about conservation practices can be obtained at the local office of the Soil Conservation Service.

Soil drainage is a management concern on about 5 percent of the soils in Carter County that are used as cropland. In soils such as the somewhat poorly drained Newark and McGary soils, wetness will damage crops in most years if the soils are not artificially drained. Tile drainage and open ditch drainage are the most commonly used systems. Tile drains are more expensive but are more effective than open ditches on soils that do not have a fragipan. Open ditches are effective on soils that have a fragipan if they intercept the water as it moves horizontally above the fragipan. Both tile and open ditch drainage require suitable outlets. Information on designing a drainage system can be obtained at the local office of the Soil Conservation Service.

Soil fertility in most soils in the county is naturally low. Nolin soils, however, are high in natural fertility, and Shelocta, Allegheny, and Cuba soils are medium. Most of the soils need applications of fertilizer and lime to produce adequate crop yields. Additions of lime and fertilizer should be based on the results of soil tests, the need of the crop, and the expected yield. The University of Kentucky Cooperative Extension Service can help determine the kind and amount of fertilizer and lime needed.

Soil tilth is an important factor in seed germination and permeability. Soils that are friable, granular, and porous have good tilth. On such soils, the movement of air and water is not restricted. Roots penetrate and shoots emerge more easily in soils that have good tilth. Most of the soils in the county that are used for crops have a granular and porous silt loam surface layer. However, in areas that are continually row cropped, the soil structure may be damaged, and the organic matter may be depleted. If the soil structure is broken down, the soil's ability to provide the proper combination of air and water to plants is hindered. In these areas, tillage for seedbed preparation should be kept to a minimum because it breaks down soil structure. Adding organic matter is helpful in maintaining soil structure.

Many soils that have a light colored surface layer are naturally low in organic matter content. The amount of organic matter in the soil must be maintained for optimum production. Erosion control, the addition of farm manure, crop residue left on the soil, cover crops, and grasses and legumes in the cropping system help maintain or increase the organic matter content.

Corn and burley tobacco are the principal row crops in the county. Soybeans and other crops are adapted to the soil and climate but are not normally grown. Wheat is commonly used as a cover crop. Specialty crops such as vegetables, orchards, and nursery stock are of minor importance in the county. Information about growing specialty crops can be obtained from 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.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; 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 residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil 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 listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for these crops.

land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

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

Class I soils have slight 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 miscellaneous areas 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 very cold or very 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. 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 shown in table 6. The capability classification of each map unit is given in the section "Detailed soil map units."

woodland management and productivity

Charles Foster, forester, Soil Conservation Service, helped prepare this section.

Woodland covers 187,900 acres, or 70 percent of the land area, in Carter County. The oak-hickory forest type is the most extensive and makes up 69 percent of the woodland. The oak-pine type is the second most extensive and makes up 9 percent. Miscellaneous hardwoods and pines make up the remaining 22 percent.

In Carter County, the woodland areas are small, privately owned tracts that average 29 acres in size. The tracts are essentially unmanaged and are not stocked with desirable, high quality trees. Many tracts change ownership about every 10 years.

Most soils that are used as woodland have the capability of producing 50 cubic feet or more of wood per acre per year if good woodland practices are used. At present, the actual yield is 33 cubic feet. If the soils are properly managed, tree growth, stocking, and quality can be improved. Removing low-quality trees in fully stocked and understocked stands of all sizes and regenerating sawtimber stands after harvest are examples of good woodland management practices. Soil surveys can be used to identify productive woodland sites, soil limitations for woodland use, and suitable species to favor in management or to plant.

There are seven sawmills and two pallet mills in Carter County. Products and services include custom sawing, rough lumber, dimension stock, pallets, cross ties, chips, and cants. Several mills in adjacent counties buy timber grown in Carter County.

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general 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; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *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 that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, t, d, c, s, f, and r.

In table 7, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

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 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 in equipment; and *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 to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality 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 where there are openings in the tree canopy. The invading plants compete with native plants or planted seedlings. 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* indicates that plant competition is expected to prevent the establishment of a desirable stand unless the site is intensively prepared, weeded, or otherwise managed to control undesirable plants.

The *potential productivity* of merchantable or *common 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. Site index was determined at age 30 years for eastern cottonwood, 35 years for American sycamore, and 50 years for all other species. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown 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 suited to the soils and to commercial wood production.

recreation

Several places in Carter County are of scenic, geologic, or historical interest. Carter Caves State Park and Grayson Lake State Park are the major parks in the county.

Carter Caves State Park is in the northwestern part of the county, about 6 miles north of Olive Hill. Tours of the natural limestone caves are given, and accommodations are available for tourists. Camping, hiking, swimming, horseback riding, golf, tennis, and fishing are some of the other activities offered in the park. Tygarts State Forest is adjacent to this area. It is used primarily for woodland preservation.

Grayson Lake State Park is in the southern part of Carter County, about 7 miles south of Grayson. It features a 1,500-acre lake, the largest manmade lake in the county (fig. 12). The dam was completed in 1969. It was built to control flooding along the Little Sandy River. The park has several picnic areas, a beach area, and a marina. Water sports such as boating, water skiing, swimming, and fishing are the main attractions.

Many of the soils in the county are suited to development as recreation areas. The soils in map unit 2 are the most suitable. They are described in the section "Broad land use considerations." The areas of these soils are characterized by nearly level to sloping terrain, woods, and streams.

The soils of the survey area are rated in table 8 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 8, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that 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 8 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 11 and interpretations for dwellings without basements and for local roads and streets in table 10.

Camp areas require site preparation such as shaping and leveling the 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 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 campsites.

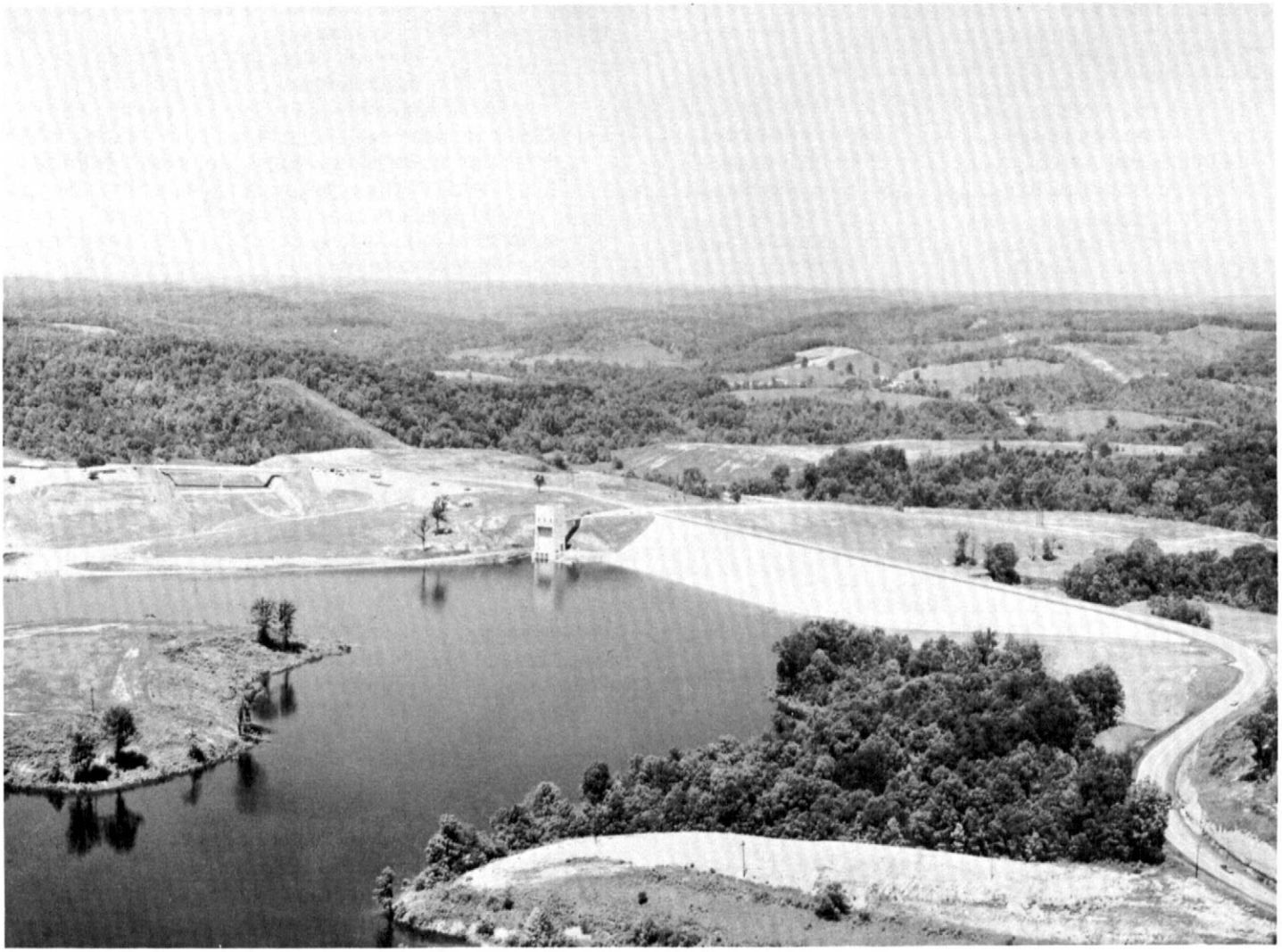


Figure 12.—Aerial view of Grayson Lake, the largest manmade lake in the county.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for 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 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 and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

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

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

wildlife habitat

William H. Casey, biologist, Soil Conservation Service, helped prepare this section.

There are an estimated 43 species of mammals, 43 species of reptiles and amphibians, and 86 species of birds inhabiting Carter County. More than 200 other kinds of birds can be found in the county during certain seasons.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 9, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in 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* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

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

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features 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. Soil properties and features 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, orchardgrass, bluegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features 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 woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and hemlock.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife 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 wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or 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.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, shore birds, muskrat, mink, and beaver.

engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

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

building site development

Table 10 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and

construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock, and the available water capacity in the upper 40 inches affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

sanitary facilities

Table 11 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 11 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the 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.

Table 11 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 11 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, and soil reaction affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

construction materials

Table 12 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 12, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

water management

Table 13 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material, many stones or boulders, and a high content organic matter. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of erosion, low available water capacity, restricted rooting depth, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

engineering index properties

Table 14 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given 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 the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*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 and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups 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 (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

physical and chemical properties

Table 15 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 15, the estimated content of organic matter of the plow layer is expressed as a percentage, by weight,

of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

soil and water features

Table 16 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive 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 mainly of deep, well drained to excessively drained sands or gravelly sands. 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 having a layer that impedes the downward movement of water or soils of 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 clays 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, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 16 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 16 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. Only saturated zones within a depth of about 6 feet are indicated. A water table that is seasonally high for less than 1 month is not indicated.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil

boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*4*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 17, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Ultisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udult (*Ud*, meaning humid, plus *ult*, from Ultisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludults (*Hapl*, meaning simple horizons, plus *udult*, the suborder of Ultisols that have a udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group 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 typifies the great group. An example is Typic Hapludults.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-silty, mixed, mesic Typic Hapludults.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*3*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*4*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed soil map units."

Allegheny series

The Allegheny series consists of deep, well drained, moderately permeable soils that formed in loamy alluvium from acid sandstone, siltstone, and shale. These are nearly level to sloping soils on low and high stream terraces throughout the county. The soils along low stream terraces are subject to rare flooding for brief periods during winter and spring. The slopes range from 0 to 12 percent.

Allegheny soils are adjacent to Monongahela, Whitley, and Shelocta soils. Monongahela soils are in positions similar to those of Allegheny soils and have a fragipan.

Whitley soils are on low stream terraces and have a fine-silty control section. Shelocta soils are on colluvial slopes and have more coarse fragments and less sand in the control section.

Typical pedon of Allegheny loam, in an area of Allegheny loam, 6 to 12 percent slopes, in a fescue field, near the state camping area at Grayson Reservoir, 4 miles south of the dam at Grayson Reservoir on Kentucky Highway 7, 0.6 mile southwest on a paved road to state camping area, 0.2 mile south of the road, 50 feet west of powerline poles:

Ap—0 to 9 inches; brown (10YR 4/3) loam; weak fine granular structure; very friable; many fine roots; medium acid; clear smooth boundary.

B21t—9 to 21 inches; yellowish brown (10YR 5/6) loam; weak fine and very fine subangular blocky structure; very friable; few fine roots; thin patchy clay films; few small rounded sandstone pebbles; very strongly acid; gradual smooth boundary.

B22t—21 to 42 inches; yellowish brown (10YR 5/6) sandy clay loam; weak fine subangular blocky structure; friable; few fine roots; few fine pores; common clay films; 5 percent small rounded sandstone pebbles; very strongly acid; gradual smooth boundary.

B3—42 to 48 inches; strong brown (7.5YR 5/6) sandy clay loam; weak fine and medium subangular blocky structure; friable; few fine pores; 5 percent rounded sandstone pebbles; very strongly acid; gradual smooth boundary.

C—48 to 62 inches; strong brown (7.5YR 5/6) sandy clay loam; few fine faint brownish yellow (10YR 6/6) mottles; massive; very friable; few fine black concretions; very strongly acid.

Depth to bedrock ranges from 60 to more than 120 inches. Reaction ranges from strongly acid to extremely acid throughout except in areas that have been treated with lime. Rounded sandstone pebbles make up 0 to 10 percent of the solum and 0 to 30 percent of the C horizon.

The A horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 through 4. It is loam or fine sandy loam.

The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 through 8. It is loam, sandy clay loam, or clay loam. In some pedons there are mottles in shades of brown, red, or yellow in the upper part of the subsoil and olive and gray mottles in the lower part.

The C horizon has hue of 10YR or 7.5YR, value of 4 through 6, and chroma of 6 through 8. It is clay loam, sandy clay loam, or fine sandy loam. The C horizon contains mottles in shades of brown, red, yellow, olive, or gray in some pedons.

Berks series

The Berks series consists of moderately deep, well drained soils that have moderate to moderately rapid permeability. Berks soils formed in residuum of acid siltstone and shale. These are steep soils on the upper part of hillsides and on narrow ridges in the northern and western parts of the county. The slopes range from 30 to 50 percent.

Berks soils and Cranston, Shelocta, Latham, and Wernock soils are on a similar landscape. Cranston soils are deep and are in lower positions on side slopes. Shelocta, Latham, and Wernock soils are in higher positions on side slopes. Berks soils have more coarse fragments than these soils and do not have an argillic horizon.

Typical pedon of Berks channery silt loam, in an area of Berks-Cranston association, steep, 25 feet east of Kentucky Highway 1024 near the head of Flat Fork, 0.5 mile southeast of the intersection of the Lewis, Carter, and Rowan County lines, about 5 miles northwest of Globe:

A1—0 to 3 inches; dark grayish brown (10YR 4/2) channery silt loam; weak fine granular structure; very friable; few fine roots; 20 percent siltstone fragments; strongly acid; abrupt irregular boundary.

B1—3 to 8 inches; yellowish brown (10YR 5/4) channery silt loam; weak medium subangular blocky structure; friable; few fine roots; 25 percent siltstone fragments; very strongly acid; gradual wavy boundary.

B21—8 to 20 inches; yellowish brown (10YR 5/4) very channery silt loam; weak medium subangular blocky structure; friable; 45 percent siltstone fragments; very strongly acid; clear wavy boundary.

B22—20 to 28 inches; yellowish brown (10YR 5/6) very channery silt loam; weak medium subangular blocky structure; friable; 50 percent siltstone and fine grained sandstone fragments; very strongly acid; abrupt smooth boundary.

R—28 inches; fine grained interbedded sandstone and siltstone.

Depth to bedrock is 20 to 40 inches. Reaction ranges from extremely acid to slightly acid. Coarse fragments of sandstone, siltstone, or shale make up 10 to 30 percent of the A and B1 horizons and 20 to 60 percent of the individual layers of the B2 and C horizons.

The A horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4. It is channery or shaly silt loam or loam.

The B horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 3 to 6. It is channery, very channery, shaly, and very shaly silt loam or loam.

In some pedons there is a C horizon. It has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 6. It is

channery, very channery, shaly, or very shaly phases of silt loam or loam.

Bethesda series

The Bethesda series consists of deep, well drained soils that have moderately slow permeability. Bethesda soils are on benches and outslopes formed by the reshaping of acid regolith from surface coal mining. These are nearly level to steep soils on ridgetops and hillsides throughout the county. The slopes range from 0 to 60 percent.

Bethesda soils are adjacent to Fairpoint, Latham, Shelocta, and Wernock soils. Fairpoint soils, which are intermingled with Bethesda soils, are nonacid and formed in medium acid to neutral regolith. Latham soils are on ridgetops and on the upper part of hillsides and have a clayey control section. Shelocta soils are on the lower part of hillsides. They have an argillic horizon and a solum that is 40 to 60 inches thick. Wernock soils are on upland ridges, are moderately deep, and have a fine-silty control section.

Typical pedon of Bethesda shaly silt loam, in an area of Bethesda-Fairpoint complex, 0 to 6 percent slopes, 0.2 mile north of Clark Branch, 1.5 miles west of Iron Hill on Kentucky Highway 7:

Ap—0 to 4 inches; brown (10YR 4/3) shaly silt loam; weak fine granular structure; friable; many roots; 15 percent shale fragments, by volume, and 5 percent sandstone fragments; very strongly acid; clear smooth boundary.

C2—4 to 16 inches; 70 percent yellowish brown (10YR 5/4) and 30 percent yellowish brown (10YR 5/6) very shaly silty clay loam; massive; firm; few roots; 25 percent shale fragments, by volume, and 15 percent sandstone fragments; very strongly acid; clear smooth boundary.

C3—16 to 65 inches; 65 percent yellowish brown (10YR 5/4) and 35 percent yellowish brown (10YR 5/6) very shaly silty clay loam; massive; firm; 45 percent shale fragments, by volume, and 20 percent sandstone fragments; very strongly acid.

Depth to bedrock is more than 5 feet. Reaction ranges from strongly acid to extremely acid throughout except in areas that have been treated with lime. Coarse fragments consist of shale, sandstone, siltstone, and coal. The fragments generally range from 0.5 inch to 10 inches in diameter, but stones and boulders may be included. Rock fragments make up 15 to 35 percent of the surface layer. They make up 35 to 80 percent of the substratum but average about 45 percent.

The A horizon is shaly, channery, or gravelly loam, silt loam, or silty clay loam. It has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 0 to 8.

The C horizon is shaly, very shaly, gravelly, very gravelly, channery, or very channery silt loam, silty clay loam, or clay loam. It has hue of 7.5YR to 5Y, value of 3 to 6, and chroma of 0 to 8.

Bledsoe series

The Bledsoe series consists of deep, well drained soils that have moderately slow permeability. Bledsoe soils formed in colluvium mainly from limestone but also from siltstone, shale, and sandstone. These are steep soils on the lower part of hillsides below limestone bluffs in the northern and southwestern parts of the county. The slopes range from 30 to 60 percent.

Bledsoe soils are adjacent to Berks, Caneyville, Cranston, and Rigley soils and to areas of rock outcrops. Berks soils have a loamy-skeletal control section. Caneyville soils are in positions above Bledsoe soils and have a solum that is 20 to 40 inches thick. Rigley soils are on the upper part of colluvial slopes and have a coarse-loamy control section. Cranston soils are on the lower part of colluvial side slopes and have a coarse-loamy control section.

Typical pedon of Bledsoe silt loam, in an area of Bledsoe-Caneyville-Rock outcrop association, steep, 100 feet north of Buffalo Creek, 500 feet northeast of intersection of Kentucky Highway 2 and Kentucky Highway 474 at Carter City:

A1—0 to 5 inches; dark brown (10YR 3/3) silt loam; weak fine granular structure; very friable; many roots; neutral; clear smooth boundary.

B1—5 to 14 inches; brown (7.5YR 4/4) silty clay loam; weak fine and medium subangular blocky structure; friable; common fine roots; 2 percent limestone and siltstone fragments; neutral; clear smooth boundary.

B21t—14 to 22 inches; brown (7.5YR 4/4) silty clay; moderate fine and medium angular and subangular blocky structure; firm; few fine roots; few clay films; 5 percent limestone and siltstone fragments; neutral; clear smooth boundary.

B22t—22 to 35 inches; brown (7.5YR 4/4) clay; moderate medium angular and subangular blocky structure; very firm; common clay films; 5 percent limestone and siltstone fragments; neutral; clear smooth boundary.

B3—35 to 52 inches; brown (7.5YR 4/4) gravelly silty clay; weak fine and medium subangular blocky structure; firm; few clay films; 20 percent limestone and siltstone fragments; neutral; gradual smooth boundary.

C—52 to 70 inches; brown (7.5YR 4/4) gravelly silty clay loam; common fine faint pale brown (10YR 6/3) and reddish brown (5YR 4/4) mottles; massive; firm; 30 percent limestone and siltstone fragments; neutral.

Depth to soft shale or siltstone is more than 60 inches. Limestone, siltstone, and sandstone fragments make up 1 to 25 percent of the material to a depth of about 40 inches, and they make up 0 to 40 percent of

the material below 40 inches. The reaction ranges from medium acid to mildly alkaline.

The A horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 to 4. It is silt loam, silty clay loam, or loam and can be gravelly, cobbly, or flaggy.

The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is silty clay loam, silty clay, or clay and can be gravelly, cobbly, or flaggy. There are mottles in shades of brown, gray, or red in the lower part of some pedons.

The C horizon has colors and textures similar to those of the B horizon, but the texture range includes clay loam. In some places the IIC horizon formed in residuum of gray, olive, brown, or mottled soft clay shale.

