United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with Virginia Polytechnic Institute and State University

Soil Survey of Lee County, Virginia

How to Use This Soil Survey

General Soil Map

The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

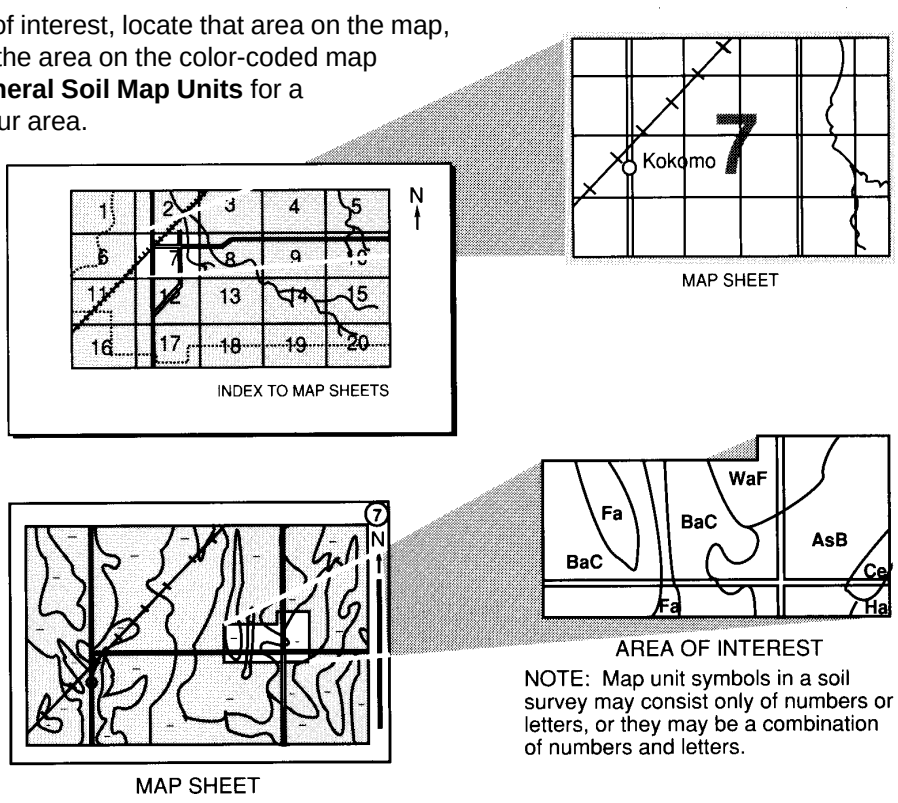
To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet and turn to that sheet.

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Contents**, which lists the map units by symbol and name and shows the page where each map unit is described.



NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

The **Contents** shows which table has data on a specific land use for each detailed soil map unit. Also see the **Contents** for sections of this publication that may address your specific needs.

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 Natural Resources Conservation Service (formerly the Soil Conservation Service) leads the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1995. Soil names and descriptions were approved in 1997. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1995. This survey was made cooperatively by the Natural Resources Conservation Service and the Virginia Polytechnic Institute and State University. The survey is part of the technical assistance furnished to the Daniel Boone Soil and Water Conservation District. The Virginia Department of Conservation and Recreation and the Lee County Board of Supervisors provided financial assistance for the survey.

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: The community of Dot as seen from the summit of Wallen Ridge. Dot is in the Valley and Ridge physiographic province in Lee County.

Additional information about the Nation's natural resources is available on the Natural Resources Conservation Service homepage on the World Wide Web. The address is http://www.nrcs.usda.gov.

Contents

CD-ROM issued 2002

Foreword

This soil survey contains information that affects land use planning in this survey area. It contains predictions of soil behavior for selected land uses. The survey also highlights soil limitations, 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 ensure 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.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. The information in this report is intended to identify soil properties that are used in making various land use or land treatment decisions. Statements made in this report are intended to help the land users identify and reduce the effects of soil limitations that affect various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

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. 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 Natural Resources Conservation Service or the Cooperative Extension Service.