Caneyville series

The Caneyville series consists of moderately deep, well drained soils that have moderately slow permeability. Caneyville soils formed in residuum of limestone. These are sloping to steep soils on ridgetops and on the upper part of hillsides in the northern and western parts of the county. They are associated mostly with areas of limestone outcrops. The slopes range from 6 to 60 percent.

Caneyville soils and Bledsoe, Latham, Wernock, and Lily soils are on a similar landscape. Bledsoe soils are in lower positions on hillsides, and their solum is 40 to 80 inches thick. Latham, Wernock, and Lily soils are in higher positions on ridgetops and hillsides, are underlain by shale, siltstone, or sandstone at a depth of 20 to 40 inches, and have base saturation of less than 35 percent.

Typical pedon of Caneyville silt loam, in an area of Caneyville-Rock outcrop complex, 12 to 30 percent slopes, 0.3 mile southwest of Kibbey Church and 0.1 mile south of the McGlone Fork of Buffalo Creek on McGlone Fork Road, 5 miles southwest of Carter City:

A1—0 to 2 inches; dark grayish brown (10YR 4/2) silt loam; weak medium granular structure; very friable; few fine roots; slightly acid; abrupt smooth boundary.

A2—2 to 5 inches; brown (10YR 5/3) silt loam; weak medium and fine subangular blocky and weak medium granular structure; friable; few fine roots; medium acid; abrupt smooth boundary.

B21t—5 to 10 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium blocky structure; firm; few coarse roots; medium acid; many clay films; medium acid; gradual smooth boundary.

B22t—10 to 23 inches; yellowish red (5YR 5/6) clay; few faint brown (7.5YR 5/4) mottles; moderate fine blocky structure; firm; few medium roots; many clay films; few chert fragments; slightly acid; gradual smooth boundary.

B23t—23 to 26 inches; dark yellowish brown (10YR 4/4) clay; moderate fine blocky structure; firm; few fine roots; many clay films and few dark coatings or stains on peds; slightly acid; abrupt smooth boundary.

R—26 inches; limestone.

Depth to bedrock ranges from 20 to 40 inches. Reaction ranges from strongly acid to neutral in the upper part of the solum and from medium acid to mildly alkaline in the lower part.

The A1 horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4. It is silt loam or silty clay loam.

The B horizon has hue of 7.5YR, 5YR, or 10YR, value of 4 or 5, and chroma of 4 to 6. Some pedons have mottles in shades of red, brown, yellow, or gray in the lower part. The B horizon is silty clay loam, silty clay, or clay.

In some places there is a C horizon. It has matrix and mottle colors in shades of red, brown, yellow, olive, or gray. It is silty clay or clay.

Cotaco series

The Cotaco series consists of deep, moderately well drained, moderately permeable soils that formed in alluvium and colluvium from acid sandstone, siltstone, and shale. These are nearly level soils on stream terraces and alluvial fans throughout the county. They are subject to rare flooding during winter and spring and have a seasonal high water table at a depth of 1.5 to 2.5 feet. The slopes range from 0 to 4 percent.

Cotaco soils are in positions on the landscape similar to those of Allegheny, Morehead, Shelocta, and Stokly soils. Allegheny soils are well drained. Morehead soils have a fine-silty control section. Shelocta soils are on gently sloping colluvial fans and are well drained. Stokly soils are on narrow flood plains and have a coarse-loamy control section.

Typical pedon of Cotaco loam, in a pasture, 0.4 mile east of intersection of U.S. Highway 60 and Kentucky Highways 1 and 7, 0.2 mile north of Grayson on a private paved road, 150 feet west of the road:

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

B1—10 to 20 inches; brown (10YR 5/3) loam; weak fine subangular blocky structure; friable; common fine roots; very strongly acid; gradual smooth boundary.

B21t—20 to 25 inches; light yellowish brown (2.5Y 6/4) loam; few medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; few fine roots; few thin patchy clay films on faces of peds; very strongly acid; gradual smooth boundary.

B22t—25 to 38 inches; brownish yellow (10YR 6/6) sandy clay loam; common medium distinct strong brown (7.5YR 5/6) mottles and few distinct light brownish gray (10YR 6/2) and light yellowish brown (10YR 6/4) mottles; weak fine and medium subangular blocky structure; friable; few coarse roots; few thin patchy clay films on faces of peds; very strongly acid; gradual smooth boundary.

C—38 to 60 inches; yellowish brown (10YR 5/6) clay loam; common medium distinct light brownish gray (10YR 6/2) and light yellowish brown (10YR 6/4) mottles; massive; friable; very strongly acid.

Depth to bedrock is more than 60 inches. The reaction ranges from strongly acid to extremely acid throughout except in areas that have been treated with lime. Coarse fragments make up 0 to 35 percent of each horizon.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 through 4. It is loam or fine sandy loam.

The B horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 3 through 6. The mottles are in shades of brown, red, or gray. The B horizon is loam, sandy clay loam, and clay loam.

The C horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 through 6. The mottles are in shades of gray or brown. The C horizon is sandy clay loam or clay loam.

Cranston series

The Cranston series consists of deep, well drained soils that have moderately rapid permeability. Cranston soils formed in colluvium of siltstone origin. These are steep soils on the lower part of hillsides in the northern and western parts of the county. The slopes range from 30 to 50 percent.

Cranston soils are associated with Berks, Latham, and Shelocta soils. Berks soils are on the higher part of convex ridges, are more than 35 percent coarse fragments, and are 20 to 40 inches deep to bedrock. Latham soils are on upland ridgetops and have a clayey control section and paralithic contact at a depth of 20 to 40 inches. Shelocta soils, which are in positions similar to those of Cranston soils, have a fine-loamy control section.

Typical pedon of Cranston channery silt loam, in an area of Berks-Cranston association, steep, 30 feet south of Grassy Creek Road, 2 miles west of Kentucky Highways 2 and 7, 0.5 mile southwest on the Greenup County line, and 3.3 miles north of Gesling:

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) channery silt loam; weak fine granular structure; very friable; common fine roots; 20 percent siltstone fragments; medium acid; clear smooth boundary.

B1—6 to 15 inches; dark yellowish brown (10YR 4/4) channery silt loam; weak fine subangular and granular structure; very friable; common very fine roots; few very fine pores; 15 percent siltstone fragments; strongly acid; clear smooth boundary.

B21t—15 to 38 inches; yellowish brown (10YR 5/6) channery silt loam; moderate fine and medium subangular blocky structure; friable; few very fine roots; few fine pores; few clay films; 30 percent siltstone fragments; strongly acid; gradual smooth boundary.

B22t—38 to 54 inches; strong brown (7.5YR 5/6) channery silt loam; moderate fine and medium subangular blocky structure; friable; few fine pores; thin continuous clay films; 30 percent siltstone fragments; very strongly acid; gradual wavy boundary.

C—54 to 84 inches; strong brown (7.5YR 5/6) very channery silt loam; common medium faint light brown (7.5YR 6/4) mottles; massive; firm; 50 percent shale and sandstone fragments; strongly acid.

Depth to siltstone or shale bedrock ranges from 5 to 20 feet. The reaction ranges from strongly acid to extremely acid. Coarse fragments or siltstone and shale make up 5 to 25 percent of the A horizon, 15 to 35 percent of the B horizon, and 30 to 55 percent of the C horizon.

The A horizon has hue of 10YR, value of 3 to 5, and chroma of 2 or 3. It is channery silt loam or silt loam. The B horizon has hue of 7.5YR or 10YR, value of 4 or 6, and chroma of 4 to 6. It is channery silt loam. The C horizon has hue of 7.5YR to 2.5YR, value of 5 or 6, and chroma of 4 to 6. The mottles are in shades of brown or gray. The C horizon is channery or very channery silt loam.

Cuba series

The Cuba series consists of deep, well drained, moderately permeable soils that formed in silty alluvium mainly from acid shale and siltstone but also from sandstone. These are nearly level soils on flood plains in the eastern and central parts of the county. The soils are subject to occasional flooding during winter and spring. The slopes range from 0 to 2 percent.

Cuba soils are adjacent to Pope, Stendal, and Whitley soils. Pope soils, which are in positions similar to those of Cuba soils, have a coarse-loamy control section. Stendal soils, which are in slightly lower positions on flood plains, are somewhat poorly drained. Whitley soils are on stream terraces and have an argillic horizon.

Typical pedon of Cuba silt loam, in a pasture, 50 feet southwest of Kentucky Highway 773, 100 feet south of bridge over the Little Sandy River, 150 feet south of Little Sandy River, about 2.3 miles south of Grayson:

Ap—0 to 10 inches; brown (10YR 4/3) silt loam; weak fine granular structure; friable; many fine roots; medium acid; abrupt smooth boundary.
B2—10 to 46 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine granular and weak medium subangular blocky structure; friable; common fine roots; strongly acid; clear smooth boundary.
C1—46 to 56 inches; dark yellowish brown (10YR 4/4) silt loam; few fine faint pale brown (10YR 6/3) mottles; massive; friable; strongly acid; clear smooth boundary.
C2—56 to 70 inches; dark yellowish brown (10YR 4/4) stratified silt loam and fine sandy loam; massive; friable; strongly acid.

Depth to bedrock ranges from 5 to more than 10 feet. The reaction is very strongly acid or strongly acid throughout except in areas that have been treated with lime.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is silt loam. The B horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is silt loam. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 2 through 6. It is commonly stratified silt loam, loam, or fine sandy loam. In some places, the C horizon contains mottles in shades of brown or gray.

Fairpoint series

The Fairpoint series consists of deep, well drained soils that have moderately slow permeability. Fairpoint soils are on benches and outslopes formed by the reshaping of regolith from surface coal mining. These are nearly level to steep soils on ridgetops and hillsides throughout the county. The slopes range from 0 to 60 percent.

Fairpoint soils are adjacent to Bethesda, Latham, Shelocta, and Wernock soils. Bethesda soils, which are intermingled with Fairpoint soils, are strongly to extremely acid and formed in shale, siltstone, coal, and medium- and fine-grained sandstone. Latham soils are on ridgetops and on the upper part of hillsides and have a clayey control section. Shelocta soils are on the lower part of hillsides. They have an argillic horizon and their solum is 40 to 60 inches thick. Wernock soils are on upland ridges. They are moderately deep and have a fine-silty control section.

Typical pedon of Fairpoint shaly silt loam, in an area of Bethesda-Fairpoint complex, 0 to 6 percent slopes, 0.1 mile north of Kentucky Highway 7, 2 miles southeast of Gesling:

A—0 to 6 inches; dark grayish brown (10YR 4/2) shaly silt loam; weak fine granular structure; friable; many roots; 15 percent shale fragments, 10 percent sandstone fragments, and 3 percent coal fragments, by volume; neutral; clear smooth boundary.
C2—6 to 62 inches; dark grayish brown (10YR 4/2) very shaly silty clay loam; massive; firm; few roots; 35 percent shale fragments, 20 percent sandstone fragments, and 5 percent coal fragments, by volume; neutral.

Depth to bedrock is more than 5 feet. Reaction ranges from medium acid to neutral. Coarse fragments of shale, sandstone, siltstone, and coal make up 15 to 35 percent of the surface layer and 35 to 80 percent of the substratum. They make up, on the average, 45 percent of the entire profile. The fragments mostly range from 2 to 250 millimeters, but stones and boulders are included.

The A horizon is shaly or gravelly loam, silt loam, or silty clay loam. It has hue of 7.5YR through 2.5Y, value of 3 through 6, and chroma of 0 through 6. The C horizon is gravelly, very gravelly, shaly, very shaly, channery, or very channery silt loam, silty clay loam, or clay loam. It has hue of 7.5YR through 5Y, value of 3 through 6, and chroma of 0 through 8.

Grigsby series

The Grigsby series consists of deep, well drained soils that have moderate or moderately rapid permeability. Grigsby soils formed in alluvium that weathered from limestone, sandstone, and shale. Grigsby soils are nearly level and are on long narrow flood plains in the north-central and south-central parts of the county. They are subject to frequent flooding in winter and spring. The slopes range from 0 to 2 percent.

Grigsby soils are commonly adjacent to Nolin and Skidmore soils. Nolin soils have a fine-silty control section, and Skidmore soils are loamy-skeletal.

Typical pedon of Grigsby fine sandy loam, 3.5 miles west of the intersection of Kentucky Highway 7 and Rattlesnake Ridge Road, 2.0 miles north on a gravel county road, 100 feet east of intersection of the county road and Big Sinking Creek, about 1.2 miles southwest of Grayson Dam:

Ap—0 to 7 inches; brown (10YR 4/3) fine sandy loam; weak fine granular structure; very friable; many fine roots; neutral; gradual smooth boundary.
B21—7 to 21 inches; brown (10YR 4/3) fine sandy loam; weak fine subangular blocky structure; very friable; few fine roots; slightly acid; gradual smooth boundary.
B22—21 to 34 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak fine subangular blocky structure; friable; few fine roots; slightly acid; clear smooth boundary.
C—34 to 60 inches; yellowish brown (10YR 5/4) loamy fine sand; thin dark yellowish brown (10YR 4/4) fine sandy loam bedding planes; massive; very friable; slightly acid.

Depth to bedrock is 5 feet or more. Reaction ranges from medium acid to neutral in the A and B horizons and from strongly acid to neutral in the C horizon.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 through 4. It is loam or fine sandy loam. The B horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is loam or fine sandy loam. The C horizon has hue of 10YR, value of 4 to 6, and chroma of 3 to 6. It is fine sandy loam, gravelly sandy loam, or loamy fine sand and commonly is stratified.

Hagerstown series

The Hagerstown series consists of deep, well drained, moderately permeable soils that formed in residuum of limestone. These are gently sloping soils on broad ridgetops in the northwestern part of the county. The slopes range from 2 to 6 percent.

Hagerstown soils are associated with Caneyville soils. Caneyville soils are on lower convex slopes and have a solum that is less than 40 inches thick.

Typical pedon of Hagerstown silt loam, 2 to 6 percent slopes, in a pasture, 3 miles east of Kentucky Highway 2, 0.7 mile north of Smoky Creek, 500 feet south of a private road, about 4.75 miles north of Olive Hill:

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

B1—10 to 21 inches; strong brown (7.5YR 5/6) silty clay loam; weak medium subangular blocky structure; friable; few fine roots; slightly acid; clear smooth boundary.

B21t—21 to 36 inches; yellowish red (5YR 5/6) clay; moderate medium subangular blocky structure; friable; few fine roots; slightly acid; clear smooth boundary.

B22t—36 to 48 inches; yellowish red (5YR 5/8) clay; moderate medium subangular blocky structure; firm; common clay films; few concretions; neutral; gradual smooth boundary.

C1—48 to 50 inches; strong brown (7.5YR 5/6) clay; many medium distinct light brownish gray (2.5Y 6/2) mottles; massive; firm; neutral.

R—50 inches; limestone.

Depth to limestone bedrock ranges from 40 to more than 84 inches. Reaction ranges from strongly acid to neutral. Chert fragments make up 0 to 15 percent of the pedon.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is silt loam or loam.

The B1 horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4 to 8. It is silt loam or silty clay loam.

The Bt horizon has hue of 2.5YR to 5YR, value of 4 or 5, and chroma of 4 to 8. Some subhorizons have hue of 7.5YR. Some pedons have reddish brown and light brown mottles. The Bt horizon is silty clay or clay.

In some places there is a C horizon. It has hue of 10YR to 2.5YR, value of 4 to 6, and chroma of 4 to 8. The color ranges from uniform to moderately or highly variegated. The C horizon is silty clay or clay.

Latham series

The Latham series consists of moderately deep, moderately well drained soils that have slow or very slow permeability. Latham soils formed in residuum of acid shale. These are sloping to steep soils on ridgetops and on the upper part of hillsides throughout the county. The slopes range from 6 to 50 percent.

Latham soils are adjacent to Shelocta, Steinsburg, Upshur, and Wernock soils. Shelocta soils, which are in lower positions on colluvial side slopes, have a solum that is 40 to 60 inches thick. Steinsburg soils, which are on the upper part of ridgetops, have a coarse-loamy control section. Upshur soils, which are in positions similar to those of Latham soils, have a redder B horizon and higher base saturation. Wernock soils, which are on upland ridges, have a fine-silty control section.

Typical pedon of Latham silt loam, in an area of Latham-Shelocta association, steep, 100 feet south of dirt road, 1 mile south of Clifty Creek, 0.3 mile west of the intersection of Kentucky Highway 7 and dirt road, 3 miles south of Grayson Dam:

Ap—0 to 6 inches; brown (10YR 5/3) silt loam; weak medium granular structure; very friable; common very fine roots; strongly acid; abrupt smooth boundary.

B1—6 to 11 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; friable; common fine roots; very strongly acid; gradual smooth boundary.

B21t—11 to 19 inches; strong brown (7.5YR 5/6) silty clay; moderate medium and fine angular blocky structure; firm; many clay films; very strongly acid; gradual wavy boundary.

B22t—19 to 28 inches; strong brown (7.5YR 5/6) silty clay; common medium distinct light brownish gray (2.5Y 6/2) and yellowish red (5YR 5/6) mottles; strong medium subangular and fine blocky structure; firm; many clay films; 5 percent shale fragments; very strongly acid; gradual wavy boundary.

C—28 to 35 inches; yellowish brown (10YR 5/4) very shaly silty clay; common medium distinct strong brown (7.5YR 5/6) and light brownish gray (2.5Y 6/2) mottles; massive and relict platy structure; firm; 50 percent shale fragments; very strongly acid; abrupt smooth boundary.

Cr—35 inches; yellowish brown and light gray acid shale.

Depth to paralithic contact ranges from 20 to 40 inches. Reaction ranges from strongly acid to extremely

acid throughout except in areas that have been treated with lime. Coarse fragments of soft shale, siltstone, or sandstone make up 0 to 15 percent of the solum and 0 to 60 percent of the C horizon.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 through 4. It is silt loam or silty clay loam.

The B horizon has hue of 10YR or 7.5YR, value of 4 through 6, and chroma of 2 through 8. The mottles are in shades of red, brown, yellow, or gray. The B horizon is silty clay loam, silty clay, or clay. Subhorizons in some pedons have hue of 5YR or 2.5Y.

The C horizon is variegated shades of red, brown, olive, and gray. It is clay, silty clay, or silty clay loam and the shaly or very shaly phases.

Lily series

The Lily series consists of moderately deep, well drained soils that have moderately rapid permeability. Lily soils formed in residuum of acid sandstone. These are sloping to moderately steep soils on ridgetops throughout the county. The slopes range from 6 to 20 percent.

Lily soils are adjacent to Latham, Steinsburg, and Wernock soils. Latham soils have more clay in the B horizon than Lily soils and are underlain by soft shale. Steinsburg soils are on narrow ridgetops and do not have an argillic horizon. Wernock soils are on broad ridgetops and have a fine-silty control section.

Typical pedon of Lily fine sandy loam, 6 to 20 percent slopes, on a ridge near the head of Blair Hollow, 300 feet south of the Greenup County line, about 6 miles north of Gesling:

A1—0 to 3 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak fine granular structure; very friable; many fine roots; very strongly acid; abrupt smooth boundary.

A2—3 to 8 inches; light yellowish brown (10YR 6/4) fine sandy loam; weak fine granular structure; very friable; many fine roots; very strongly acid; clear smooth boundary.

B1—8 to 12 inches; light yellowish brown (10YR 6/4) loam; weak medium and fine subangular blocky structure; friable; few fine roots; very strongly acid; clear wavy boundary.

B21t—12 to 16 inches; yellowish brown (10YR 5/6) sandy clay loam; moderate medium subangular blocky structure; friable; few fine roots; few clay films; very strongly acid; clear smooth boundary.

B22t—16 to 23 inches; yellowish brown (10YR 5/8) clay loam; moderate medium subangular blocky structure; friable; few fine roots; few clay films; 5 percent soft sandstone fragments; very strongly acid; abrupt smooth boundary.

B3—23 to 32 inches; yellowish brown (10YR 5/6) gravelly sandy clay loam; weak medium subangular blocky structure; friable; few fine roots; few streaks of light yellowish brown (2.5Y 6/4); 30 percent soft sandstone fragments; very strongly acid; abrupt smooth boundary.

R—32 inches; sandstone and thin bedded shale.

Depth to bedrock ranges from 20 to 40 inches. Reaction ranges from extremely acid to strongly acid throughout except in areas that have been treated with lime. Coarse fragments of weathered sandstone make up 0 to 10 percent of the material to a depth of about 24 inches and 0 to 35 percent below a depth of 24 inches.

The A horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 4. It is loam, fine sandy loam, or sandy loam.

The B1 horizon has hue of 10YR, value of 5 or 6, and chroma of 4 to 6. It is loam, fine sandy loam, or sandy loam.

The Bt horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 4 to 8. It is sandy clay loam or clay loam.

In some places there are B3 and C horizons. They have hue of 5YR to 10YR, value of 5 or 6, and chroma of 4 to 8. They are fine sandy loam, sandy clay loam, clay loam, or their gravelly phases. The mottles are in shades of red, brown, olive, yellow, or gray.

McGary series

The McGary series consists of deep, somewhat poorly drained soils that have slow or very slow permeability. McGary soils formed in lacustrine deposits of silty clay loam, silty clay, and clay. These are nearly level soils on broad low stream terraces of major streams throughout the county. They are subject to rare flooding in winter and spring. They have a seasonal high water table at a depth of 1.0 foot to 3.0 feet. The slopes range from 0 to 2 percent.

The McGary soils in Carter County are more acid in the upper part of the solum, do not have carbonates within a depth of 40 inches, and have chroma that are higher than is typical for the McGary series. They are, therefore, considered to be a taxadjunct to the series.

McGary soils are adjacent to Whitley, Cotaco, and Morehead soils. Whitley soils are on stream terraces and are well drained. Cotaco soils are in positions similar to those of McGary soils and have a fine-loamy control section. Morehead soils are on higher stream terraces and have a fine-silty control section.

Typical pedon of McGary silt loam, in a pasture, 2.0 miles north of the intersection of I-64 and Kentucky Highways 1 and 7, 0.4 mile east of Wilson Creek-Pactolus Road, 0.2 mile south of Pactolus Road, 300 feet east of the road, and 300 feet south of a pond, about 3 miles northeast of Grayson:

Ap—0 to 9 inches; brown (10YR 5/3) silt loam; few medium distinct yellowish brown (10YR 5/6) mottles; weak fine granular structure; friable; many fine roots; medium acid; clear smooth boundary.

B21t—9 to 16 inches; yellowish brown (10YR 5/6) silty clay loam; many medium distinct light brownish gray (10YR 6/2) mottles; moderate coarse prismatic structure; firm; common fine roots; thin continuous light brownish gray (10YR 6/2) clay films; strongly acid; gradual smooth boundary.

B22tg—16 to 30 inches; light brownish gray (10YR 6/2) silty clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure; firm; common fine roots; continuous light brownish gray (10YR 6/2) clay films; strongly acid; gradual smooth boundary.

B23tg—30 to 42 inches; light brownish gray (10YR 6/2) silty clay; many medium distinct yellowish brown (10YR 5/8) mottles; moderate coarse prismatic structure; firm; continuous light brownish gray (10YR 6/2) clay films; common fine pores; few black concretions; medium acid; gradual smooth boundary.

C—42 to 62 inches; gray (10YR 6/1) silty clay; common medium distinct yellowish brown (10YR 5/8) mottles; massive; very firm; common fine pores; common black concretions; slightly acid.

Depth to bedrock is 120 inches or more. Reaction is strongly acid or medium acid in the solum except in areas that have been treated with lime. The C horizon is medium acid to neutral.

The A horizon has hue of 10YR, value of 4 to 6, and chroma of 1 to 3. It is silt loam or silty clay loam. The B2 horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 to 4. The mottles are in shades of red, brown, or gray. The B2 horizon is silty clay loam or silty clay. The C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 3. The mottles are in shades of red, brown, or gray. It is silty clay or clay.

Monongahela series

The Monongahela series consists of deep, moderately well drained soils that have moderate permeability above the fragipan and moderately slow or slow permeability in the fragipan. Monongahela soils formed in old alluvium from acid sandstone and shale. These soils are on low and high stream terraces throughout the county. The soils on low terraces are subject to rare flooding in winter and spring. There is a seasonal perched water table at a depth of 1.5 to 3.0 feet. The slopes range from 0 to 6 percent.

Monongahela soils are adjacent to Allegheny, Morehead, and McGary soils. Allegheny soils are in positions similar to those of Monongahela soils and do not have a fragipan. Morehead soils are on low stream terraces and have a fine-silty control section. McGary soils are on low stream terraces and have a fine control section.

Typical pedon of Monongahela loam, in an area of Monongahela loam, 2 to 6 percent slopes, in a pasture, 2.0 miles northeast of Grayson on old U.S. Highway 60, 0.3 mile south of the bridge at Little Sandy River:

Ap—0 to 11 inches; brown (10YR 4/3) loam; weak fine granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

B2t—11 to 28 inches; yellowish brown (10YR 5/6) loam; moderate fine and medium subangular blocky structure; friable; few fine roots; thin discontinuous clay films; strongly acid; clear smooth boundary.

Bx1—28 to 34 inches; light yellowish brown (10YR 6/4) loam; few fine faint pale brown (10YR 6/3) and few fine distinct yellowish brown (10YR 5/6) mottles; weak very coarse prismatic structure parting to weak fine and medium subangular blocky; very firm; brittle; very strongly acid; clear smooth boundary.

Bx2—34 to 48 inches; light yellowish brown (10YR 6/4) clay loam; common medium distinct yellowish brown (10YR 5/8) and light gray (10YR 7/2) mottles; weak very coarse prismatic structure parting to weak medium subangular blocky; very firm; brittle; strongly acid; clear smooth boundary.

C—48 to 62 inches; mottled yellowish brown (10YR 5/8) and light gray (10YR 7/2) clay loam; massive; firm; very strongly acid.

Depth to bedrock is 60 inches or more. Reaction is strongly acid or very strongly acid throughout except in areas that have been treated with lime.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is silt loam or loam.

The B2 horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 4 to 6. It is loam, sandy clay loam, or silt loam.

The Bx horizon has hue of 10YR or 7.5Y, value of 5 or 6, and chroma of 4 to 6. The fragipan expression ranges from evident to strong. The mottles are in shades of brown, yellow, gray, or olive. The Bx horizon is silt loam, loam, or sandy clay loam.

The C horizon has hue of 7.5YR to 2.5Y, value of 5 or 6, and chroma of 3 to 6. The mottles are in shades of brown or gray. The C horizon is loam, clay loam, or sandy clay loam.

Morehead series

The Morehead series consists of deep, somewhat poorly drained to moderately well drained soils that have moderate permeability. Morehead soils formed in acid alluvium from sandstone, siltstone, and shale. These are nearly level soils on low stream terraces and alluvial fans throughout the county. They are subject to rare flooding in winter and spring. They have a seasonal high water

table at a depth of 0.5 foot to 1.5 feet. The slopes range from 0 to 4 percent.

Morehead soils and Cotaco, McGary, and Whitley soils are on a similar landscape. Cotaco soils have a fine-loamy control section. McGary soils are on broad stream terraces and have a fine control section. Whitley soils are well drained.

Typical pedon of Morehead silt loam, in a pasture, 1.5 miles northeast of Iron Hill, 0.2 mile south of Tygarts Creek:

Ap—0 to 10 inches; yellowish brown (10YR 5/4) silt loam; weak fine and medium granular structure; very friable; many fine roots; medium acid; abrupt smooth boundary.

B21t—10 to 24 inches; yellowish brown (10YR 5/6) silt loam; few fine faint pale brown (10YR 6/3) and light gray (10YR 7/2) mottles; weak fine and medium subangular blocky structure; friable; few fine roots; few thin discontinuous clay films; very strongly acid; gradual smooth boundary.

B22t—24 to 39 inches; yellowish brown (10YR 5/4) silty clay loam; few fine faint yellowish brown (10YR 5/6), common medium distinct light gray (10YR 7/1), and light brownish gray (10YR 6/2) mottles; weak fine and medium subangular blocky structure; friable; few thin discontinuous clay films; very strongly acid; gradual smooth boundary.

B3t—39 to 48 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct light gray (10YR 7/1) and yellowish brown (10YR 5/4) mottles; weak fine subangular blocky structure; firm; thin discontinuous clay films; very strongly acid; gradual smooth boundary.

C—48 to 72 inches; mottled brownish yellow (10YR 6/6), yellowish brown (10YR 5/8), gray (10YR 6/1), and light gray (10YR 7/1) silty clay loam; massive; firm; very strongly acid.

Depth to bedrock is more than 60 inches. Reaction is very strongly acid or strongly acid throughout except in areas that have been treated with lime.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 through 4. It is silt loam.

The Bt horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 4 through 6. The mottles are in shades of brown or gray. The Bt horizon is silt loam or silty clay loam.

The C horizon is mottled. The matrix has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 through 6. The mottles are in shades of gray or brown. The C horizon is silt loam, loam, or silty clay loam.

Newark series

The Newark series consists of deep, somewhat poorly drained, moderately permeable soils that formed in alluvium from limestone, siltstone, shale, and sandstone. These are nearly level soils on flood plains and alluvial fans in the eastern and western parts of the county. They are subject to frequent flooding in winter and spring. They have a seasonal high water table at a depth of 0.5 foot to 1.5 feet. The slopes range from 0 to 2 percent.

Newark soils and Nolin and Grigsby soils are on a similar landscape. Nolin soils are on adjacent flood plains and are well drained. Grigsby soils have a coarse-loamy control section.

Typical pedon of Newark silt loam, in a pasture, 100 feet east of Kentucky Highway 2, 0.1 mile south of intersection of Kentucky Highways 2 and 474, at Carter City:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium granular structure; very friable; many roots; neutral; clear smooth boundary.

B21—7 to 18 inches; brown (10YR 5/3) silt loam; few fine faint light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; friable; common roots; neutral; gradual smooth boundary.

B22g—18 to 32 inches; grayish brown (10YR 5/2) silt loam; common medium distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; friable; few roots; neutral; gradual smooth boundary.

Cg—32 to 60 inches; light brownish gray (10YR 6/2) silt loam; common medium distinct yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; massive; friable; neutral.

Depth to bedrock is more than 60 inches. Reaction ranges from medium acid to mildly alkaline.

The Ap horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or 3. In some pedons there are mottles in shades of brown or gray. The Ap horizon is silt loam.

The B21 horizon has hue of 10YR or 2.5Y, value of 5, and chroma of 2 through 4. The mottles are in shades of brown or gray. The B21 horizon is silt loam.

The B22g horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 0 through 2. The mottles are in shades of brown. The B22g horizon is silt loam or silty clay loam.

The Cg horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 0 through 2. The mottles are in shades of brown through neutral. The Cg horizon is silt loam or silty clay loam.

Nolin series

The Nolin series consists of deep, well drained, moderately permeable soils that formed in alluvium from limestone, siltstone, shale, and sandstone. These are nearly level soils on flood plains of major streams in the western part of the county. They are subject to occasional flooding in winter and spring and have a

seasonal high water table at a depth of 3 to 6 feet. The slopes range from 0 to 2 percent.

Nolin soils and Newark and Grigsby soils are on a similar landscape. Newark soils are on adjacent flood plains and are somewhat poorly drained. Grigsby soils have a coarse-loamy control section.

Typical pedon of Nolin silt loam, in a pasture, 100 feet north of Kentucky Highway 2, 0.1 mile east of intersection of Kentucky Highways 2 and 474, at Carter City:

Ap—0 to 10 inches; dark brown (10YR 4/3) silt loam; moderate medium granular structure; very friable; many roots; neutral; clear smooth boundary.
B21—10 to 22 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine and medium subangular blocky structure; friable; common roots; neutral; gradual smooth boundary.
B22—22 to 55 inches; brown (10YR 4/3) silt loam; weak medium and fine subangular blocky structure; friable; few roots; neutral; clear smooth boundary.
C—55 to 65 inches; dark yellowish brown (10YR 4/4) silt loam; few fine faint pale brown (10YR 6/3) mottles; structureless; friable; neutral.

Depth to bedrock is more than 60 inches. Reaction ranges from medium acid to moderately alkaline.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is silt loam. The B horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is silt loam or silty clay loam. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 2 through 4. It is silt loam, loam, or sandy loam and is stratified in some places.

Pope series

The Pope series consists of deep, well drained soils that have moderate to moderately rapid permeability. Pope soils formed in alluvium from acid sandstone, siltstone, and shale. These are nearly level soils on long, narrow or broad flood plains of major streams and their tributaries throughout the county. They are subject to frequent flooding in winter and spring. The slopes range from 0 to 2 percent.

Pope soils are adjacent to Cuba, Stendal, and Stokly soils. Cuba soils have a fine-silty control section. Stendal soils are somewhat poorly drained and have a fine-silty control section. Stokly soils are somewhat poorly drained.

Typical pedon of Pope fine sandy loam, in a pasture, 200 feet south of Kentucky Highway 1,300 feet north of Little Sandy River, about 4.5 miles north of Grayson:

Ap—0 to 8 inches; brown (10YR 4/3) fine sandy loam; weak fine granular structure; very friable; medium acid; clear smooth boundary.
B21—8 to 20 inches; dark yellowish brown (10YR 4/4) loam; weak medium subangular blocky structure; very friable; strongly acid; gradual smooth boundary.
B22—20 to 32 inches; brown (10YR 4/3) fine sandy loam; weak medium subangular blocky structure; very friable; strongly acid; gradual smooth boundary.
C—32 to 62 inches; yellowish brown (10YR 5/6) sandy loam; single grained; loose; strongly acid.

Depth to bedrock is 6 feet or more. Reaction is extremely acid to strongly acid throughout except in areas that have been treated with lime. Coarse fragments make up 0 to 30 percent of the solum and 0 to 60 percent of the C horizon.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is loam or fine sandy loam. The B horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. It is loam or fine sandy loam. The C horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. It is fine sandy loam, sandy loam, or loamy sand and is stratified in some places.

Rigley series

The Rigley series consists of deep, well drained soils that have moderately rapid permeability. Rigley soils formed in colluvium mainly from sandstone but also from siltstone and shale. These are steep soils on hillsides below sandstone outcrops in the south-central and north-central parts of the county. The slopes range from 30 to 60 percent.

Rigley soils are adjacent to Latham, Caneyville, Shelocta, Bledsoe, and Steinsburg soils. Latham and Caneyville soils are on upland ridgetops and have a solum that is 20 to 40 inches thick. Shelocta soils are on colluvial side slopes and have a fine-loamy control section. Bledsoe soils are on the lower part of side slopes and have a fine control section. Steinsburg soils are on upland ridgetops and have a solum that is 10 to 20 inches thick.

Typical pedon of Rigley stony fine sandy loam, in an area of Rigley-Rock outcrop association, steep, along a tributary 0.2 mile north of Big Sinking Creek, 2 miles southeast of Grahn:

O1—1 inch to 0; partly decomposed leaf litter.
A1—0 to 4 inches; dark brown (10YR 3/3) stony fine sandy loam; moderate medium granular structure; very friable; many very fine roots; 15 percent sandstone fragments; strongly acid; clear smooth boundary.
B1—4 to 14 inches; yellowish brown (10YR 5/4) sandy loam; weak medium subangular blocky structure; very friable; few fine roots; 10 percent sandstone fragments; very strongly acid; gradual wavy boundary.

B21t—14 to 41 inches; yellowish brown (10YR 5/6) gravelly sandy loam; weak medium subangular blocky structure; friable; few medium roots; few thin discontinuous clay films; 25 percent sandstone fragments; very strongly acid; gradual wavy boundary.

B22t—41 to 60 inches; yellowish brown (10YR 5/6) very gravelly sandy loam; weak medium subangular blocky structure; few medium roots; thin brown (7.5YR 5/4) continuous clay films; 35 percent sandstone fragments; very strongly acid; gradual wavy boundary.

C—60 to 73 inches; strong brown (7.5YR 5/6) very gravelly sandy clay loam; massive; friable; 50 percent sandstone fragments; very strongly acid.

Depth to bedrock ranges from 60 to 100 inches or more. Reaction ranges from strongly acid to extremely acid, except in areas that have been treated with lime. Sandstone gravel, cobbles, stones, or boulders make up 5 to 35 percent of the solum and 20 to 70 percent of the C horizon.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 through 4. In the fine earth fraction, it is fine sandy loam or loam. The B horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 through 6. The mottles are in shades of brown or yellow. In the fine earth fraction, the B horizon is sandy loam or sandy clay loam.

Shelocta series

The Shelocta series consists of deep, well drained, moderately permeable soils that formed in colluvium from acid shale, siltstone, and sandstone. These are gently sloping to steep soils on hillsides, foot slopes, and alluvial fans throughout the county. The slopes range from 2 to 50 percent.

Shelocta soils and Latham, Rigley, Cranston, and Vandalia soils are on a similar landscape. Latham soils are on ridgetops and have a solum that is 20 to 40 inches thick. Rigley and Cranston soils are on the lower part of colluvial side slopes and have a coarse-loamy control section. Vandalia soils are on the lower part of colluvial side slopes and have a fine control section.

Typical pedon of Shelocta silt loam, in an area of Latham-Shelocta association, steep, 20 feet south of a private road, 0.2 mile west of Kentucky Highway 7, 1.1 miles north of Clifty Creek, 2.2 miles south of Grayson Dam:

Ap—0 to 6 inches; brown (10YR 4/3) silt loam; moderate medium granular structure; very friable; common fine roots; 5 percent shale fragments; medium acid; clear smooth boundary.

B21t—6 to 24 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium and fine subangular blocky structure; friable; common fine roots; thin continuous clay films; 10 percent shale and sandstone fragments; very strongly acid; gradual smooth boundary.

B22t—24 to 48 inches; strong brown (7.5YR 5/6) gravelly silty clay loam; moderate medium and fine subangular blocky structure; friable; thick continuous clay films; 20 percent gravel and shale fragments; strongly acid; gradual wavy boundary.

B3t—48 to 64 inches; yellowish brown (10YR 5/4) gravelly silty clay loam; moderate medium subangular blocky structure; firm; few clay films; 30 percent gravel and shale fragments; very strongly acid; gradual wavy boundary.

C—64 to 76 inches; yellowish brown (10YR 5/4) very gravelly silty clay loam; few fine distinct light gray (2.5Y 7/2) mottles; massive; firm; 35 percent gravel and shale fragments; very strongly acid.

Depth to bedrock ranges from 60 to more than 120 inches. Reaction is very strongly acid or strongly acid throughout except in areas that have been treated with lime. Coarse fragments of shale and sandstone make up 5 to 35 percent of the solum and 20 to 60 percent of the C horizon.

The A horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4. It is silt loam, gravelly silt loam, gravelly loam, or loam. The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is silt loam or silty clay loam and the gravelly or shaly phases. The C horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It contains low chroma mottles in some places. It is silt loam or silty clay loam and the gravelly, channery, or shaly phases.

Skidmore series

The Skidmore series consists of deep, well drained soils that have moderately rapid permeability. Skidmore soils formed in alluvium from shale, siltstone, sandstone, and limestone. These are nearly level soils on flood plains along major streams and their tributaries in the northwestern part of the county. They are subject to frequent flooding in winter and spring and have a seasonal high water table at a depth of 3 to 4 feet. The slopes range from 0 to 2 percent.

Skidmore soils are adjacent to Nolin, Pope, and Grigsby soils. Nolin soils have a fine-silty control section. Pope soils are on flood plains and are more acid than Skidmore soils. Grigsby soils are on flood plains and have a coarse-loamy control section.

Typical pedon of Skidmore gravelly loam, 600 feet west of Kibbey Church, 150 feet north of road on McGlone Fork of Buffalo Creek, 5 miles southwest of Carter City on McGlone Fork Road:

Ap—0 to 7 inches; brown (10YR 4/3) gravelly loam; weak fine granular structure; very friable; few fine roots; 15 percent sandstone and siltstone fragments; slightly acid; clear smooth boundary.
B2—7 to 24 inches; brown (10YR 4/3) gravelly sandy loam; weak medium granular structure; very friable; few fine roots; 18 percent sandstone and siltstone fragments; neutral; clear smooth boundary.
IIC—24 to 60 inches; brown (10YR 4/3) very gravelly sandy loam; single grained; loose; 60 percent siltstone and sandstone fragments; neutral.

Depth to bedrock is 40 to more than 100 inches. Reaction ranges from medium acid to mildly alkaline. Siltstone fragments and sandstone pebbles make up 10 to 20 percent of the A horizon, up to 50 percent of the B horizon, and 35 to 65 percent of the C horizon.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is loam, gravelly loam, fine sandy loam, or gravelly sandy loam. The B horizon has hue of 10YR, value of 4 to 6, and chroma of 3 or 4. It is gravelly, very gravelly, channery, or very channery phases of loam, fine sandy loam, or sandy loam. The C horizon has hue of 10YR, value of 4 to 6, and chroma of 3 or 4. It is gravelly, very gravelly, channery, or very channery phases of loam, fine sandy loam, or sandy loam.

Steinsburg series

The Steinsburg series consists of moderately deep, well drained soils that have moderately rapid permeability. Steinsburg soils formed in residuum of acid sandstone. These are steep soils on narrow ridgetops and on the upper part of hillsides in the central and eastern parts of the county. They are associated, in some places, with large sandstone boulders and rock outcrops. The slopes range from 30 to 50 percent.

Steinsburg soils are in positions on the landscape similar to those of Latham and Lily soils. Latham soils are on narrow ridgetops and have a clayey control section. Lily soils have a fine-loamy control section.

Typical pedon of Steinsburg sandy loam, in an area of Steinsburg-Latham association, steep, on a ridge, 0.8 mile south of Clifty Creek, 0.8 mile west of Kentucky Highway 7, 3.2 miles southwest of Grayson Dam:

O—1 inch to 0; loose hardwood leaf litter and twigs.
A1—0 to 5 inches; dark grayish brown (10YR 4/2) sandy loam; weak fine granular structure; very friable; common fine roots and few coarse roots; 5 percent sandstone fragments; very strongly acid; clear smooth boundary.
B1—5 to 12 inches; yellowish brown (10YR 5/4) sandy loam; weak medium subangular blocky structure; friable; common fine roots and few coarse roots; 10 percent sandstone fragments; extremely acid; gradual smooth boundary.
B2—12 to 18 inches; yellowish brown (10YR 5/4) gravelly sandy loam; weak medium subangular blocky structure; friable; few fine roots; 15 percent sandstone fragments; extremely acid; clear wavy boundary.
C—18 to 30 inches; yellowish brown (10YR 5/6) gravelly sandy loam; single grained; loose; 25 percent sandstone fragments; extremely acid; abrupt smooth boundary.
R—30 inches; sandstone bedrock.

Depth to bedrock ranges from 24 to 40 inches. Reaction is strongly acid or very strongly acid. Coarse fragments of sandstone make up 5 to 20 percent of the solum and 20 to 60 percent of the C horizon.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 through 4. It is sandy loam, fine sandy loam, or loam. The B horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 through 6. It is sandy loam or fine sandy loam and the gravelly phases. The C horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 through 6. It is sandy loam or loamy sand and the gravelly or very gravelly phases.