M. Denise Doetzer
State Conservationist
Natural Resources Conservation Service

Soil Survey of
Lee County, Virginia

By Jeff Thomas, Natural Resources Conservation Service

Fieldwork by Jeff Thomas and Shawn Finn, Natural Resources Conservation Service

United States Department of Agriculture, Natural Resources Conservation Service,
in cooperation with
Virginia Polytechnic Institute and State University

LEE COUNTY is in the southwestern part of Virginia (fig. 1). The area of the county is about 425 square miles, or 272,100 acres.

The survey area includes both privately owned land and the part of the Cumberland Gap National Historical Park in Virginia. The survey area covers 260,600 acres. It does not include the Jefferson National Forest, part of which covers 11,500 acres in the eastern part of the county.

This soil survey supersedes the Soil Survey of Lee County, Virginia, published in 1953 (*7*). It provides additional information and has larger soil maps, which generally show the soils in greater detail.

General Nature of the County

This section gives general information about Lee County. It describes history and development; physiography, relief, and drainage; climate; industry; transportation facilities; natural resources; forests; wildlife; and agriculture.

History and Development

In 1792, Lee County was formed from 425 square miles of Russell County. It was named in honor of Henry Lee, Governor of Virginia (1791-94). During the Revolutionary War, Lee earned the name "Light-Horse Harry."

In 1750, Dr. Thomas Walker passed through the area now called Lee County on his way to the Cumberland Gap. Before his exploration, the local Indians hunted in the area. Cherokees, Shawnees, and members of the Six Nation Federation, forbade settlement of any kind. In 1768, an unsuccessful attempt at settlement was made in present-day Rose Hill.

In 1793, Daniel Boone, leading a party to Kentucky, traveled the Wilderness Road through the survey area. In an Indian attack, his eldest son, James, was killed.

In 1774-75, several forts and stations were built in and around Powell Valley. However, the lack of fortification and military protection resulted in many settlers abandoning these places and moving to safety during the Revolutionary War.

Until the end of the Civil War, the economy of Lee County was mainly agricultural and many water grist mills were built in the county. Coal became important in the late nineteenth century. The discovery of coal led to the growth of the railroad, which led to the establishment of townships and eventually the present-day municipalities.

Physiography, Relief, and Drainage

The northern part of Lee County lies in the Appalachian Plateau physiographic province, Cumberland Plateau and Cumberland Mountain section. The rest of Lee County lies in the Valley and Ridge physiographic province in the southern Appalachian Highlands. The Valley and Ridge province consists of parallel valleys separated by long, narrow, even-topped mountain ridges. Streams have trenched the valley floors. The mountains are folded, and their ridges formed in resistant strata. The valleys formed in the weaker strata. The Appalachian Plateau is a dissected, old plain that consists of broad, smooth

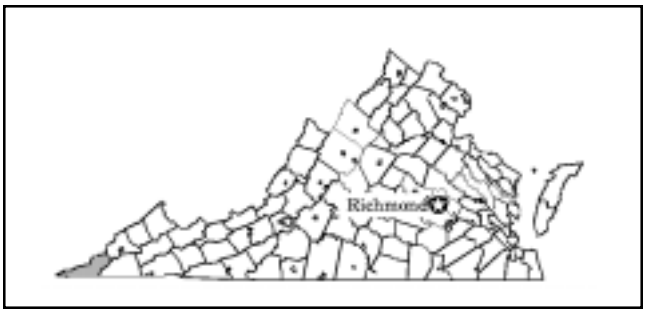


Figure 1.—Location of Lee County in Virginia.

ridge summits and very steep, deep, V-shaped mountain side slopes.

The parallel ridges in the county are generally straight and even-crested and trend northeast-southwest. The intervening valleys are narrow to broad and comparatively deep. Differences in the hardness of the underlying bedrock and geologic structure have caused these valleys and ridges. Powell, Stone, and Cumberland Mountains and Wallen Ridge are underlain by weather-resistant sandstone. In contrast, most of the foothills and the limestone valley are underlain by shale and limestone, both of which are less resistant to weathering than sandstone. The purer limestone breaks down faster than either shale or sandstone, and some of the lowest valley floors likely resulted from the deterioration of limestone through solution. In many areas of the limestone belt, the limestone is interstratified with some sandstone but mostly with shale. It contains large quantities of a hard, flinty mineral called chert. Shale, sandstone, and chert, which are resistant to weathering, help to support the ridges in the foothills and in the limestone valley.