Stendal series

The Stendal series consists of deep, somewhat poorly drained, moderately permeable soils that formed in alluvium from sandstone, siltstone, and shale. These are nearly level soils on flood plains of major streams and their tributaries throughout the county. They are subject to frequent flooding in winter and spring. They have a seasonal high water table at a depth of 1.0 foot to 3.0 feet. The slopes range from 0 to 2 percent.

Stendal soils are in positions on the landscape similar to those of Cuba, Pope, and Stokly soils. Cuba soils are well drained. Pope soils are well drained and have a coarse-loamy control section. Stokly soils are somewhat poorly drained and have a coarse-loamy control section.

Typical pedon of Stendal silt loam, in a pasture, 1 mile east of Willard, Kentucky, 100 feet south of Kentucky Highway 1496 where EK Mines Branch intersects Lost Creek:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam; common fine distinct yellowish brown (10YR 5/4 and 5/6) mottles; weak medium granular structure; friable; strongly acid; clear smooth boundary.
C1g—7 to 36 inches; grayish brown (10YR 5/2) silt loam; common fine distinct yellowish brown (10YR 5/4 and 5/6) mottles; weak medium granular structure; friable; strongly acid; clear smooth boundary.
C2g—36 to 60 inches; grayish brown (10YR 5/2) silty clay loam; common medium and coarse distinct gray (10YR 5/1) and yellowish brown (10YR 5/6) mottles; massive; friable; few fine black (7.5YR 2/0) concretions; strongly acid.

Depth to bedrock is 5 feet or more. Reaction is strongly acid or very strongly acid throughout except in areas that have been treated with lime.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is silt loam. The Cg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 3. The mottles are in shades of brown or gray. The Cg horizon is silt loam or silty clay loam.

Stokly series

The Stokly series consists of deep, somewhat poorly drained soils that have moderately rapid permeability. Stokly soils formed in alluvium from acid sandstone, siltstone, and shale. These are nearly level soils on flood plains of small streams throughout the county. They are subject to frequent flooding in winter and spring and have a seasonal high water table at a depth of 0.5 to 1.0 foot. The slope generally is less than 2 percent.

Stokly soils are in positions on the landscape similar to those of Pope, Cotaco, and Stendal soils. Pope soils are on adjacent flood plains and are well drained. Cotaco soils are on adjacent low terraces and have an argillic horizon. Stendal soils are on adjacent flood plains and have a fine-silty control section.

Typical pedon of Stokly fine sandy loam, 3.5 miles north of Grayson, 1.0 mile east of intersection of Kentucky Highway 1 and Wilson Creek-Pactolus Road, 0.1 mile south on private gravel road and 500 feet east, in a pasture:

Ap—0 to 5 inches; grayish brown (10YR 5/2) fine sandy loam; common fine and medium faint dark grayish brown (10YR 4/2) and common fine distinct dark yellowish brown (10YR 4/6) mottles; weak fine granular structure; friable; many fine roots; slightly acid; clear smooth boundary.

B21—5 to 15 inches; brown (10YR 5/3) fine sandy loam; common fine distinct dark brown (7.5YR 4/4) and olive gray (5Y 5/2) mottles; weak fine and medium subangular blocky structure; friable; few fine roots; few black concretions; medium acid; clear smooth boundary.

B22g—15 to 34 inches; light brownish gray (2.5Y 6/2) fine sandy loam; common fine and medium distinct dark brown (7.5YR 4/4) mottles; weak fine and medium subangular blocky structure; friable; few fine roots; common black concretions; few fine pores; strongly acid; clear smooth boundary.

C—34 to 62 inches; mottled, olive gray (5Y 5/2), yellowish brown (10YR 5/6), and brown (7.5YR 4/4) fine sandy loam; massive; friable; common black concretions; very strongly acid.

Depth to bedrock is 5 feet or more. Reaction ranges from strongly acid to extremely acid throughout except in areas that have been treated with lime.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is loam or fine sandy loam. The B2 horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. The mottles are in shades of brown or gray. The B2 horizon is fine sandy loam or loam. The B2g horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 or less. The mottles are in shades of brown, gray, or olive. The B2g horizon is fine sandy loam or loam. The C horizon has hue of 10YR or 5Y, value of 4 or 5, and chroma of 2 or less. The mottles are in shades of brown or gray. The C horizon is fine sandy loam or loamy sand.

Tilsit series

The Tilsit series consists of deep, moderately well drained soils that have moderate permeability above the fragipan and slow to very slow permeability in the fragipan. Tilsit soils formed in silty residuum of acid sandstone and shale. These are gently sloping soils on ridgetops in the central and western parts of the county. There is a seasonal perched water table at a depth of 1.5 to 2.5 feet. The slopes range from 2 to 6 percent.

Tilsit soils are in positions on the landscape similar to those of Latham, Monongahela, and Wernock soils. Latham soils do not have a fragipan and have a clayey control section. Monongahela soils have a fine-loamy control section. Wernock soils do not have a fragipan and are well drained.

Typical pedon of Tilsit silt loam, 2 to 6 percent slopes, in a pasture, 1 mile north of Kentucky Highway 182, 1.25 miles east of the intersection of Kentucky Highways 182 and 2, 4 miles south of Carter City:

Ap—0 to 9 inches; brown (10YR 5/3) silt loam; weak fine and medium granular structure; very friable; many fine roots; neutral; abrupt smooth boundary.

B21t—9 to 18 inches; yellowish brown (10YR 5/6) silt loam; moderate fine and medium subangular blocky structure; friable; few fine roots; thin discontinuous clay films; few small sandstone fragments; slightly acid; clear smooth boundary.

B22t—18 to 24 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct pale brown (10YR 6/3) mottles; moderate fine and medium subangular blocky structure; firm; few fine roots; thin continuous clay films; few small sandstone fragments; strongly acid; clear smooth boundary.

Bx1—24 to 35 inches; yellowish brown (10YR 5/6) silt loam; many medium and coarse distinct light brownish gray (10YR 6/2) and gray (10YR 5/1) mottles; weak very coarse prismatic structure parting to weak medium and fine angular blocky; very firm; brittle; thin discontinuous clay films; strongly acid; gradual smooth boundary.

Bx2—35 to 50 inches; mottled, yellowish brown (10YR 5/6), gray (10YR 6/1), and grayish brown (2.5Y 5/2) silty clay loam; weak very coarse prismatic structure parting to weak medium and fine angular blocky structure; very firm; brittle; very thin discontinuous clay films; strongly acid; gradual smooth boundary.
C—50 to 65 inches; mottled, yellowish brown (10YR 5/6), grayish brown (2.5Y 5/2), and light brownish gray (10YR 6/2) silty clay loam; massive; firm; few sandstone fragments; strongly acid.

Depth to bedrock ranges from 40 to 120 inches. Reaction ranges from extremely acid to strongly acid throughout except in areas that have been treated with lime.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is silt loam.

The B1 horizon has hue of 10YR, value of 5 or 6, and chroma of 4 to 6. It is silt loam. The B2t horizon has hue of 2.5Y or 10YR, value of 5 or 6, and chroma of 4 to 6. The mottles are in shades of yellow or brown. The B2t horizon is silt loam or silty clay loam. The Bx horizon has hue of 2.5Y or 10YR, value of 5 or 6, and chroma of 4 to 8. The mottles are in shades of brown or gray. The Bx horizon is silt loam or silty clay loam.

In some places there is a C horizon. It has hue of 2.5Y or 10YR, value of 5 or 6, and chroma of 4 to 8. It is silt loam, silty clay loam, or silty clay. The mottles are in shades of brown, yellow, red, or gray.

Upshur series

The Upshur series consists of deep, well drained soils that have slow permeability. Upshur soils formed in residuum of shale and siltstone. These are moderately steep to steep soils on ridgetops, benches, and hillsides in the southeastern part of the county. The slopes range from 12 to 50 percent.

Upshur soils are associated with Latham, Steinsburg, and Vandalia soils. Latham soils are on upland ridges and have a solum that is 20 to 40 inches thick. Steinsburg soils have a coarse-loamy control section. Vandalia soils are on the lower part of colluvial slopes and have less clay in the upper part of the argillic horizon than Upshur soils.

Typical pedon of Upshur silty clay loam, in an area of Upshur silty clay loam, 12 to 30 percent slopes, 0.1 mile north of Kentucky 773, 0.1 mile southwest of the Lawrence-Boyd County line, about 3 miles southeast of Denton:

Ap—0 to 4 inches; brown (7.5YR 4/2) silty clay loam; moderate medium granular structure; very friable; common very fine roots; medium acid; abrupt smooth boundary.
B21t—4 to 10 inches; reddish brown (2.5YR 4/4) silty clay; strong fine blocky and subangular blocky structure; firm, plastic and sticky; few fine roots; reddish brown (5YR 5/3) clay films on peds; very strongly acid; gradual smooth boundary.
B22t—10 to 26 inches; dark reddish brown (2.5YR 3/4) clay; strong medium and fine angular blocky structure; firm, very plastic and sticky; few fine roots; thick reddish brown (5YR 5/3) clay films on peds; very strongly acid; gradual wavy boundary.
B3—26 to 38 inches; dark red (2.5YR 3/6) clay; few medium distinct pale brown (10YR 6/3) and yellowish red (5YR 5/6) mottles; strong medium and fine angular blocky structure; firm, plastic and sticky; very strongly acid; clear smooth boundary.
C—38 to 47 inches; yellowish brown (10YR 5/6) silty clay; common medium distinct light brownish gray (2.5Y 6/2) mottles; massive; common dark stains and coatings; 5 percent gray shale fragments; strongly acid; abrupt smooth boundary.
Cr—47 inches; gray and olive shale and siltstone.

Depth to paralithic or lithic contact ranges from 40 to more than 72 inches. Coarse fragments of shale, siltstone, or sandstone make up 0 to 10 percent of the A horizon and upper part of the B2t horizon, 0 to 25 percent of the lower part of the B2t horizon and of the B3 horizon, and less than 5 to 75 percent of the C horizon. Reaction ranges from very strongly acid to slightly acid in the surface layer and upper part of the subsoil and from very strongly acid to moderately alkaline in the lower part. The substratum is strongly acid to moderately alkaline.

The A horizon has hue of 10YR through 2.5YR, value of 4 or 5, and chroma of 2 through 4. It is silt loam or silty clay loam. The B horizon has hue of 5YR through 2.5YR, value of 3 through 5, and chroma of 4 through 6. It is silty clay or clay and the shaly phases. The C horizon has hue of 2.5YR through 10YR, value of 3 through 6, and chroma of 2 through 8. In most pedons the C horizon is variegated olive, brown, gray, or yellow. It is silty clay or clay and the shaly or very shaly phases.

Vandalia series

The Vandalia series consists of deep, well drained soils that have moderately slow to slow permeability. Vandalia soils formed in colluvium from upland shale, siltstone, and sandstone. These are steep soils on colluvial side slopes and benches in the eastern part of the county. The slopes range from 30 to 50 percent.

Vandalia soils are associated with Latham, Shelocta, and Upshur soils. Latham soils are on upland ridgetops and have a solum that is 20 to 40 inches thick. Shelocta soils have a fine-loamy control section. Upshur soils are on high convex ridges and are less than 10 percent sand in the control section.

Typical pedon of Vandalia silt loam, in an area of Vandalia-Upshur association, steep, 0.1 mile south of Kentucky Highway 773 on Straight Creek, 0.5 mile west of the Lawrence County line, about 2.75 miles southeast of Denton:

Ap—0 to 7 inches; dark brown (7.5YR 4/2) silt loam; moderate medium granular structure; very friable; many very fine roots; medium acid; abrupt smooth boundary.
B21t—7 to 14 inches; yellowish red (5YR 4/6) silty clay loam; moderate medium and fine subangular blocky structure; friable; few fine roots; thin continuous reddish brown (5YR 4/4) clay films on peds; strongly acid; gradual wavy boundary.
B22t—14 to 33 inches; yellowish red (5YR 4/6) silty clay; moderate, medium and fine, subangular blocky and blocky structure; firm, sticky; few medium roots; many clay films; 5 percent sandstone fragments; medium acid; gradual wavy boundary.
B23t—33 to 55 inches; reddish brown (5YR 5/4) shaly silty clay; moderate, medium and fine, blocky and subangular blocky structure; firm; few clay films; 20 percent shale and sandstone fragments; medium acid; gradual wavy boundary.
C—55 to 68 inches; yellowish brown (10YR 5/4) silty clay; common medium distinct strong brown (7.5YR 5/6) and gray (10YR 6/1) mottles; massive; firm; 10 percent shale fragments; medium acid; abrupt smooth boundary.
Cr—68 inches; gray soft shale.

Depth to bedrock is 6 feet or more. Reaction ranges from medium acid to very strongly acid in the A horizon and upper part of the B horizon and is medium acid or slightly acid in the lower part. The C horizon is strongly acid to neutral. Coarse fragments of shale, siltstone, and sandstone make up 5 to 40 percent of the A and B horizons and up to 50 percent of the C horizon.

The A horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 through 4. It is silt loam or silty clay loam.

The Bt horizon has hue of 2.5YR to 5YR, value of 4 or 5, and chroma of 4 through 6. In some pedons the lower part of the Bt horizon is mottled in shades of olive and gray. The Bt horizon is silty clay loam, silty clay, or clay and the gravelly or shaly phases.

The C horizon has hue of 2.5YR through 10YR, value of 3 through 6, and chroma of 4 or 5. It is silty clay or clay and the gravelly or shaly phases. In some pedons it is mottled in shades of olive or gray.

Wernock series

The Wernock series consists of moderately deep, well drained, moderately permeable soils that formed in residuum of acid sandstone, siltstone, and shale. These are gently sloping to moderately steep soils on upland ridgetops throughout the county. The slopes range from 2 to 20 percent.

Wernock soils are in positions on the landscape similar to those of Latham and Tilsit soils. Latham soils have a clayey control section. Tilsit soils have a fragipan and are moderately well drained.

Typical pedon of Wernock silt loam, in an area of Wernock silt loam, 6 to 12 percent slopes, in a pasture, 0.1 mile southwest of a county road, 1.2 miles south of Kentucky Highway 7, 0.5 mile west of Iron Hill:

Ap—0 to 6 inches; brown (10YR 4/3) silt loam; weak fine granular structure; very friable; many fine roots; medium acid; clear smooth boundary.
B21t—6 to 18 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; common fine roots; common clay films; strongly acid; clear smooth boundary.
B22t—18 to 26 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; common fine roots; common clay films; very strongly acid; clear smooth boundary.
B23t—26 to 34 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct light yellowish brown (10YR 6/4) mottles; weak and fine moderate subangular blocky structure; firm; few fine roots; few clay films; very strongly acid; clear smooth boundary.
C—34 to 40 inches; yellowish brown (10YR 5/6) shaly silty clay loam; common medium distinct yellowish red (5YR 4/6), strong brown (7.5YR 5/6), and light brownish gray (10YR 6/2) mottles; massive; firm; 25 percent sandstone and shale fragments; very strongly acid; abrupt smooth boundary.
Cr—40 inches; interbedded shale and sandstone.

Depth to soft sandstone or shale ranges from 30 to 40 inches. Reaction ranges from strongly acid to extremely acid throughout except in areas that have been treated with lime. Coarse fragments make up 0 to 10 percent of the material to a depth of about 24 inches and 0 to 30 percent below a depth of 24 inches.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is silt loam.

In some places there is a B1 horizon. It has hue of 10YR, value of 4 or 5, and chroma of 4 to 6. It is silt loam.

The Bt horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 4 to 6. It is silt loam or silty clay loam. It contains mottles in shades of brown or red in some places.

The C horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 4 to 6. The mottles are in shades of brown or gray. The C horizon is silt loam or silty clay loam and the gravelly, shaly, or channery phases.

Whitley series

The Whitley series consists of deep, well drained, moderately permeable soils that formed in alluvium from acid siltstone, sandstone, and shale. These are nearly level soils on low stream terraces and alluvial fans throughout the county. They are subject to rare flooding in winter and spring. The slopes range from 0 to 4 percent.

Whitley soils and Allegheny, Cuba, and Morehead soils are on a similar landscape. Allegheny soils have a fine-loamy control section. Cuba soils are on flood plains and do not have an argillic horizon. Morehead soils are somewhat poorly drained.

Typical pedon of Whitley silt loam, 0 to 4 percent slopes, in a pasture, 1 mile north of the Grayson interchange of Interstate 64, 500 feet east of Kentucky Highways 7 and 1:

Ap—0 to 9 inches; brown (10YR 4/3) silt loam; weak fine granular structure; very friable; many fine roots; neutral; abrupt smooth boundary.

B21t—9 to 18 inches; dark brown (7.5YR 4/4) silt loam; moderate medium subangular blocky structure; friable; common fine roots; few thin continuous clay films; very strongly acid; gradual smooth boundary.

B22t—18 to 33 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure; friable; few fine roots; few thin continuous clay films; very strongly acid; gradual smooth boundary.

B23t—33 to 54 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium and fine subangular blocky structure; friable; few thin discontinuous clay films; very strongly acid; gradual smooth boundary.

B3—54 to 70 inches; dark yellowish brown (10YR 4/4) silt loam; few fine distinct light yellowish brown (2.5Y 6/4) mottles; weak fine subangular blocky structure; friable; strongly acid; gradual smooth boundary.

C—70 to 80 inches; dark yellowish brown (10YR 4/6) silt loam; common medium distinct light yellowish brown (2.5Y 6/4) mottles; massive; friable; very strongly acid.

Depth to bedrock is more than 60 inches. Reaction is very strongly acid or strongly acid throughout except in areas that have been treated with lime.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is silt loam.

The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. The lower part of the Bt horizon has mottles in shades of yellow or brown in some places. The Bt horizon is silt loam or silty clay loam.

The C horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. The mottles are in shades of yellow or brown. The C horizon is silt loam, silty clay loam, or sandy loam or the gravelly phases.

formation of the soils

The characteristics of a soil are determined by climate, plant and animal life, parent material, topography, and time. Soils are formed through the interaction of these factors, but the relative importance of each factor is not constant from one soil to another. The effects of climate and plant and animal life are not likely to vary much within the county, but local differences in relief and parent material may affect the characteristics of a soil considerably. The interrelationship between the five factors of soil formation is complex, and the effect of any one factor is difficult to isolate.

In this section the factors of soil formation are discussed as they relate to the soils in Carter County. In addition, the processes of horizon development are described.

factors of soil formation

climate

Climate affects the physical, chemical, and biological relationships in the soil. 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 in Carter County is temperate and humid. The average annual precipitation is about 43 inches, and the mean annual air temperature is about 53 degrees F. The soils are almost never dry, and leaching occurs throughout the year. Most soluble bases have been leached out of the solum, and clay minerals have been translocated out of the surface layer into the subsoil. As a result, most of the soils have a leached, acid surface layer and a subsoil that has a finer texture than the surface layer. Latham and Wernock soils are strongly leached soils.

plant and animal life

Plants affect soil formation mainly by adding organic matter to the soil. Organic matter imparts a dark color to the soil material. Animals, bacteria, and fungi affect soil formation by converting the organic matter to humus and plant nutrients. Humus influences the structure of the soil.

The soils in Carter County formed mainly under hardwood forests. These soils 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 contribute to differences in forest density, composition of plant species, and the kinds of associated ground cover. Variations in the soils reflect these local differences. Shelocta soils, for example, have a darker colored surface layer on steep, north-facing slopes than on south-facing slopes. North-facing slopes receive less direct sunlight. They have a slightly lower soil temperature and have more favorable moisture conditions. These sites produce more understory and overstory vegetation, and the decaying leaf litter causes a thicker and darker surface layer to form.

Man has greatly altered the natural development of soil by clearing forests, draining swamps, plowing, and mining. He has mixed the soil horizons, moved soil materials from place to place, added lime and fertilizer, and introduced new plants. Where he misused the land, erosion accelerated. In these areas part or all of the original surface layer has been removed, and the subsoil has been exposed. In some areas these changes have been so drastic that different kinds of soils have formed. Bethesda and Fairpoint are examples of soils formed by the reshaping of soil material during surface coal mining.

parent material

Parent material is the unconsolidated mass in which a soil forms. The soils in Carter County formed mostly in residuum and colluvium from bedrock and in alluvium. In some valleys they formed in deposits of lacustrine material.

Most of the surface rock formations consist of acid shale, siltstone, and sandstone, or limestone and a few thin layers of calcareous shale. The chemical and mineralogical content of the soil, its texture, and the depth to rock are greatly influenced by the kind of parent material in which a soil forms. Steinsburg soils, for example, formed in material that weathered from sandstone. They have a coarser texture than Caneyville soils, which formed in material that weathered from limestone. Berks and Cranston soils have a medium texture and formed in material that weathered from siltstone and shale. Cuba soils and other alluvial soils have the same general composition as the surrounding soils on uplands. McGary soils have a fine texture and formed in lacustrine deposits.

topography

Topography affects soil formation through its influence on drainage and erosion. The position, shape, and slope of the soil affect aeration, soil temperature, plant cover, and exposure to sun and wind.

The topography of Carter County ranges from nearly level valleys to narrow sloping ridges and steep hillsides. The difference in elevation between the valleys and adjacent hillcrests ranges from about 300 to 600 feet.

Many steep soils developed in colluvial material that washed or crept downhill from the upper part of the slope, and as a result, these soils are deep. Vandalia, Bledsoe, and Shelocta soils formed in this manner. Some steep soils are moderately deep mainly because of rapid geologic erosion. Berks soils are steep, moderately deep soils. Steep soils generally have fewer, less distinct horizons than soils that form in less sloping areas because water tends to run off the surface in steep areas. In less sloping areas, more rain penetrates the surface; the horizons are more distinct, and the soils are less eroded.

The shape of the land generally is related to the rate at which the underlying rocks weather. Shale weathers more rapidly than siltstone and sandstone; consequently, areas underlain by shale are rounded and highly dissected, and areas underlain by interbedded shale, siltstone, and sandstone are benched and have abrupt changes in slope.

Topography generally determines the depth of the water table, which is an important factor in soil development. In some nearly level areas the soils are saturated for extended periods. These soils commonly are gray and mottled. Stendal and Cotaco soils are mottled, nearly level soils.

time

Time is required for parent material to be altered and for soils to form. The length of time required for a soil to develop depends mainly on the kind and nature of the parent material and the topography. Plant and animal life and climate are comparatively less important than parent material and topography in determining the rate of soil development. A soil generally is said to be mature if it has been in place long enough to acquire distinct profile characteristics. Lily, Cranston, and Tilsit soils are mature soils.

Steinsburg and Latham soils formed in different parent material in about the same length of time. Steinsburg soils formed in residuum of resistant sandstone and have weaker profile development than Latham soils, which formed in residuum of easily weathered soft shale.

Berks and Wernock soils formed in similar parent material but on different landscapes. Both formed in residuum of siltstone and shale, but Wernock soils are sloping to moderately steep and Berks soils are steep. Wernock soils have greater horizon development than Berks soils although both have been forming for about the same length of time.

Soils that form in recently deposited sediment have weak horizon development. In places the surface layer has a high organic matter content, and the subsoil has weak structure. Such soils are said to be immature or young. Skidmore and Pope soils are immature. After a long time, if no additional sediment is deposited, weathering occurs, some of the finer material moves into the subsoil, and the structure and color of the subsoil may change. Whitley soils have undergone this maturing process.

soil horizon development

The development of soil horizons is the result of one or more of the following processes: accumulation of organic matter; leaching of carbonates and other more soluble minerals; chemical weathering, chiefly by hydrolysis, of primary minerals into silicate clay minerals; translocation of the silicate clays and silt-sized particles; and reduction and transfer of iron.

Several of these processes have been active in the formation of most soils in Carter County. The interaction of the first four processes is reflected by the distinct horizons in the well drained Upshur and Hagerstown soils. All five processes have been active in the formation of the moderately well drained Monongahela and Tilsit soils. Accumulation of organic matter has had the greatest effect on Nolin soils, which formed in recent alluvium.

Organic matter accumulates on soils to form an immediate surface layer, or A1 horizon. The organic matter content of the soils in the county ranges from low, as in Berks soils, to high, as in Nolin soils. If the soil is tilled, the A1 horizon is mixed with part or all of the B horizon. This plow layer is also called an Ap horizon.

Most of the soils in the county are acid because they formed in material low in carbonates and other soluble materials. Allegheny and Rigley soils are very strongly acid and formed in material derived from sandstone, siltstone, and shale. Material recently deposited on flood plains generally reflects the composition of the soils on surrounding uplands. Cuba and Pope soils, for example, are strongly acid and formed in acid material that washed from uplands. Nolin and Grigsby soils are not so acid and formed in material that weathered from limestone, sandstone, and shale. McGary soils formed in calcareous deposits. They are acid in the upper layers and have carbonates in the lower layers.

The translocation of clay minerals is an important process in horizon development in many soils in the county. Clay minerals move from the A horizon into the B horizon and generally are immobilized. They form clay films on the faces of peds, in pores, and in root channels.

The reduction and transfer of iron occurs in soils that do not have good drainage. This process is known as gleying. Some iron may become reoxidized and segregated and form mottles. The subsoil of gleyed soils typically has yellowish brown, strong brown, and other brightly-colored mottles in a grayish matrix. Concretions of iron or manganese commonly are formed under these conditions, as in Stokly soils.

As silicate clay forms in primary minerals, some iron is freed as hydrated oxide. These oxides are reddish, and even in small amounts they give the soil a brownish color. Oxides are largely responsible for the strong brown, yellowish brown, or reddish brown color of the subsoil of many soils in Carter County.

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glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Aspect (forestry). The direction that a slope faces.

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 commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 40-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

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 flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of a standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

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 coating, clay skin.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

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.

Conservation tillage. A form of noninversion tillage that retains protective amounts of residue mulch on the surface throughout the year. Various forms include no-tillage, strip tillage, stubble mulching, and other types of noninversion tillage.

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. 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 that part of the soil profile between depths of 10 inches and 40 or 80 inches.

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 (in tables). The walls of excavations tend to cave in or slough.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Differential settlement potential. The potential for irregular settlement of the soil because of differences in compressibility and deformation of the underlying soil.

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 they are wet 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.

Drainage, surface. Runoff, or surface flow of water, from an area.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the

building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fine textured soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

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. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

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.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:
O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.
A horizon.—The mineral horizon 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.
B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have 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 in which the solum 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.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

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 (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

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.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

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 simple 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.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outslope. The exposed area sloping away from a bench cut section.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated 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 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through 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 semisolid to plastic.

Reaction, soil. A measure 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

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil 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.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

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.

Sinkhole. A depression in the landscape where limestone has been dissolved.

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.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

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.

Slope (in tables). Slope is great enough that special practices are required to insure satisfactory performance of the soil for a specific use.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It 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 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in 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 plant and animal activities 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.

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. 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 layer. 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 and behavior.

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 water soaks into the soil or flows slowly to a prepared outlet. 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.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1951-77 at Grayson, Kentucky]

Month	Temperature						Precipitation				
	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[1]	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	Unit	In	In	In		In
January	43.6	22.0	32.9	75	-8	109	3.45	1.80	4.79	9	4.8
February	47.3	24.0	35.7	75	-2	91	3.31	1.36	4.88	7	2.7
March	56.3	30.2	40.5	83	11	384	4.07	2.30	5.50	10	2.8
April	68.4	39.4	53.9	89	20	422	3.78	2.15	5.10	8	.0
May	77.0	47.9	55.1	92	28	938	4.27	2.46	5.73	8	.0
June	83.8	57.9	70.9	96	41	927	4.20	2.99	5.30	9	.0
July	87.4	62.3	74.9	98	49	1,082	4.31	2.70	5.76	8	.0
August	86.1	60.7	73.5	97	45	1,039	3.66	2.12	4.90	6	.0
September	80.3	53.3	66.8	97	35	804	3.35	1.85	4.56	6	.0
October	69.0	40.5	54.8	87	21	467	2.48	1.05	3.63	6	.0
November	56.3	30.3	43.4	80	10	153	2.69	1.43	3.71	6	1.3
December	47.4	25.7	36.6	74	2	106	3.29	1.77	4.53	7	1.7
Yearly:											
Average	66.9	41.2	53.3	---	---	---	---	---	---	---	---
Extreme	---	---	---	101	-13	---	---	---	---	---	---
Total	---	---	---	---	---	6,522	42.86	36.54	49.82	90	13.3

[1] 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 (40° F) below which growth is minimal for the principal crops in the area.

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-77 at Grayson, Kentucky]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 17	May 2	May 15
2 years in 10 later than--	April 11	April 27	May 11
5 years in 10 later than--	March 31	April 17	May 3
First freezing temperature in fall:			
1 year in 10 earlier than--	October 22	October 9	September 29
2 years in 10 earlier than--	October 26	October 14	October 3
5 years in 10 earlier than--	November 2	October 23	October 11

TABLE 3.--GROWING SEASON

[Recorded in the period 1951-77 at Grayson, Kentucky]

Probability	Length of growing season if daily minimum temperature is--		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	196	170	147
8 years in 10	202	176	151
5 years in 10	215	188	160
2 years in 10	229	200	169
1 year in 10	235	206	174

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
AlA	Allegheny loam, 0 to 2 percent slopes	970	0.4
AlB	Allegheny loam, 2 to 6 percent slopes	190	0.1
AlC	Allegheny loam, 6 to 12 percent slopes	210	0.1
BCF	Berks-Cranston association, steep	15,310	6.0
BeB	Bethesda-Fairpoint complex, 0 to 6 percent slopes	1,370	0.5
BeF	Bethesda-Fairpoint complex, 6 to 60 percent slopes	4,240	1.7
BRF	Bledsoe-Caneyville-Rock outcrop association, steep	11,730	4.6
CaC	Caneyville silt loam, 6 to 20 percent slopes	2,350	0.9
CbD	Caneyville-Rock outcrop complex, 12 to 30 percent slopes	7,380	2.9
Co	Cotaco loam	4,350	1.7
Cu	Cuba silt loam	470	0.2
Gr	Grigsby fine sandy loam	1,370	0.5
HaB	Hagerstown silt loam, 2 to 6 percent slopes	170	0.1
LaC	Latham silt loam, 6 to 12 percent slopes	6,210	2.5
LaD	Latham silt loam, 12 to 20 percent slopes	11,890	4.7
LsE	Latham-Shelocta silt loams, 20 to 30 percent slopes	27,120	10.7
LTF	Latham-Shelocta association, steep	99,150	39.0
LyD	Lily fine sandy loam, 6 to 20 percent slopes	3,550	1.4
Mc	McGary silt loam	1,210	0.5
MoA	Monongahela loam, 0 to 2 percent slopes	540	0.2
MoB	Monongahela loam, 2 to 6 percent slopes	760	0.3
Mr	Morehead silt loam	1,250	0.5
Ne	Newark silt loam	460	0.2
No	Nolin silt loam	140	0.1
Pm	Pits-Dumps complex	240	0.1
Po	Pope fine sandy loam	4,570	1.8
RSF	Rigley-Rock outcrop association, steep	4,170	1.6
SaB	Shelocta silt loam, 2 to 6 percent slopes	2,290	0.9
SaC	Shelocta silt loam, 6 to 12 percent slopes	2,610	1.0
SaD	Shelocta silt loam, 12 to 20 percent slopes	2,340	0.9
Sd	Skidmore gravelly loam	3,050	1.2
SNF	Steinsburg-Latham association, steep	2,030	0.8
St	Stendal silt loam	880	0.3
Sv	Stokly fine sandy loam	3,110	1.2
TlB	Tilsit silt loam, 2 to 6 percent slopes	1,690	0.7
UpD	Upshur silty clay loam, 12 to 30 percent slopes	640	0.3
VUF	Vandalia-Upshur association, steep	11,540	4.5
WeB	Wernock silt loam, 2 to 6 percent slopes	1,290	0.5
WeC	Wernock silt loam, 6 to 12 percent slopes	4,830	1.9
WeD	Wernock silt loam, 12 to 20 percent slopes	5,190	2.0
WhA	Whitley silt loam, 0 to 4 percent slopes	1,220	0.5
	Total	254,080	100.0

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn	Soybeans	Wheat	Tobacco	Grass-legume hay	Pasture
	Bu	Bu	Bu	Lb	Ton	AUM*
AlA---------- Allegheny	125	40	45	3,200	4.0	8.5
AlB---------- Allegheny	115	40	45	3,000	3.5	8.0
AlC---------- Allegheny	105	35	40	2,750	3.5	7.5
BCF:						
Berks----------	---	---	---	---	---	2.0
Cranston----------	---	---	---	---	---	2.5
BeB---------- Bethesda-Fairpoint	---	---	---	---	---	2.5
BeF---------- Bethesda-Fairpoint	---	---	---	---	---	---
BRF:						
Bledsoe----------	---	---	---	---	---	4.0
Caneyville----------	---	---	---	---	---	3.0
Rock outcrop.						
CaC---------- Caneyville	---	---	---	---	---	5.0
CbD---------- Caneyville-Rock outcrop	---	---	---	---	---	4.0
Co---------- Cotaco	110	35	40	2,700	3.5	7.0
Cu---------- Cuba	135	45	45	3,000	4.5	8.5
Gr---------- Grigsby	130	---	40	3,000	4.0	8.0
HaB---------- Hagerstown	135	40	50	3,000	4.5	8.5
LaC---------- Latham	80	---	30	2,200	3.0	6.0
LaD---------- Latham	---	---	---	---	2.5	5.0
LsE---------- Latham-Shelocta	---	---	---	---	---	5.0
LTF:						
Latham----------	---	---	---	---	---	4.0
Shelocta----------	---	---	---	---	---	4.5
LyD---------- Lily	80	---	---	1,900	3.0	5.0
Mc---------- McGary	100	35	40	---	3.5	7.0

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Wheat	Tobacco	Grass-legume hay	Pasture
	Bu	Bu	Bu	Lb	Ton	AUM*
MoA, MoB---- Monongahela	110	40	40	2,700	3.5	7.0
Mr---- Morehead	110	40	40	2,800	4.0	8.0
Ne---- Newark	115	40	45	2,700	4.5	8.5
No---- Nolin	135	45	45	3,200	4.5	9.0
Pm---- Pits-Dumps	---	---	---	---	---	---
Po---- Pope	130	40	45	3,000	4.0	8.0
RSF: Rigley----	---	---	---	---	---	2.5
Rock outcrop.						
SaB---- Shelocta	110	40	45	3,000	4.0	8.5
SaC---- Shelocta	100	30	40	2,300	4.0	8.0
SaD---- Shelocta	80	---	35	2,000	3.0	7.0
Sd---- Skidmore	90	35	40	2,500	4.0	5.5
SNF: Steinsburg----	---	---	---	---	---	2.5
Latham----	---	---	---	---	---	2.5
St---- Stendal	125	45	40	2,500	4.0	8.5
Sv---- Stokly	110	40	50	2,000	4.0	8.0
TlB---- Tilsit	100	35	40	2,600	3.5	6.5
UpD---- Upshur	---	---	---	---	2.5	5.0
VUF: Vandalia----	---	---	---	---	---	3.5
Upshur----	---	---	---	---	---	2.5
WeB---- Wernock	100	35	40	2,800	4.0	8.0
WeC---- Wernock	90	30	35	2,600	4.0	8.0
WeD---- Wernock	75	---	30	2,200	3.5	7.0
WhA---- Whitley	125	45	45	3,200	4.5	8.5

* 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 30 days.

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I	2,190	---	---	---
II	26,580	6,390	17,140	3,050
III	15,070	13,860	1,210	---
IV	25,320	22,970	---	2,350
V	---	---	---	---
VI	36,510	27,760	---	8,750
VII	148,170	144,000	---	4,170
VIII	---	---	---	---

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that 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	Common trees	Site index	
AlA, AlB, AlC---- Allegheny	2o	Slight	Slight	Slight	Severe	Northern red oak----	82	Eastern white pine, Virginia pine, yellow-poplar, black walnut, white oak, shortleaf pine, white ash, northern red oak.
						Yellow-poplar-------	82	
						Virginia pine-------	72	
						Eastern white pine--	94	
						Shortleaf pine------	75	
BCF*:								
Berks---------- (South aspect)	4f	Severe	Severe	Slight	Slight	Northern red oak----	60	Virginia pine, shortleaf pine.
						Black oak----------	60	
						Virginia pine-------	60	
Cranston---------- (South aspect)	3r	Severe	Severe	Moderate	Moderate	Scarlet oak---------	68	Shortleaf pine, white oak, Virginia pine.
						Shortleaf pine------	63	
Berks---------- (North aspect)	3f	Severe	Severe	Slight	Moderate	Northern red oak----	70	Virginia pine, eastern white pine, shortleaf pine.
						Black oak----------	70	
						Virginia pine-------	70	
Cranston---------- (North aspect)	2r	Severe	Severe	Slight	Severe	Yellow-poplar-------	90	Northern red oak, yellow-poplar, eastern white pine, shortleaf pine, Virginia pine.
						Northern red oak----	74	
BeB*, BeF*:								
Bethesda----------	---	Moderate	Moderate	Severe	Moderate	----------	---	Eastern white pine, black locust, Virginia pine, shortleaf pine.
Fairpoint---------	---	Moderate	Moderate	Severe	Moderate	----------	---	Eastern white pine, black locust, yellow-poplar, shortleaf pine, Virginia pine.
BRF*:								
Bledsoe----------	1r	Severe	Severe	Slight	Severe	Yellow-poplar-------	95	Yellow-poplar, black walnut, eastern white pine, white ash, northern red oak, shortleaf pine, Virginia pine.
						Northern red oak----	85	
						White ash----------	---	
Caneyville-------- (South aspect)	3x	Severe	Severe	Moderate	Slight	Scarlet oak---------	69	Eastern redcedar, Virginia pine, eastern white pine, shortleaf pine, loblolly pine.
						Eastern redcedar----	45	
Caneyville-------- (North aspect)	2x	Severe	Severe	Slight	Moderate	Scarlet oak---------	69	Yellow-poplar, black walnut, Virginia pine.
						Eastern redcedar----	45	
CaC---------- Caneyville	3c	Moderate	Moderate	Slight	Moderate	Black oak----------	65	Eastern redcedar, Virginia pine, black oak, eastern white pine, white ash, white oak.
						Eastern redcedar----	38	
						White ash----------	63	

See footnote 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	Common trees	Site index	
CbD								
Caneyville (South aspect)	3x	Severe	Severe	Moderate	Slight	Scarlet oak Eastern redcedar	69 45	Eastern redcedar, Virginia pine, eastern white pine, shortleaf pine, loblolly pine.
Caneyville (North aspect)	2x	Severe	Severe	Slight	Moderate	Scarlet oak Eastern redcedar	69 45	Yellow-poplar, black walnut, Virginia pine.
Co Cotaco	2o	Slight	Slight	Slight	Severe	Northern red oak Yellow-poplar Loblolly pine Virginia pine Shortleaf pine Black oak Black walnut	83 99 --- 75 --- --- ---	Eastern white pine, yellow-poplar, Virginia pine, white oak, sweetgum, black walnut, white ash, shortleaf pine, northern red oak.
Cu Cuba	1o	Slight	Slight	Slight	Severe	Yellow-poplar Virginia pine	100 77	Eastern white pine, northern red oak, black walnut, yellow-poplar, white ash, shortleaf pine, Virginia pine.
Gr Grigsby	1o	Slight	Slight	Slight	Severe	Yellow-poplar Northern red oak	110 85	Yellow-poplar, black walnut, northern red oak, eastern white pine, shortleaf pine, Virginia pine, white ash.
HaB Hagerstown	1c	Slight	Moderate	Slight	Severe	Northern red oak Yellow-poplar	85 95	Black walnut, yellow-poplar, eastern white pine, white ash.
LaC Latham	3c	Slight	Slight	Slight	Moderate	Northern red oak Yellow-poplar Virginia pine Shortleaf pine	64 --- 67 72	Black oak, eastern white pine, Virginia pine, shortleaf pine, northern red oak.
LaD Latham	3c	Moderate	Moderate	Slight	Moderate	Northern red oak Yellow-poplar Virginia pine Shortleaf pine	59 --- 67 72	Eastern white pine, shortleaf pine, yellow-poplar, Virginia pine, white ash, white oak, black oak.
LsE*:								
Latham (South aspect)	4c	Moderate	Moderate	Moderate	Moderate	Northern red oak Yellow-poplar	59 ---	Eastern white pine, shortleaf pine, Virginia pine, white oak, black oak.
Shelocta (South aspect)	3r	Moderate	Moderate	Moderate	Moderate	Northern red oak Virginia pine Shortleaf pine	69 71 65	Eastern white pine, white oak, Virginia pine, black oak, shortleaf pine.
Latham (North aspect)	3c	Moderate	Moderate	Slight	Moderate	Northern red oak Yellow-poplar	68 ---	Eastern white pine, shortleaf pine, white ash, black oak, white oak, Virginia pine.

See footnote 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	Common trees	Site index	
LsE*:								
Shelocta (North aspect)	2r	Moderate	Moderate	Slight	Severe	Northern red oak Yellow-poplar Virginia pine Shortleaf pine	80 108 79 75	Eastern white pine, shortleaf pine, yellow-poplar, black walnut, Virginia pine, white ash, northern red oak.
LTF*:								
Latham (South aspect)	4c	Severe	Severe	Moderate	Moderate	Northern red oak Yellow-poplar	59 ---	Eastern white pine, shortleaf pine, Virginia pine, white ash, black oak.
Shelocta (South aspect)	3r	Severe	Severe	Moderate	Moderate	Northern red oak Virginia pine Shortleaf pine	69 71 65	Eastern white pine, white oak, Virginia pine, black oak, shortleaf pine.
Latham (North aspect)	3c	Severe	Severe	Slight	Moderate	Northern red oak Yellow-poplar	68 ---	Eastern white pine, white oak, black oak, white ash, shortleaf pine, Virginia pine.
Shelocta (North aspect)	2r	Severe	Severe	Slight	Severe	Northern red oak Yellow-poplar Virginia pine Shortleaf pine	80 108 79 75	Eastern white pine, yellow-poplar, black walnut, Virginia pine, shortleaf pine, white ash, northern red oak.
LyD Lily	4r	Moderate	Moderate	Slight	Moderate	Shortleaf pine Virginia pine Black oak	63 65 65	Shortleaf pine, Virginia pine, white oak.
Mc McGary	3w	Slight	Moderate	Slight	Severe	Pin oak Sweetgum White oak White ash Red maple	85 90 66 --- ---	Eastern white pine, baldcypress, white ash, red maple, yellow-poplar, American sycamore, sweetgum.
MoA, MoB Monongahela	3o	Slight	Slight	Slight	Severe	Northern red oak Yellow-poplar Eastern white pine Virginia pine White ash Black walnut	70 85 72 66 --- ---	Eastern white pine, Virginia pine, shortleaf pine, black oak, white oak, sweetgum.
Mr Morehead	2w	Slight	Moderate	Slight	Severe	Yellow-poplar Shortleaf pine Pitch pine Virginia pine Red maple Pin oak River birch	82 84 --- --- --- --- ---	Shortleaf pine, yellow-poplar, Virginia pine, sweetgum, pin oak, eastern white pine, white ash.
Ne Newark	1w	Slight	Moderate	Slight	Severe	Pin oak Eastern cottonwood Northern red oak Sweetgum	99 94 85 88	Eastern cottonwood, sweetgum, American sycamore, eastern white pine, white ash.