Powell Valley is a broad, limestone valley. It lies between Cumberland and Stone Mountains on the northwest and Wallen Ridge on the southeast. It extends across the county in a southwest-northeast direction from the Virginia-Tennessee boundary to the Wise County line. Most of it lies northwest of the Powell River. The widest point in the valley, 7 miles, is between the southern boundary where the Powell River leaves the county northwestward and the foot of Cumberland Mountain. Further northeast the valley tapers and narrows. From Woodway westward it has a smooth surface that is sloping, moderately steep, and steep. Northeastward, its relief is greater, but it has some less sloping areas, particularly near and southwest of Dryden and southeast of Olinger.

Narrow valleys are along the North Fork Powell River in the northeastern part of the county, the North Fork Clinch River and Wallen Creek in the eastern part, and Blackwater Creek in the southern part. Wallen Creek Valley generally is comparatively narrow, but it widens to a fairly broad, rounded cove northeast of Stickleyville. Narrow to fairly wide, nearly level bottom lands are along many streams throughout the county.

Cumberland and Stone Mountains rise abruptly northwest of Powell Valley, on the southeast flank of which is Wallen Ridge. Many rock escarpments jut out from the face of Cumberland and Stone Mountains, some of which continue for great distances. These mountains have very steep slopes and are dissected by numerous drainageways. In the area between Stone and Little Black Mountains, the slopes are very steep and broken and the surface is closely and deeply dissected and level only in narrow areas along streams. Wallen Ridge, Powell Mountain, and Newman Ridge are successive parallel ridges in the eastern and southeastern parts of the county. Their skylines generally are even and their tops are narrow. These ridges are very steep except near their bases, where they are less sloping. They are indented by small drainageways.

Elevation in the county ranges from about 1,200 to 3,650 feet above mean sea level, and the general slope dips toward the southwest. The elevation of the limestone valley floor ranges from about 1,200 feet, where the Powell River crosses the Virginia-Tennessee line to about 1,800 feet on some of the valley's ridges. The general elevation of the mountains and foothills is about 2,000 to 3,500 feet. Potato Hill is on Little Black Mountain near the northeastern corner of the county. At an elevation of 3,650 feet, Potato Hill is the highest point in the county.

In general, the elevation of Little Black Mountain ranges from about 2,900 to 3,650 feet. Cumberland Mountain extends from the western corner of the county northeastward to a point directly north of Jonesville. At that point it gives way to Stone Mountain, which extends into Wise County, Virginia. The elevations of these mountains range from about 2,500 to 3,000 feet. Poor Valley Ridge runs parallel to the southern feet of Cumberland and Stone Mountains. It has an elevation of about 1,800 to 2,200 feet. In the eastern and southeastern parts of the county, the prominent surface features are Powell Mountain (about 2,000 to 3,500 feet), Wallen Ridge (about 2,000 to 3,200 feet), and Newman Ridge (about 2,000 feet).

The elevations of several towns and villages are as follows; Stickleyville, 1,600 feet; Rose Hill, Jonesville, and Dryden, 1,500 feet; Pennington Gap and Olinger, 1,400 feet; and Blackwater, 1,200 feet.

Surface drainage, which is well established throughout the county, is excessive in many of the steeper areas. Lee County has many streams throughout. The soils are poorly drained on only a few of the low, nearly level flood plains. Most of the soils in

the county are well drained. Nearly all the county is drained by the Powell River and its tributaries. A small area in the southeastern part of the county is drained by Blackwater Creek, and a small tract in the eastern part is drained by the North Fork Clinch River. These small areas both are in the drainage basin of the Clinch River to the south. In limestone areas some of the surface drainage leads to sinkholes.

The Powell River rises in Wise County and flows southwestward across the middle of Lee County into Tennessee. Its important tributaries are the North Fork Powell River and Wallen, Martin, and Indian Creeks. All these streams have cut channels, depending on location, to a depth of 200 to 300 feet below the 1,500 foot level of the valleys on uplands. In some places the channels are less than 200 feet deep, and in others they are more than 300 feet deep. In drainageways the slopes are gentle to steep.