See footnote 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	Common trees	Site index	
No---------- Nolin	1o	Slight	Slight	Slight	Severe	Sweetgum---------- Yellow-poplar-------	92 107	Sweetgum, yellow-poplar, eastern white pine, eastern cottonwood, white ash, black walnut, shortleaf pine, northern red oak.
Po---------- Pope	1o	Slight	Slight	Slight	Severe	Northern red oak---- Yellow-poplar------- Eastern white pine-- Virginia pine-------	80 102 89 74	Eastern white pine, yellow-poplar, black walnut, Virginia pine, northern red oak, white ash, shortleaf pine.
RSF*:								
Rigley---------- (South aspect)	3r	Severe	Severe	Moderate	Moderate	Black oak----------	75	Shortleaf pine, Virginia pine, black oak, white oak.
Rock outcrop.								
Rigley---------- (North aspect)	2r	Severe	Severe	Slight	Moderate	Northern red oak---- Yellow-poplar-------	80 90	Yellow-poplar, white ash, Virginia pine, shortleaf pine, black walnut, northern red oak.
Rock outcrop.								
SaB, SaC---------- Shelocta	2o	Slight	Slight	Slight	Severe	Northern red oak---- Yellow-poplar------- Virginia pine------- Shortleaf pine------	80 108 79 75	Eastern white pine, yellow-poplar, black walnut, Virginia pine, shortleaf pine, white ash, northern red oak.
SaD:								
Shelocta---------- (South aspect)	3r	Slight	Moderate	Slight	Moderate	Northern red oak---- Virginia pine------- Shortleaf pine------	69 71 65	Eastern white pine, white oak, Virginia pine, black oak, shortleaf pine.
Shelocta---------- (North aspect)	2r	Slight	Moderate	Slight	Severe	Northern red oak---- Yellow-poplar------- Virginia pine------- Shortleaf pine------	80 108 79 65	Eastern white pine, yellow-poplar, black walnut, shortleaf pine, Virginia pine, white ash, northern red oak.
Sd---------- Skidmore	1o	Slight	Slight	Slight	Severe	Northern red oak---- Yellow-poplar-------	85 95	Yellow-poplar, black walnut, white ash, eastern white pine, American sycamore, northern red oak.
SNF*:								
Steinsburg-------- (South aspect)	3f	Severe	Severe	Moderate	Moderate	Virginia pine------- Northern red oak----	70 ---	Eastern white pine, Virginia pine, shortleaf pine, black oak, white oak.
Latham---------- (South aspect)	4c	Severe	Severe	Moderate	Moderate	Northern red oak---- Yellow-poplar------- Red maple---------- Green ash----------	59 --- --- ---	Eastern white pine, shortleaf pine, Virginia pine, red cedar, black oak, white oak.

See footnote 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	Common trees	Site index	
SNF*:								
Steinsburg (North aspect)	3f	Severe	Severe	Moderate	Moderate	Virginia pine Yellow-poplar Northern red oak	70 --- ---	Eastern white pine, Virginia pine, shortleaf pine, northern red oak, white oak.
Latham (North aspect)	3c	Severe	Severe	Slight	Moderate	Northern red oak Yellow-poplar Red maple Green ash	68 --- --- ---	Eastern white pine, white ash, shortleaf pine, Virginia pine.
St Stendal	1w	Slight	Moderate	Slight	Severe	Sweetgum Yellow-poplar Virginia pine	85 90 --	Eastern white pine, sweetgum, baldcypress, American sycamore, white ash.
Sv Stokly	1w	Slight	Moderate	Slight	Severe	Pin oak Sweetgum Virginia pine	90 90 85	Eastern white pine, American sycamore, sweetgum.
TlB Tilsit	3o	Slight	Slight	Slight	Severe	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, white oak, black oak.
UpD Upshur	3c	Moderate	Moderate	Slight	Moderate	Northern red oak Eastern white pine Virginia pine	65 75 60	Virginia pine, eastern white pine, shortleaf pine, eastern redcedar, white oak, black oak.
VUF*:								
Vandalia (South aspect)	3c	Severe	Severe	Moderate	Severe	Northern red oak Yellow-poplar	68 75	Eastern white pine, Virginia pine, shortleaf pine, eastern redcedar, white oak, black oak.
Upshur (South aspect)	4c	Severe	Severe	Moderate	Slight	Northern red oak Eastern white pine Virginia pine	65 75 60	Virginia pine, shortleaf pine, eastern redcedar, white oak, black oak.
Vandalia (North aspect)	2c	Severe	Severe	Slight	Severe	Northern red oak Yellow-poplar	77 90	Eastern white pine, Virginia pine, yellow-poplar, black walnut, northern red oak.
Upshur (North aspect)	3c	Severe	Severe	Slight	Moderate	Northern red oak Yellow-poplar Eastern white pine Virginia pine	70 90 90 70	Eastern white pine, Virginia pine, shortleaf pine, white oak, black oak.
WeB, WeC Wernock	2o	Slight	Slight	Slight	Severe	Northern red oak Yellow-poplar Virginia pine Shortleaf pine	73 75 70 68	Yellow-poplar, eastern white pine, shortleaf pine, Virginia pine, white ash, northern red oak.

See footnote 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	Common trees	Site index	
WeD---------- Wernock	2r	Moderate	Moderate	Slight	Severe	Northern red oak----	73	Yellow-poplar, eastern white pine, shortleaf pine, Virginia pine, white ash, northern red oak.
						Yellow-poplar-------	75	
						Virginia pine-------	70	
						Shortleaf pine------	68	
WhA---------- Whitley	2o	Slight	Slight	Slight	Severe	Northern red oak----	80	Yellow-poplar, eastern white pine, shortleaf pine, Virginia pine, northern red oak.
						Yellow-poplar-------	75	
						Virginia pine-------	70	
						Shortleaf pine------	68	

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
AlA Allegheny	Severe: floods.	Slight	Slight	Slight	Slight.
AlB Allegheny	Slight	Slight	Moderate: slope.	Slight	Slight.
AlC Allegheny	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
BCF*: Berks	Severe: slope, small stones.	Severe: small stones, slope.	Severe: slope, small stones.	Severe: slope.	Severe: small stones, slope.
Cranston	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
BeB*: Bethesda	Moderate: small stones, percs slowly.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: droughty, small stones.
Fairpoint	Moderate: small stones, percs slowly.	Moderate: small stones, percs slowly.	Severe: small stones.	Slight	Severe: droughty.
BeF*: Bethesda	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Fairpoint	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope, erodes easily.	Severe: slope.
BRF*: Bledsoe	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Caneyville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Rock outcrop.					
CaC Caneyville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
CbD*: Caneyville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Rock outcrop.					
Co Cotaco	Severe: floods.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Cu---------- Cuba	Severe: floods.	Slight----------	Moderate: floods.	Slight----------	Moderate: floods.
Gr---------- Grigsby	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.	Moderate: floods.
HaB---------- Hagerstown	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
LaC---------- Latham	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: slope.
LaD---------- Latham	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Severe: slope.
LsE*, LTF*: Latham----------	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, erodes easily.	Severe: slope.
Shelocta----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
LyD---------- Lily	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Mc---------- McGary	Severe: floods, wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
MoA---------- Monongahela	Severe: floods.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
MoB---------- Monongahela	Moderate: wetness.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
Mr---------- Morehead	Severe: floods, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Ne---------- Newark	Severe: floods, wetness.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness.
No---------- Nolin	Severe: floods.	Slight----------	Moderate: floods.	Slight----------	Moderate: floods.
Pm*: Pits.					
Dumps.					
Po---------- Pope	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.	Moderate: floods.
RSF*: Rigley----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.					

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
SaB---------- Shelocta	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
SaC---------- Shelocta	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
SaD---------- Shelocta	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Sd---------- Skidmore	Severe: floods.	Moderate: small stones, floods.	Severe: small stones.	Moderate: floods.	Severe: floods.
SNF*: Steinsburg----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Latham----------	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, erodes easily.	Severe: slope.
St---------- Stendal	Severe: floods, wetness.	Moderate: floods, wetness.	Severe: floods, wetness.	Moderate: floods, wetness.	Severe: floods.
Sv---------- Stokly	Severe: floods, wetness.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.
TlB---------- Tilsit	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
UpD---------- Upshur	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
VUF*: Vandalia----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Upshur----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
WeB---------- Wernock	Slight----------	Slight----------	Moderate: slope.	Slight----------	Moderate: thin layer.
WeC---------- Wernock	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope, thin layer.
WeD---------- Wernock	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
WhA---------- Whitley	Severe: floods.	Slight----------	Moderate: slope.	Slight----------	Slight.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--WILDLIFE HABITAT

[See text for definitions or "good," "fair," "poor," and "very poor." Absence of an entry indicates that 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
AlA---- Allegheny	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
AlB---- Allegheny	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
AlC---- Allegheny	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
BCF*:										
Berks----	Very poor.	Very poor.	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Cranston----	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
BeB*:										
Bethesda----	Very poor.	Very poor.	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Very poor.
Fairpoint----	Very poor.	Very poor.	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Very poor.
BeF*:										
Bethesda----	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.
Fairpoint----	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.
BRF*:										
Bledsoe----	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Caneyville----	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Rock outcrop.										
CaC---- Caneyville	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
CbD*:										
Caneyville----	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Rock outcrop.										
Co---- Cotaco	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Cu---- Cuba	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Gr---- Grigsby	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
HaB---- Hagerstown	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
LaC---- Latham	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--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
LaD---------- Latham	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
LsE*:										
Latham----------	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Shelocta----------	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
LTF*:										
Latham----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Shelocta----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
LyD---------- Lily	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Mc---------- McGary	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
MoA---------- Monongahela	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
MoB---------- Monongahela	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Very poor.
Mr---------- Morehead	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Ne---------- Newark	Fair	Fair	Good	Good	Good	Fair	Fair	Fair	Good	Fair.
No---------- Nolin	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Pm*:										
Pits.										
Dumps.										
Po---------- Pope	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
RSF*:										
Rigley----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Rock outcrop.										
SaB---------- Shelocta	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
SaC---------- Shelocta	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
SaD---------- Shelocta	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Sd---------- Skidmore	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--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
SNF*:										
Steinsburg	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Latham	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
St Stendal	Poor	Fair	Good	Good	Good	Fair	Fair	Fair	Good	Fair.
Sv Stokly	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
TlB Tilsit	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
UpD Upshur	Poor	Fair	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
VUF*:										
Vandalia	Very poor.	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
Upshur	Very poor.	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
WeB Wernock	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WeC Wernock	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
WeD Wernock	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
WhA Whitley	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
AlA---------- Allegheny	Slight---------	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.	Slight.
AlB---------- Allegheny	Slight---------	Slight---------	Slight---------	Moderate: slope.	Slight---------	Slight.
AlC---------- Allegheny	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.
BCF*:						
Berks----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Cranston---------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
BeB*:						
Bethesda---------	Moderate: dense layer, large stones.	Moderate: large stones.	Moderate: large stones.	Moderate: large stones.	Moderate: large stones.	Moderate: droughty.
Fairpoint--------	Moderate: large stones.	Moderate: shrink-swell, large stones.	Moderate: shrink-swell, large stones.	Moderate: shrink-swell, large stones.	Moderate: shrink-swell.	Severe: small stones, droughty.
BeF*:						
Bethesda---------	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope.
Fairpoint--------	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, slippage.	Severe: small stones, slope.
BRF*:						
Bledsoe----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.	Severe: slope.
Caneyville-------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Rock outcrop.						
CaC---------- Caneyville	Severe: depth to rock, slope.	Moderate: shrink-swell, slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
CbD*:						
Caneyville-------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Rock outcrop.						
Co---------- Cotaco	Severe: wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Moderate: wetness, floods.	Moderate: wetness.
Cu---------- Cuba	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Gr Grigsby	Moderate: floods, wetness.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
HaB Hagerstown	Moderate: depth to rock, too clayey.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
LaC Latham	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: wetness.	Severe: slope.	Severe: low strength.	Moderate: wetness, slope.
LaD Latham	Severe: wetness, slope.	Severe: slope.	Severe: wetness, slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
LsE*, LTF*: Latham	Severe: wetness, slope.	Severe: slope.	Severe: wetness, slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Shelocta	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
LyD Lily	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Moderate: depth to rock, slope.	Moderate: slope, thin layer.
Mc McGary	Severe: wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: low strength, shrink-swell.	Moderate: wetness.
MoA Monongahela	Severe: wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Moderate: low strength, wetness, floods.	Moderate: wetness.
MoB Monongahela	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Moderate: low strength, wetness.	Moderate: wetness.
Mr Morehead	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: low strength, wetness.	Severe: wetness.
Ne Newark	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: low strength, wetness, floods.	Severe: wetness.
No Nolin	Moderate: wetness, floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength, floods.	Moderate: floods.
Pm*: Pits.						
Dumps.						
Po Pope	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
RSF*: Rigley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.						

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
SaB---------- Shelocta	Slight---------	Slight---------	Slight---------	Moderate: slope.	Moderate: low strength.	Slight.
SaC---------- Shelocta	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope.
SaD---------- Shelocta	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sd---------- Skidmore	Moderate: depth to rock, wetness, floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: small stones.
SNF*:						
Steinsburg-------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Latham----------	Severe: wetness, slope.	Severe: slope.	Severe: wetness, slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
St---------- Stendal	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods.	Moderate: wetness, floods.
Sv---------- Stokly	Severe: cutbanks cave, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: wetness, floods.	Severe: wetness.
TlB---------- Tilsit	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: slope, wetness.	Severe: low strength.	Moderate: wetness.
UpD---------- Upshur	Severe: slope, slippage.	Severe: slope, shrink-swell, slippage.	Severe: slope, shrink-swell, slippage.	Severe: slope, shrink-swell, slippage.	Severe: slope, shrink-swell, low strength.	Severe: slope.
VUF*:						
Vandalia---------	Severe: slope, too clayey.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell, low strength.	Severe: slope.
Upshur----------	Severe: slope, slippage.	Severe: slope, shrink-swell, slippage.	Severe: slope, shrink-swell, slippage.	Severe: slope, shrink-swell, slippage.	Severe: slope, shrink-swell, low strength.	Severe: slope.
WeB---------- Wernock	Moderate: depth to rock.	Slight---------	Moderate: depth to rock.	Moderate: slope.	Severe: low strength.	Moderate: thin layer.
WeC---------- Wernock	Moderate: depth to rock, slope.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Severe: low strength.	Moderate: slope, thin layer.
WeD---------- Wernock	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
WhA---------- Whitley	Slight---------	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: low strength, floods.	Slight.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
AlA---------- Allegheny	Moderate: floods, percs slowly.	Severe: floods.	Moderate: floods.	Moderate: floods.	Fair: too clayey.
AlB---------- Allegheny	Moderate: percs slowly.	Moderate: slope, seepage.	Slight----------	Slight----------	Fair: too clayey.
AlC---------- Allegheny	Moderate: slope, percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: too clayey, slope.
BCF*:					
Berks----------	Severe: slope, depth to rock.	Severe: slope, seepage, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage, depth to rock.	Poor: slope, small stones, area reclaim.
Cranston----------	Severe: slope.	Severe: seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: slope.
BeB*:					
Bethesda----------	Severe: percs slowly.	Moderate: slope, large stones.	Moderate: too clayey, large stones.	Slight----------	Poor: small stones.
Fairpoint----------	Severe: percs slowly.	Moderate: slope, large stones.	Moderate: too clayey, large stones.	Slight----------	Poor: small stones.
BeF*:					
Bethesda----------	Severe: percs slowly, slope, slippage.	Severe: slope.	Severe: slope, slippage.	Severe: slope.	Poor: small stones, slope.
Fairpoint----------	Severe: percs slowly, slope, slippage.	Severe: slope.	Severe: slope, slippage.	Severe: slope.	Poor: small stones, slope.
BRF*:					
Bledsoe----------	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Severe: slope, too clayey, hard to pack.
Caneyville---------	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
Rock outcrop.					
CaC---------- Caneyville	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey, slope.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.

See footnote at end of table.

TABLE 11.--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
CbD*:					
Caneyville	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack, slope.
Rock outcrop.					
Co	Severe: wetness.	Severe: floods, wetness.	Severe: wetness.	Severe: seepage, wetness.	Fair: wetness.
Cotaco					
Cu	Severe: floods.	Severe: floods.	Severe: floods, too sandy.	Severe: floods.	Poor: too sandy.
Cuba					
Gr	Severe: floods.	Severe: floods, seepage.	Severe: floods, seepage, wetness.	Severe: floods, seepage.	Good.
Grigsby					
HaB	Moderate: depth to rock, percs slowly.	Moderate: seepage, depth to rock, slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock.	Poor: too clayey, hard to pack.
Hagerstown					
LaC	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, wetness.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
Latham					
LaD	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, wetness, slope.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
Latham					
LsE*, LTF*:					
Latham	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, wetness, slope.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
Shelocta	Severe: slope.	Severe: seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: slope.	Poor: slope.
LyD	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: area reclaim, slope.
Lily					
Mc	Severe: wetness, percs slowly.	Severe: floods, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
McGary					
MoA	Severe: percs slowly, wetness.	Severe: floods, wetness.	Severe: wetness.	Moderate: floods, wetness.	Fair: wetness.
Monongahela					
MoB	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Fair: wetness.
Monongahela					
Mr	Severe: wetness.	Severe: floods, wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Morehead					

See footnote at end of table.

TABLE 11.--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
Ne Newark	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
No Nolin	Severe: floods.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Fair: too clayey.
Pm*: Pits.					
Dumps.					
Po Pope	Severe: floods.	Severe: seepage, floods.	Severe: floods, seepage.	Severe: floods, seepage.	Good.
RSF*: Rigley	Severe: slope.	Severe: seepage, slope.	Severe: depth to rock, seepage.	Severe: seepage, slope.	Poor: slope.
Rock outcrop.					
SaB Shelocta	Moderate: depth to rock.	Severe: seepage.	Severe: depth to rock, seepage.	Slight	Fair: too clayey.
SaC Shelocta	Moderate: depth to rock, slope.	Severe: seepage, slope.	Severe: depth to rock, seepage.	Moderate: slope.	Fair: too clayey, slope.
SaD Shelocta	Severe: slope.	Severe: seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: slope.	Poor: slope.
Sd Skidmore	Severe: floods, wetness.	Severe: floods, seepage, wetness.	Severe: floods, seepage, depth to rock.	Severe: floods, seepage, wetness.	Poor: small stones, seepage.
SNF*: Steinsburg	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage, depth to rock.	Poor: slope, area reclaim, thin layer.
Latham	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, wetness, slope.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
St Stendal	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
Sv Stokly	Severe: floods, wetness.	Severe: seepage, floods, wetness.	Severe: floods, seepage, wetness.	Severe: floods, seepage, wetness.	Poor: wetness.
TlB Tilsit	Severe: percs slowly, wetness.	Severe: wetness.	Severe: depth to rock, wetness.	Moderate: wetness, depth to rock.	Fair: area reclaim, too clayey, wetness.

See footnote at end of table.

TABLE 11.--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
UpD---------- Upshur	Severe: slope, percs slowly, slippage.	Severe: slope.	Severe: slope, too clayey, depth to rock.	Severe: slope, slippage.	Poor: slope, too clayey, hard to pack.
VUF*:					
Vandalia----------	Severe: slope, percs slowly.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: slope, too clayey.
Upshur----------	Severe: slope, percs slowly, slippage.	Severe: slope.	Severe: slope, too clayey, depth to rock.	Severe: slope, slippage.	Poor: slope, too clayey, hard to pack.
WeB---------- Wernock	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
WeC---------- Wernock	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
WeD---------- Wernock	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
WhA---------- Whitley	Moderate: floods.	Severe: floods.	Moderate: too clayey, floods.	Moderate: floods.	Fair: too clayey.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
AlA, AlB Allegheny	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
AlC Allegheny	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
BCF*:				
Berks	Poor: slope, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Cranston	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
BeB*:				
Bethesda	Fair: large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Fairpoint	Fair: large stones, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
BeF*:				
Bethesda	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Fairpoint	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
BRF*:				
Bledsoe	Severe: slope, low strength.	Improbable: excess fines.	Improbable: excess fines.	Severe: slope.
Caneyville	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
Rock outcrop.				
CaC Caneyville	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
CbD*:				
Caneyville	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
Rock outcrop.				

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Co---------- Cotaco	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Cu---------- Cuba	Good----------	Improbable: excess fines.	Improbable: excess fines.	Good.
Gr---------- Grigsby	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
HaB---------- Hagerstown	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
LaC---------- Latham	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
LaD---------- Latham	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
LsE*, LTF*: Latham----------	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
Shelocta----------	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
LyD---------- Lily	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones.
Mc---------- McGary	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
MoA---------- Monongahela	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
MoB---------- Monongahela	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, too clayey.
Mr---------- Morehead	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Ne---------- Newark	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
No---------- Nolin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Pm*: Pits.				
Dumps.				
Po---------- Pope	Good----------	Improbable: excess fines.	Improbable: excess fines.	Good.
RSF*: Rigley----------	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
RSF*: Rock outcrop.				
SaB, SaC---- Shelocta	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
SaD---- Shelocta	Fair: area reclaim, slope, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Sd---- Skidmore	Fair: area reclaim.	Improbable: small stones.	Probable----	Poor: small stones, area reclaim.
SNF*: Steinsburg----	Poor: slope, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Latham----	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
St---- Stendal	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Sv---- Stokly	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
TlB---- Tilsit	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
UpD---- Upshur	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
VUF*: Vandalia----	Poor: slope, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
Upshur----	Poor: slope, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
WeB---- Wernock	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones.
WeC---- Wernock	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones, slope.
WeD---- Wernock	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
WhA---- Whitley	Fair: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Soil name and map symbol	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
AlA, AlB---------- Allegheny	Moderate: seepage.	Severe: piping.	Deep to water----	Favorable--------	Favorable.
AlC---------- Allegheny	Moderate: seepage.	Severe: piping.	Deep to water----	Slope----------	Slope.
BCF*: Berks----------	Severe: seepage, slope.	Severe: seepage.	Deep to water----	Depth to rock, slope, large stones.	Droughty, depth to rock, slope.
Cranston---------	Severe: seepage, slope.	Severe: piping.	Deep to water----	Slope----------	Slope.
BeB*: Bethesda---------	Moderate: slope.	Severe: seepage, piping.	Deep to water----	Large stones-----	Large stones, droughty.
Fairpoint--------	Moderate: slope.	Severe: piping.	Deep to water----	Large stones, erodes easily.	Large stones, erodes easily.
BeF*: Bethesda---------	Severe: slope, slippage.	Severe: seepage, piping.	Deep to water----	Slope, large stones, slippage.	Large stones, slope, droughty.
Fairpoint--------	Severe: slope, slippage.	Severe: piping.	Deep to water----	Slope, large stones, erodes easily.	Large stones, slope, erodes easily.
BRF*: Bledsoe----------	Severe: slope.	Moderate: hard to pack.	Deep to water----	Slope, erodes easily.	Slope, erodes easily.
Caneyville-------	Severe: slope.	Severe: thin layer, hard to pack.	Deep to water----	Slope, depth to rock.	Slope, depth to rock.
Rock outcrop.					
CaC---------- Caneyville	Moderate: depth to rock.	Severe: thin layer, hard to pack.	Deep to water----	Slope, depth to rock, erodes easily.	Slope, depth to rock.
CbD*: Caneyville-------	Severe: slope.	Severe: thin layer, hard to pack.	Deep to water----	Slope, depth to rock, erodes easily.	Slope, depth to rock.
Rock outcrop.					
Co---------- Cotaco	Moderate: seepage.	Severe: piping, wetness.	Favorable--------	Erodes easily, wetness.	Erodes easily.
Cu---------- Cuba	Moderate: seepage.	Severe: piping.	Deep to water----	Erodes easily----	Erodes easily.
Gr---------- Grigsby	Severe: seepage.	Severe: piping.	Deep to water----	Favorable--------	Favorable.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
HaB---------- Hagerstown	Moderate: seepage, depth to rock.	Moderate: hard to pack.	Deep to water----	Favorable--------	Favorable.
LaC, LaD---------- Latham	Moderate: depth to rock.	Severe: thin layer.	Percs slowly, depth to rock, slope.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
LsE*, LTF*: Latham----------	Severe: slope.	Severe: thin layer.	Percs slowly, depth to rock, slope.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Shelocta---------	Severe: slope.	Severe: piping.	Deep to water----	Slope----------	Slope.
LyD---------- Lily	Severe: seepage.	Severe: piping.	Deep to water----	Slope, depth to rock.	Slope, depth to rock.
Mc---------- McGary	Slight----------	Severe: wetness.	Percs slowly-----	Erodes easily, wetness, percs slowly.	Wetness, erodes easily.
MoA---------- Monongahela	Slight----------	Severe: piping.	Percs slowly-----	Erodes easily, wetness, rooting depth.	Erodes easily, rooting depth, percs slowly.
MoB---------- Monongahela	Slight----------	Severe: piping.	Percs slowly, slope.	Erodes easily, wetness, rooting depth.	Erodes easily, rooting depth, percs slowly.
Mr---------- Morehead	Moderate: seepage.	Severe: piping, wetness.	Favorable--------	Erodes easily, wetness.	Wetness, erodes easily.
Ne---------- Newark	Moderate: seepage.	Severe: piping, wetness.	Floods----------	Erodes easily, wetness.	Wetness, erodes easily.
No---------- Nolin	Severe: seepage.	Severe: piping.	Deep to water----	Erodes easily----	Erodes easily.
Pm*: Pits.					
Dumps.					
Po---------- Pope	Severe: seepage.	Severe: seepage, piping.	Deep to water----	Favorable--------	Favorable.
RSF*: Rigley----------	Severe: seepage, slope.	Severe: piping.	Deep to water----	Slope----------	Slope.
Rock outcrop.					
SaB---------- Shelocta	Moderate: seepage.	Severe: piping.	Deep to water----	Favorable--------	Favorable.
SaC, SaD---------- Shelocta	Moderate: seepage.	Severe: piping.	Deep to water----	Slope----------	Slope.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
Sd---------- Skidmore	Severe: seepage.	Severe: seepage.	Deep to water----	Large stones-----	Droughty, large stones.
SNF*:					
Steinsburg-------	Severe: seepage, slope.	Severe: thin layer, seepage.	Deep to water----	Depth to rock, slope.	Slope, droughty, depth to rock.
Latham----------	Severe: slope.	Severe: thin layer.	Percs slowly, depth to rock, slope.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
St---------- Stendal	Moderate: seepage.	Severe: piping, wetness.	Floods----------	Wetness, erodes easily.	Erodes easily, wetness.
Sv---------- Stokly	Severe: seepage.	Severe: seepage, piping, wetness.	Floods, cutbanks cave.	Wetness, too sandy.	Wetness.
TlB---------- Tilsit	Moderate: depth to rock, seepage.	Severe: piping.	Percs slowly, slope.	Erodes easily, wetness, rooting depth.	Erodes easily, rooting depth.
UpD---------- Upshur	Severe: slope, slippage.	Moderate: hard to pack.	Deep to water----	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
VUF*:					
Vandalia---------	Severe: slope.	Moderate: hard to pack.	Deep to water----	Slope, erodes easily.	Slope, erodes easily.
Upshur----------	Severe: slope, slippage.	Moderate: hard to pack.	Deep to water----	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
WeB---------- Wernock	Moderate: seepage.	Severe: piping.	Deep to water----	Depth to rock, erodes easily.	Erodes easily, depth to rock.
WeC, WeD---------- Wernock	Moderate: seepage.	Severe: piping.	Deep to water----	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
WhA---------- Whitley	Moderate: seepage.	Severe: piping.	Deep to water----	Erodes easily----	Erodes easily.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

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	
A1A, A1B, A1C---- Allegheny	0-9	Loam----------	ML, CL, CL-ML	A-4	0	90-100	80-100	65-100	55-95	<35	NP-10
	9-48	Clay loam, loam, sandy clay loam.	ML, CL, SM, SC	A-4, A-6	0	90-100	80-100	65-95	35-80	<35	NP-15
	48-62	Clay loam, sandy loam, gravelly sandy loam.	SM, GC, ML, CL	A-4, A-6, A-2, A-1	0-5	65-100	55-100	35-95	20-75	<35	NP-15
BCF*:											
Berks----------	0-8	Channery silt loam.	GM, ML, GC, SC	A-2, A-4	0-30	50-80	45-70	40-60	30-55	25-36	5-10
	8-28	Channery loam, very channery loam, channery silt loam.	GM, SM, GC, SC	A-1, A-2, A-4	0-30	40-80	35-70	25-60	20-45	25-36	5-10
	28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Cranston--------	0-6	Channery silt loam.	GM, GC, ML, SM	A-4, A-2, A-1	0-30	50-80	25-80	23-80	18-70	<35	NP-10
	6-54	Gravelly silt loam, channery silt loam.	ML, CL, GM, GC	A-4	0-20	60-80	55-75	50-70	40-65	<35	NP-10
	54-84	Gravelly silt loam, very gravelly silt loam, very channery silt loam.	GM, GC, SM	A-4, A-2, A-1	0-30	50-80	25-75	23-60	18-45	<35	NP-10
BeB*, BeF*:											
Bethesda--------	0-4	Shaly silt loam	ML, GM, GM-GC, CL-ML	A-4, A-6	0-15	65-90	55-80	50-80	35-75	25-40	4-14
	4-65	Very shaly clay loam, very gravelly silty clay loam.	GM, GC, ML, CL	A-4, A-6, A-7, A-2	10-30	40-80	25-65	20-65	18-60	24-50	3-23
Fairpoint-------	0-6	Shaly silt loam	CL, CL-ML, SC, GC	A-4, A-6, A-2	5-15	55-90	45-85	40-85	30-75	20-40	4-18
	6-62	Gravelly clay loam, very shaly silty clay loam.	GC, CL, CL-ML, SC	A-4, A-6, A-7, A-2	15-30	55-75	25-65	20-65	15-60	25-50	4-24
BRF*:											
Bledsoe---------	0-5	Silt loam--------	CL, CL-ML	A-4, A-6	0-5	85-95	80-95	70-90	50-90	20-35	5-15
	5-52	Silty clay, silty clay loam, gravelly silty clay.	CH, CL	A-7, A-6	0-15	65-95	65-95	60-90	50-90	35-60	15-35
	52-70	Gravelly silty clay loam, silty clay, clay.	CH, CL, GC	A-7, A-6	0-25	50-100	50-100	40-90	35-90	35-60	15-40
Caneyville------	0-5	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0-3	90-100	85-100	75-100	60-95	20-35	2-12
	5-10	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-3	90-100	85-100	75-100	65-100	42-70	20-45
	10-26	Clay, silty clay	CH	A-7	0-3	90-100	85-100	75-100	65-100	50-75	30-45
	26	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--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	
CaC---------- Caneyville	0-5	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0-3	90-100	85-100	75-100	60-95	20-35	2-12
	5-10	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-3	90-100	85-100	75-100	65-100	42-70	20-45
	10-26	Clay, silty clay	CH	A-7	0-3	90-100	85-100	75-100	65-100	50-75	30-45
	26	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
CbD*:											
Caneyville------	0-5	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0-3	90-100	85-100	75-100	60-95	20-35	2-12
	5-10	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-3	90-100	85-100	75-100	65-100	42-70	20-45
	10-26	Clay, silty clay	CH	A-7	0-3	90-100	85-100	75-100	65-100	50-75	30-45
	26	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
Co---------- Cotaco	0-20	Loam----------	ML, CL-ML, SM, SM-SC	A-4	0-5	80-100	75-95	55-85	35-80	<30	NP-7
	20-60	Sandy clay loam, clay loam, gravelly loam.	SC, SM, GC, CL	A-2, A-4, A-6	0-10	60-100	50-95	40-70	26-70	<35	NP-15
Cu---------- Cuba	0-56	Silt loam--------	CL, ML, CL-ML	A-4, A-6	0	100	95-100	90-100	70-90	25-35	3-12
	56-70	Stratified silt loam to fine sand.	CL, ML, CL-ML	A-4	0	100	80-100	75-100	50-85	15-30	2-10
Gr---------- Grigsby	0-7	Fine sandy loam	SM, SM-SC	A-2, A-4	0-5	80-100	80-100	50-95	25-50	<20	NP-5
	7-34	Loam, fine sandy loam.	ML, SM, SC, CL	A-2, A-4	0-5	80-100	80-100	70-100	30-70	<25	NP-10
	34-60	Fine sandy loam, gravelly sandy loam, loamy fine sand.	SM, SM-SC, ML, GM-GC	A-2, A-1, A-4	0-30	40-100	30-100	25-100	20-70	<20	NP-5
HaB---------- Hagerstown	0-10	Silt loam--------	CL, CL-ML	A-4, A-6, A-7	0-5	85-100	80-100	80-100	70-95	25-50	5-25
	10-21	Silty clay loam, silt loam.	CL, CH	A-7	0-5	90-100	80-100	75-100	55-95	48-65	26-34
	21-50	Clay, silty clay	CH, CL	A-7, A-6	0-5	85-100	80-100	75-100	75-95	30-70	15-40
LaC, LaD---------- Latham	0-6	Silt loam--------	CL-ML, CL	A-4, A-6	0-5	85-100	70-100	70-100	65-90	20-35	5-12
	6-35	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-10	85-100	70-95	65-95	60-90	45-65	25-40
	35	Weathered bedrock	---	---	---	---	---	---	---	---	---
LsE*, LTF*:											
Latham----------	0-6	Silt loam--------	CL-ML, CL	A-4, A-6	0-5	85-100	70-100	70-100	65-90	20-35	5-12
	6-35	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-10	85-100	70-95	65-95	60-90	45-65	25-40
	35	Weathered bedrock	---	---	---	---	---	---	---	---	---
Shelocta--------	0-6	Silt loam--------	ML, CL-ML	A-4	0-5	80-95	75-95	60-95	55-90	<35	NP-10
	6-64	Silty clay loam, silt loam, gravelly silty clay loam.	CL, CL-ML, GC, SC	A-6, A-4	0-10	55-95	50-95	45-95	40-90	25-40	4-15
	64-76	Channery silt loam, channery silty clay loam, very gravelly silty clay loam.	GM, GC, ML, CL	A-4, A-6, A-2, A-1-B	0-15	40-85	35-70	25-70	20-65	20-40	3-20

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--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	
LyD---------- Lily	0-8	Fine sandy loam	SM	A-4, A-2	0-5	90-100	85-100	55-80	25-50	<20	NP-4
	8-23	Clay loam, sandy clay loam, loam.	SM, SC, ML, CL	A-4, A-6	0-5	90-100	85-100	75-100	40-80	<35	3-15
	23-32	Sandy clay loam, clay loam, gravelly sandy clay loam.	SM, SC, ML, CL	A-4, A-2, A-6, A-1-B	0-10	65-100	50-100	40-95	20-75	<35	3-15
	32	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Mc---------- McGary	0-9	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-90	25-36	5-15
	9-42	Silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-100	46-58	24-32
	42-62	Stratified silty clay loam to clay.	CL, CH	A-6, A-7	0	95-100	95-100	95-100	85-100	38-54	20-32
MoA, MoB---------- Monongahela	0-11	Loam----------	ML, SM, CL-ML, SM-SC	A-4	0-5	90-100	85-100	75-100	45-90	20-35	1-10
	11-28	Silt loam, clay loam, loam.	ML, CL, CL-ML	A-4, A-6	0-15	90-100	80-100	75-100	70-90	25-40	5-15
	28-48	Silt loam, sandy clay loam, loam.	ML, CL, SM, SC	A-4, A-6	0-10	80-100	60-100	55-95	45-95	20-40	3-15
	48-62	Sandy loam, clay loam.	ML, CL, SM, SC	A-4, A-6, A-7	0-10	85-100	80-90	60-85	40-85	20-40	1-15
Mr---------- Morehead	0-10	Silt loam--------	ML, CL, CL-ML	A-4	0	95-100	95-100	90-100	80-100	25-35	2-10
	10-48	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	95-100	95-100	90-100	85-100	25-40	5-20
	48-72	Silt loam, loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	90-100	85-100	70-100	60-95	20-40	2-20
Ne---------- Newark	0-7	Silt loam--------	ML, CL, CL-ML	A-4	0	95-100	90-100	80-100	55-95	<32	NP-10
	7-32	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	95-100	90-100	85-100	70-95	22-42	3-20
	32-60	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0-3	75-100	70-100	65-100	55-95	22-42	3-20
No---------- Nolin	0-10	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	80-100	25-40	5-18
	10-55	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	95-100	85-100	75-100	25-46	5-23
	55-65	Loam, silt loam, sandy loam.	ML, CL, CL-ML, GM	A-2, A-4, A-6	0-10	50-100	50-100	40-95	35-95	<30	NP-15
Pm*: Pits.											
Dumps.											
Po---------- Pope	0-8	Fine sandy loam	SM, ML, CL-ML, SM-SC	A-2, A-4	0	85-100	75-100	51-85	25-55	<20	NP-5
	8-32	Fine sandy loam, sandy loam, loam.	SM, SM-SC, ML, CL-ML	A-2, A-4	0	95-100	80-100	51-95	25-75	<30	NP-7
	32-62	Sandy loam, loamy sand.	SM, SM-SC, ML, GM	A-2, A-1, A-4	0-20	45-100	35-100	30-95	15-70	<30	NP-7

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--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	
RSF*:											
Rigley	0-14	Stony fine sandy loam.	SM, ML	A-2, A-4	5-25	80-95	75-90	55-80	25-65	<30	NP-7
	14-60	Gravelly sandy loam, gravelly loam, sandy loam.	SM, ML, GM	A-2, A-4, A-1	5-15	65-95	60-90	40-75	20-60	<30	NP-7
	60-73	Gravelly sandy loam, gravelly loam, very gravelly sandy clay loam.	GM, GC, SM, SC	A-2, A-1, A-4, A-6	0-20	55-80	45-70	30-60	15-50	<35	NP-15
Rock outcrop.											
SaB, SaC, SaD	0-6	Silt loam	ML, CL-ML	A-4	0-5	80-95	75-95	60-95	55-90	<35	NP-10
Shelocta	6-64	Silty clay loam, silt loam, channery silty clay loam.	CL, CL-ML, GC, SC	A-6, A-4	0-10	55-95	50-95	45-95	40-90	25-40	4-15
	64-76	Channery silt loam, very gravelly silty clay loam, very channery clay loam.	GM, GC, ML, CL	A-4, A-6, A-2, A-1-B	0-15	40-85	35-70	25-70	20-65	20-40	3-20
Sd	0-24	Gravelly loam	GM, SM, GM-GC, ML	A-4, A-2	0-10	60-90	40-85	40-75	25-60	<30	NP-7
Skidmore	24-60	Gravelly fine sandy loam, very channery sandy loam, very gravelly loam.	GM, GM-GC	A-2, A-1	5-30	35-60	20-50	15-40	10-35	<30	NP-5
SNF*:											
Steinsburg	0-5	Sandy loam	ML, SM	A-4	0-5	95-100	90-100	65-90	35-70	<25	5-10
	5-18	Loam, gravelly sandy loam, fine sandy loam.	SM, SM-SC	A-2, A-4, A-1	0-10	75-95	65-85	35-60	15-40	<25	NP-5
	18-30	Gravelly sandy loam, very gravelly loamy sand.	SM, GM	A-2, A-1	10-40	45-85	40-80	35-60	15-35	<25	NP-3
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Latham	0-6	Silt loam	CL-ML, CL	A-4, A-6	0-5	85-100	70-100	70-100	65-90	20-35	5-12
	6-35	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-10	85-100	70-95	65-95	60-90	45-65	25-40
	35	Weathered bedrock	---	---	---	---	---	---	---	---	---
St	0-7	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	90-100	75-90	25-40	5-15
Stendal	7-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	75-90	25-40	5-15
Sv	0-34	Fine sandy loam	ML, SM, SC, SM-SC	A-4	0	85-100	80-100	65-90	35-65	<30	NP-10
Stokly	34-62	Fine sandy loam, gravelly loam, loamy sand.	SM, SC, SM-SC	A-1-B, A-2-4, A-4	0	65-100	60-100	45-70	15-45	<30	NP-10

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

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	
TlB---------- Tilsit	0-9	Silt loam--------	ML, CL, CL-ML	A-4	0	90-100	85-100	75-100	60-100	20-35	4-10
	9-24	Silt loam, silty clay loam, loam.	CL, CL-ML	A-4, A-6	0	90-100	85-100	75-100	65-100	25-40	5-20
	24-50	Silt loam, silty clay loam, loam.	CL, CL-ML	A-4, A-6, A-7	0	90-100	85-100	75-100	65-100	25-45	5-25
	50-65	Silt loam, silty clay loam, silty clay.	CL, CH, CL-ML	A-4, A-6, A-7	0-30	70-100	65-85	60-85	55-80	25-60	5-35
UpD---------- Upshur	0-4	Silty clay loam	CL, ML	A-6, A-7	0	95-100	95-100	90-100	80-95	35-50	11-25
	4-38	Silty clay, clay	MH, CH, CL	A-7	0	95-100	95-100	90-100	85-100	45-70	20-40
	38-47	Silty clay loam, silty clay, clay.	CL, ML, MH, CH	A-6, A-7	0	80-100	65-100	60-100	55-95	35-55	11-25
	47	Weathered bedrock	---	---	---	---	---	---	---	---	---
VUF*:											
Vandalia--------	0-7	Silt loam--------	ML, MH	A-4, A-6, A-7	0-5	80-100	75-100	70-100	50-95	35-55	5-20
	7-55	Silty clay loam, shaly silty clay, clay.	CL, CH, GC	A-6, A-7	0-5	50-100	45-100	40-100	35-95	35-55	15-30
	55-68	Silty clay, clay, shaly silty clay loam.	CL, CH, ML, GC	A-6, A-7	0-5	40-100	35-100	30-100	25-95	35-55	15-30
Upshur----------	0-4	Silty clay loam	CL, ML	A-6, A-7	0	95-100	95-100	90-100	80-95	35-50	11-25
	4-38	Silty clay, clay	MH, CH, CL	A-7	0	95-100	95-100	90-100	85-100	45-70	20-40
	38-47	Silty clay loam, silty clay, clay.	CL, ML, MH, CH	A-6, A-7	0	80-100	65-100	60-100	55-95	35-55	11-25
	47	Weathered bedrock	---	---	---	---	---	---	---	---	---
WeB, WeC, WeD---- Wernock	0-6	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	90-100	85-100	75-95	55-90	25-35	4-11
	6-26	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	90-100	85-100	75-100	55-95	25-45	4-22
	26-40	Silt loam, silty clay loam, channery clay loam.	ML, CL, CL-ML, GC	A-4, A-6, A-7	0-20	55-100	50-100	45-95	40-95	25-45	4-22
	40	Weathered bedrock	---	---	---	---	---	---	---	---	---
WhA---------- Whitley	0-9	Silt loam--------	ML, CL	A-4	0	95-100	90-100	75-100	60-95	<35	NP-10
	9-70	Silty clay loam, silt loam.	CL, CL-ML	A-6, A-4	0	95-100	90-100	85-100	70-100	20-40	5-20
	70-80	Silt loam, gravelly sandy loam, silty clay loam.	GC, GM, CL, ML	A-2, A-4	0-25	45-100	35-100	30-90	15-80	<30	NP-15