Industry

Of Lee County's basic industries, manufacturing has the most important economic benefit. Manufacturing jobs made up almost 22 percent of employment in Lee County. In 1993, mining in the Lee County area employed 398 persons. In 1990, although agricultural employment in Lee County continued to decline, it still accounted for the primary employment of 602 persons. Supporting employment consisted of local contract construction; transportation and public utilities; wholesale and retail trade; finance, insurance, and real estate; and services. It provided an estimated 2,461 jobs in 1993, a increase of 716 jobs from 1980.

Transportation Facilities

U.S. Routes 58 and 58A run east-west through Pennington Gap and Jonesville. At the Tennessee State line U.S. 58 intersects with I-181 and U.S. 11 to the east, both of which lead to I-81. Alt. U.S. 58, part of the Virginia Arterial Highway System, connects Jonesville and Pennington Gap with U.S. 23. U.S. Route 421 connects Pennington Gap to the Kentucky State line. State primary and secondary roads make these main highways accessible to all parts of the county.

Daily motor freight transportation is available from numerous carriers regularly doing business in the region. The two railroad lines that run in Lee County are used for general freight transportation but primarily serve regional coal fields.

Pennington Gap Airport serves Lee County. Commercial air service is available at the Tri-City Airport near Kingsport, Tennessee, about 70 miles from Jonesville and also at McGee-Tyson Airport in Knoxville, Tennessee.

Natural Resources

Most of Lee County is in the Valley and Ridge physiographic province, and is underlain by folded and faulted limestone, dolomite, shale, and sandstone formations. The northeastern edge of the county is in the Appalachian Plateau physiographic province, Cumberland Plateau and Cumberland Mountain section. This part of the county is underlain by nearly horizontal strata of shale, sandstone, and coal.

Wells nearly everywhere in the county provide sufficient quantities of water for farm and home needs. Springs provide water for many schools and towns. Springs and cisterns supply water to many farms and rural residences.

Lee County lies in the Tennessee River Basin. The main streams in the county are the Powell River and its tributaries. The Powell River is a headwater stream; hence, the size of the area it drains provides it with only a moderate supply of surface water.

Lee County is underlain entirely by sedimentary rocks. Mining of bituminous coal is an important industry in the part of the county in the Appalachian Plateau. In 1991, 28 coal mines produced a total of 2,025,643 tons of coal.

About 47 percent of Lee County is underlain by limestone that is either mostly dolomitic or magnesium-bearing, not pure calcium limestone. Several companies quarry and crush limestone for use as roadbuilding material, concrete aggregate, and the like.

Timber in Lee County covers about 158,000 acres. The loblolly pine-shortleaf pine type makes up about 6 percent of this acreage, and the oak-hickory type makes up 94 percent. Most timber in Lee County is harvested for a pulpwood mill in nearby Kingsport, Tennessee. Also, some sawtimber is produced for use in making furniture, architectural woodwork, and veneer.

Forests

Clark Boyer, area forester, Virginia Department of Forestry, Big Stone Gap, Virginia, helped to prepare this section.

About 58 percent, or 157,865 acres of the total land area in Lee County, is forestland. These forests are a renewable resource that provides environmental, economic, recreational, and social benefits to the county. With proper management the forests can

provide the desired benefits for many years. Although some past harvesting techniques and wildfires have had a negative influence on the condition of the forests of Lee County, proper forest management can improve the quality of future woodland. In some areas Lee County has naturally occuring, high quality hardwoods. Primarily because of climate and natural soil fertility, Lee County has the potential to produce some of the best quality hardwoods in Virginia.

In general, the best quality timber grows on Frederick, Watahala, and Timberville soils in the limestone valley, and on Jefferson, Tumbling, and Pineville soils on the lower slopes and in drainageways of mountains. The primary species growing on these sites include black walnut, ash, basswood, cherry, yellow-poplar, and white and red oaks. On the upper slopes and ridges of mountains, Wallen, Weikert, and Alitcrest soils tend to support the lower quality trees. On these sites the common species include hickory, scarlet oak, black oak, and chestnut oak.