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm³	In/hr	In/in	pH				Pct
AlA, AlB, AlC----	0-9	15-27	1.20-1.40	0.6-2.0	0.12-0.22	3.6-5.5	Low----------	0.32	4	1-4
Allegheny	9-48	18-35	1.20-1.50	0.6-2.0	0.13-0.18	3.6-5.5	Low----------	0.28		
	48-62	10-35	1.20-1.40	0.6-2.0	0.08-0.17	3.6-5.5	Low----------	0.28		
BCF*:										
Berks----------	0-8	5-23	1.20-1.50	0.6-6.0	0.08-0.12	3.6-6.5	Low----------	0.24	3	.5-3
	8-28	5-32	1.20-1.60	0.6-6.0	0.04-0.10	3.6-6.5	Low----------	0.17		
	28	---	---	---	---	---	----------	----		
Cranston--------	0-6	12-18	1.20-1.40	2.0-6.0	0.12-0.20	3.6-7.3	Low----------	0.28	4	.5-4
	6-54	12-18	1.20-1.40	2.0-6.0	0.14-0.19	3.6-5.5	Low----------	0.28		
	54-84	12-18	1.30-1.50	2.0-6.0	0.12-0.18	3.6-5.5	Low----------	0.28		
BeB*, BeF*:										
Bethesda--------	0-4	18-27	1.40-1.55	0.6-2.0	0.10-0.16	3.6-5.5	Low----------	0.32	5	<.5
	4-65	18-35	1.60-1.90	0.2-0.6	0.04-0.13	3.6-5.5	Low----------	0.32		
Fairpoint-------	0-6	18-27	1.40-1.55	0.6-2.0	0.09-0.18	5.6-7.3	Low----------	0.37	5	<.5
	6-62	18-35	1.60-1.80	0.2-0.6	0.03-0.10	5.6-7.3	Moderate-----	0.37		
BRF*:										
Bledsoe---------	0-5	15-30	1.20-1.50	0.6-2.0	0.16-0.21	5.6-7.8	Low----------	0.37	4	1-4
	5-52	35-50	1.30-1.60	0.2-0.6	0.12-0.19	5.6-7.8	Low----------	0.32		
	52-70	30-60	1.35-1.60	0.06-0.6	0.12-0.19	5.6-7.8	Moderate-----	0.32		
Caneyville------	0-5	10-25	1.20-1.40	0.6-2.0	0.15-0.22	5.1-7.3	Low----------	0.43	3	2-4
	5-10	36-60	1.35-1.60	0.2-0.6	0.12-0.18	5.1-7.3	Moderate-----	0.28		
	10-26	40-60	1.35-1.60	0.2-0.6	0.12-0.18	5.6-7.8	Moderate-----	0.28		
	26	---	---	---	---	---	----------	----		
Rock outcrop.										
CaC----------	0-5	10-25	1.20-1.40	0.6-2.0	0.15-0.22	5.1-7.3	Low----------	0.43	3	2-4
Caneyville	5-10	36-60	1.35-1.60	0.2-0.6	0.12-0.18	5.1-7.3	Moderate-----	0.28		
	10-26	40-60	1.35-1.60	0.2-0.6	0.12-0.18	5.6-7.8	Moderate-----	0.28		
	26	---	---	---	---	---	----------	----		
CbD*:										
Caneyville------	0-5	10-25	1.20-1.40	0.6-2.0	0.15-0.22	5.1-7.3	Low----------	0.43	3	2-4
	5-10	36-60	1.35-1.60	0.2-0.6	0.12-0.18	5.1-7.3	Moderate-----	0.28		
	10-26	40-60	1.35-1.60	0.2-0.6	0.12-0.18	5.6-7.8	Moderate-----	0.28		
	26	---	---	---	---	---	----------	----		
Rock outcrop.										
Co----------	0-20	7-27	1.20-1.40	0.6-6.0	0.12-0.20	3.6-5.5	Low----------	0.37	3	.5-4
Cotaco	20-60	18-35	1.20-1.50	0.6-2.0	0.07-0.15	3.6-5.5	Low----------	0.28		
Cu----------	0-56	18-25	1.30-1.45	0.6-2.0	0.22-0.24	4.5-7.3	Low----------	0.37	5	1-3
Cuba	56-70	14-20	1.45-1.65	0.6-2.0	0.19-0.21	4.5-5.5	Low----------	0.37		
Gr----------	0-7	5-10	1.20-1.50	2.0-6.0	0.08-0.14	5.6-7.3	Low----------	0.28	5	1-4
Grigsby	7-34	5-18	1.20-1.50	0.6-6.0	0.10-0.20	5.6-7.3	Low----------	0.28		
	34-60	5-10	1.20-1.50	2.0-6.0	0.03-0.16	5.1-7.3	Low----------	0.28		
HaB----------	0-10	15-35	1.20-1.40	0.6-6.0	0.16-0.24	5.1-7.3	Low----------	0.32	4	1-5
Hagerstown	10-21	23-60	1.20-1.60	0.6-2.0	0.10-0.24	5.1-7.3	Moderate-----	0.28		
	21-50	23-60	1.20-1.60	0.6-2.0	0.10-0.24	5.1-7.3	Moderate-----	0.28		
LaC, LaD----------	0-6	20-27	1.30-1.50	0.6-2.0	0.16-0.20	3.6-5.5	Low----------	0.43	3	1-3
Latham	6-35	35-55	1.40-1.70	<0.2	0.11-0.15	3.6-5.5	Moderate-----	0.32		
	35	---	---	---	---	---	----------	----		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm^3	In/hr	In/in	pH				Pct
LsE*, LTF*:										
Latham	0-6	20-27	1.30-1.50	0.6-2.0	0.16-0.20	3.6-5.5	Low	0.43	3	1-3
	6-35	35-55	1.40-1.70	<0.2	0.11-0.15	3.6-5.5	Moderate	0.32		
	35	---	---	---	---	---	---	---		
Shelocta	0-6	10-25	1.15-1.30	0.6-2.0	0.16-0.22	4.5-5.5	Low	0.32	4	.5-5
	6-64	18-34	1.30-1.55	0.6-2.0	0.10-0.20	4.5-5.5	Low	0.28		
	64-76	15-34	1.30-1.55	0.6-6.0	0.08-0.16	4.5-5.5	Low	0.17		
LyD	0-8	5-20	1.20-1.40	2.0-6.0	0.09-0.16	3.6-5.5	Low	0.28	3	.5-4
Lily	8-23	18-35	1.25-1.55	2.0-6.0	0.12-0.18	3.6-5.5	Low	0.28		
	23-32	20-35	1.25-1.55	2.0-6.0	0.08-0.17	3.6-5.5	Low	0.17		
	32	---	---	---	---	---	---	---		
Mc	0-9	22-27	1.35-1.50	0.6-2.0	0.22-0.24	5.1-6.0	Low	0.43	3	1-4
McGary	9-42	35-50	1.60-1.75	<0.2	0.11-0.13	5.1-6.0	High	0.32		
	42-62	35-50	1.60-1.75	<0.2	0.14-0.16	5.6-7.3	High	0.32		
MoA, MoB	0-11	10-27	1.20-1.40	0.6-2.0	0.18-0.24	4.5-5.5	Low	0.43	3	2-4
Monongahela	11-28	18-35	1.30-1.50	0.6-2.0	0.14-0.18	4.5-5.5	Low	0.43		
	28-48	18-35	1.30-1.60	0.06-0.6	0.08-0.12	4.5-5.5	Low	0.43		
	48-62	10-35	1.20-1.40	0.2-0.6	0.08-0.12	4.5-5.5	Low	0.37		
Mr	0-10	12-27	1.20-1.50	0.6-2.0	0.19-0.23	4.5-5.5	Low	0.37	4	1-4
Morehead	10-48	18-35	1.20-1.50	0.6-2.0	0.18-0.22	4.5-5.5	Low	0.43		
	48-72	7-40	1.20-1.50	0.6-2.0	0.15-0.22	4.5-5.5	Low	0.43		
Ne	0-7	7-27	1.20-1.40	0.6-2.0	0.15-0.23	5.6-7.8	Low	0.43	5	1-4
Newark	7-32	18-35	1.20-1.45	0.6-2.0	0.18-0.23	5.6-7.8	Low	0.43		
	32-60	12-40	1.30-1.50	0.6-2.0	0.15-0.22	5.6-7.8	Low	0.43		
No	0-10	12-35	1.20-1.40	0.6-2.0	0.18-0.23	5.6-8.4	Low	0.43	5	2-4
Nolin	10-55	18-35	1.25-1.50	0.6-2.0	0.18-0.23	5.6-8.4	Low	0.43		
	55-65	10-30	1.30-1.55	0.6-6.0	0.10-0.23	5.6-8.4	Low	0.43		
Pm*:										
Pits.										
Dumps.										
Po	0-8	5-15	1.20-1.40	2.0-6.0	0.10-0.16	3.6-5.5	Low	0.28	5	1-4
Pope	8-32	5-18	1.30-1.60	0.6-6.0	0.10-0.18	3.6-5.5	Low	0.28		
	32-62	5-20	1.30-1.60	0.6-6.0	0.10-0.18	3.6-5.5	Low	0.28		
RSF*:										
Rigley	0-14	7-18	1.20-1.40	2.0-6.0	0.09-0.15	3.6-5.5	Low	0.24	4	.5-3
	14-60	7-18	1.30-1.60	2.0-6.0	0.09-0.15	3.6-5.5	Low	0.17		
	60-73	7-40	1.30-1.60	2.0-6.0	0.07-0.15	3.6-5.5	Low	0.17		
Rock outcrop.										
SaB, SaC, SaD	0-6	10-25	1.15-1.30	0.6-2.0	0.16-0.22	4.5-5.5	Low	0.32	4	.5-5
Shelocta	6-64	18-34	1.30-1.55	0.6-2.0	0.10-0.20	4.5-5.5	Low	0.28		
	64-76	15-34	1.30-1.55	0.6-6.0	0.08-0.16	4.5-5.5	Low	0.17		
Sd	0-24	7-18	---	2.0-6.0	0.07-0.13	5.6-7.8	Low	0.17	5	<2
Skidmore	24-60	7-18	---	2.0-6.0	0.04-0.10	5.6-7.8	Low	0.17		
	60	---	---	---	---	---	---	---		
SNF*:										
Steinsburg	0-5	10-20	1.20-1.40	2.0-6.0	0.10-0.14	4.5-5.5	Low	0.28	2	1-3
	5-18	10-20	1.20-1.40	2.0-6.0	0.10-0.14	4.5-5.5	Low	0.24		
	18-30	5-18	1.10-1.40	2.0-6.0	0.04-0.08	4.5-5.5	Low	0.20		
	30	---	---	---	---	---	---	---		
Latham	0-6	20-27	1.30-1.50	0.6-2.0	0.16-0.20	3.6-5.5	Low	0.43	3	1-3
	6-35	35-55	1.40-1.70	<0.2	0.11-0.15	3.6-5.5	Moderate	0.32		
	35	---	---	---	---	---	---	---		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm^3	In/hr	In/in	pH				Pct
St	0-7	18-35	1.30-1.45	0.6-2.0	0.22-0.24	4.5-6.5	Low	0.37	5	1-3
Stendal	7-60	18-35	1.45-1.65	0.6-2.0	0.20-0.22	4.5-5.5	Low	0.37		
Sv	0-34	---	---	2.0-6.0	0.10-0.18	3.6-7.3	Low	0.28	3	---
Stokly	34-62	---	---	2.0-6.0	0.08-0.18	3.6-5.5	Low	0.17		
TlB	0-9	10-25	1.20-1.55	0.6-2.0	0.16-0.22	3.6-5.5	Low	0.43	3	1-3
Tilsit	9-24	18-35	1.30-1.55	0.6-2.0	0.16-0.22	3.6-5.5	Low	0.43		
	24-50	18-35	1.40-1.65	0.06-0.2	0.08-0.12	3.6-5.5	Low	0.43		
	50-65	10-50	1.40-1.60	0.06-0.6	0.08-0.12	3.6-5.5	Low	0.43		
	65	---	---	---	---	---	---	---		
UpD	0-4	27-35	1.20-1.50	0.2-0.6	0.12-0.16	4.5-6.5	Moderate	0.43	3	.5-3
Upshur	4-38	40-55	1.30-1.60	0.06-0.2	0.10-0.14	4.5-8.4	High	0.28		
	38-47	27-45	1.30-1.60	0.06-0.2	0.08-0.12	5.1-8.4	Moderate	0.28		
	47	---	---	---	---	---	---	---		
VUF*:										
Vandalia	0-7	---	---	0.6-2.0	0.12-0.18	4.5-6.0	Moderate	0.37	4	---
	7-55	---	---	0.2-0.6	0.12-0.15	4.5-6.0	High	0.28		
	55-68	---	---	0.06-0.2	0.08-0.12	5.1-7.3	High	0.28		
Upshur	0-4	27-35	1.20-1.50	0.2-0.6	0.12-0.16	4.5-6.5	Moderate	0.43	3	.5-3
	4-38	40-55	1.30-1.60	0.06-0.2	0.10-0.14	4.5-8.4	High	0.28		
	38-47	27-45	1.30-1.60	0.06-0.2	0.08-0.12	5.1-8.4	Moderate	0.28		
	47	---	---	---	---	---	---	---		
WeB, WeC, WeD	0-6	12-27	1.20-1.40	0.6-2.0	0.19-0.23	3.6-7.3	Low	0.37	3	.5-4
Wernock	6-26	18-35	1.30-1.50	0.6-2.0	0.18-0.22	3.6-5.5	Low	0.32		
	26-40	18-35	1.30-1.50	0.6-2.0	0.12-0.18	3.6-5.5	Low	0.28		
	40	---	---	---	---	---	---	---		
WhA	0-9	7-27	1.20-1.40	0.6-2.0	0.16-0.23	4.5-5.5	Low	0.37	4	1-4
Whitley	9-70	18-35	1.30-1.50	0.6-2.0	0.18-0.22	4.5-5.5	Low	0.37		
	70-80	5-30	1.30-1.50	0.6-2.0	0.05-0.18	4.5-5.5	Low	0.28		

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
AlA---------- Allegheny	B	Rare---------	---	---	>6.0	---	---	>60	---	Low-------	High.
AlB, AlC---------- Allegheny	B	None---------	---	---	>6.0	---	---	>60	---	Low-------	High.
BCF*:											
Berks----------	C	None---------	---	---	>6.0	---	---	20-40	Hard	Low-------	High.
Cranston---------	B	None---------	---	---	>6.0	---	---	>60	---	Low-------	Moderate.
BeB*, BeF*:											
Bethesda---------	C	None---------	---	---	>6.0	---	---	>60	---	Moderate	High.
Fairpoint--------	C	None---------	---	---	>6.0	---	---	>60	---	High------	Moderate.
BRF*:											
Bledsoe----------	C	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Caneyville-------	C	None---------	---	---	>6.0	---	---	20-40	Hard	High------	Moderate.
Rock outcrop.											
CaC---------- Caneyville	C	None---------	---	---	>6.0	---	---	20-40	Hard	High------	Moderate.
CbD*:											
Caneyville-------	C	None---------	---	---	>6.0	---	---	20-40	Hard	High------	Moderate.
Rock outcrop.											
Co---------- Cotaco	C	Rare---------	---	---	1.5-2.5	Apparent	Nov-May	>60	---	Moderate	High.
Cu---------- Cuba	B	Occasional	Brief-----	Jan-May	>6.0	---	---	>60	---	Low-------	High.
Gr---------- Grigsby	B	Frequent----	Very brief to brief.	Dec-May	3.5-6.0	Apparent	Jan-Apr	>60	---	Low-------	Low.
HaB---------- Hagerstown	C	None---------	---	---	>6.0	---	---	>40	Hard	Moderate	Low.
LaC, LaD---------- Latham	D	None---------	---	---	1.5-3.0	Perched	Jan-Apr	20-40	Soft	High------	High.
LsE*, LTF*:											
Latham----------	D	None---------	---	---	1.5-3.0	Perched	Jan-Apr	20-40	Soft	High------	High.
Shelocta---------	B	None---------	---	---	>6.0	---	---	>60	---	Low-------	High.
LyD---------- Lily	B	None---------	---	---	>6.0	---	---	20-40	Hard	Moderate	High.
Mc---------- McGary	C	Rare---------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High------	Low.
MoA---------- Monongahela	C	Rare---------	---	---	1.5-3.0	Perched	Dec-Apr	>60	---	High------	High.
MoB---------- Monongahela	C	None---------	---	---	1.5-3.0	Perched	Dec-Apr	>60	---	High------	High.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
Mr---------- Morehead	C	Rare--------	---	---	0.5-1.5	Apparent	Dec-Apr	>60	---	Moderate	High.
Mr---------- Morehead	C	Rare--------	---	---	0.5-1.5	Apparent	Dec-Apr	>60	---	Moderate	High.
Ne---------- Newark	C	Frequent----	Brief-----	Jan-Apr	0.5-1.5	Apparent	Dec-May	>60	---	High-----	Low.
No---------- Nolin	B	Occasional	Brief to long.	Feb-May	3.0-6.0	Apparent	Feb-Mar	>60	---	Low------	Moderate.
Pm*: Pits.											
Dumps.											
Po---------- Pope	B	Frequent----	Very brief to brief.	Nov-Apr	>6.0	---	---	>60	---	Low------	High.
RSF*: Rigley----------	B	None--------	---	---	>6.0	---	---	>60	---	Low------	High.
Rock outcrop.											
SaB, SaC, SaD----- Shelocta	B	None--------	---	---	>6.0	---	---	>60	---	Low------	High.
Sd---------- Skidmore	B	Frequent----	Very brief	Dec-May	3.0-4.0	Apparent	Dec-Mar	>40	Hard	Low------	Moderate.
SNF*: Steinsburg-------	C	None--------	---	---	>6.0	---	---	24-40	Hard	Low------	High.
Latham----------	D	None--------	---	---	1.5-3.0	Perched	Jan-Apr	20-40	Soft	High-----	High.
St---------- Stendal	C	Frequent----	Brief-----	Jan-May	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High.
Sv---------- Stokly	B	Frequent----	Very brief	Feb-May	0.5-1.0	Apparent	Feb-May	>60	---	Moderate	High.
TlB---------- Tilsit	C	None--------	---	---	1.5-2.5	Perched	Jan-Apr	>40	Hard	High-----	High.
UpD---------- Upshur	C	None--------	---	---	>6.0	---	---	>40	Soft	High-----	Moderate.
VUF*: Vandalia---------	C	None--------	---	---	4.0-6.0	Apparent	Dec-Apr	>60	---	High-----	Moderate.
Upshur----------	C	None--------	---	---	>6.0	---	---	>40	Soft	High-----	Moderate.
WeB, WeC, WeD----- Wernock	B	None--------	---	---	>6.0	---	---	30-40	Soft	Moderate	High.
WhA---------- Whitley	B	Rare--------	---	---	>6.0	---	---	>60	---	Moderate	High.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Allegheny	Fine-loamy, mixed, mesic Typic Hapludults
Berks	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
Bethesda	Loamy-skeletal, mixed, acid, mesic Typic Udorthents
Bledsoe	Fine, mixed, mesic Typic Hapludalfs
Caneyville	Fine, mixed, mesic Typic Hapludalfs
Cotaco	Fine-loamy, mixed, mesic Aquic Hapludults
Cranston	Coarse-loamy, mixed, mesic Ultic Hapludalfs
Cuba	Fine-silty, mixed, mesic Fluventic Dystrochrepts
Fairpoint	Loamy-skeletal, mixed, nonacid, mesic Typic Udorthents
Grigsby	Coarse-loamy, mixed, mesic Dystric Fluventic Eutrochrepts
Hagerstown	Fine, mixed, mesic Typic Hapludalfs
Latham	Clayey, mixed, mesic Aquic Hapludults
Lily	Fine-loamy, siliceous, mesic Typic Hapludults
*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
Pope	Coarse-loamy, mixed, mesic Fluventic Dystrochrepts
Rigley	Coarse-loamy, mixed, mesic Typic Hapludults
Shelocta	Fine-loamy, mixed, mesic Typic Hapludults
Skidmore	Loamy-skeletal, mixed, mesic Dystric Fluventic Eutrochrepts
Steinsburg	Coarse-loamy, mixed, mesic Typic Dystrochrepts
Stendal	Fine-silty, mixed, acid, mesic Aeric Fluvaquents
Stokly	Coarse-loamy, mixed, acid, mesic Aeric Fluvaquents
Tilsit	Fine-silty, mixed, mesic Typic Fragiudults
Upshur	Fine, mixed, mesic Typic Hapludalfs
Vandalia	Fine, mixed, mesic Typic Hapludalfs
Wernock	Fine-silty, mixed, mesic Typic Hapludults
Whitley	Fine-silty, mixed, mesic Typic Hapludults

* The soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series.

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