North- and east-facing slopes are generally cooler and moister. These areas are more productive than the warmer and drier south- and west-facing slopes. Also, limestone-influenced soils tend to produce more timber than sandstone- or shale-influenced soils. Proper moisture content is the single, most important factor in influencing tree growth; generally, slope position and aspect can compensate for a lack of inherent fertility.

The forests of Lee County have been a valuable resource beginning with American Indians. Forests provide enjoyment and many other benefits for people. In the future, forests conceivably could become an even more important resource.

Wildlife

William Keith, soil conservationist, Natural Resources Conservation Service, helped to prepare this section.

Lee County has a diverse plant and animal life. The open farmlands and riparian areas of the valleys as well as the broadleaf, deciduous forests of the ridges provide habitat for a variety of species.

Among the popular upland game animals are whitetailed deer, wild turkey, ruffed grouse, bobwhite quail, squirrel, cottontail, racoon, and red and gray foxes.

The Powell River and its tributaries provide habitat for various aquatic species. Native gamefish include smallmouth bass, rock bass, redbreast sunfish, bluegill, and catfish. Many rare and threatened species inhabit the Powell River in Lee County. The populations of freshwater mussels that were once abundant throughout the Tennessee River system are now vanishing. Some mussel species found in the Powell River are currently listed as threatened and endangered.

Karst in Lee County formed in dissolved, underlying bedrock. It provides the conditions for certain unique communities, such as the “Cedars.” The karst geology and the Beech Grove-Rock outcrop complex, 3 to 60 percent slopes, of the “Cedars” support an oligotrophic scrub, or “cedar glade,” community. The “cedar glade” community has rare plants, such as running glade clover (*trifolium calcaricum*). With its caves it also provides habitat for 17 rare, threatened, or endangered invertebrates, including the cave isopod (*lirecus usdagalun*), which is on the Federal list of endangered species, as are the Indiana bat (*myotis sodalis*), and the gray bat (*myotis griscens*), also inhabitants of Lee County.

Climate

Table 1 gives data on temperature and precipitation for the survey area as recorded at Pennington Gap in the period 1931 to 1994. 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 36.3 degrees F and the average daily minimum temperature is 25.2 degrees. The lowest temperature on record, which occurred on January 20, 1994, is -25 degrees. In summer, the average temperature is 72.2 degrees and the average daily maximum temperature is 84.5 degrees. The highest recorded temperature, which occurred on June 10, 1998, 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 about 49.8 inches. Of this, 24.6 inches, or 49 percent, usually falls in April through September. The growing season for most crops falls within this period. The heaviest 1-day rainfall during the period of record was 5.26 inches on October 17, 1985. Thunderstorms occur on about 45 days each year, and most occur between May and August.

The average seasonal snowfall is about 18 inches. The greatest snow depth at any one time during the period of record was 19 inches. On the average, 11 days of the year have at least 1 inch of snow 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 81 percent. The sun shines 66 percent of the time possible in summer and 44 percent in winter. The prevailing wind is from the south. Average windspeed is highest, between 10 and 11 miles per hour, between November and April.

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept or model of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, their observations, supplemented by their understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

The descriptions, names, and delineations of the soils in this survey area may not fully agree with those

of the soils in adjacent survey areas. Differences are the result of a better knowledge of soils, modifications in series concepts, or variations in the intensity of mapping or in the extent of the soils in the survey areas.

Areas of Lee County within the Jefferson National Forest are excluded from this soil survey report. They will be included in a separate soil survey report.

Soil Survey Procedures

The general procedures followed in making this survey are described in the Soil Survey Manual (*13*). The Soil Survey of Lee County, Virginia (*7*), published in 1953, was used as a reference in making this soil survey.

Map Unit Composition

After mapping was completed, soil scientists studied each map unit to obtain data on the components, or kinds of soil, that make up the map units. They used a stratified sampling technique to determine map unit composition.

Sampling points were stratified across the entire survey area. About 15 delineations were selected for each map unit; similar slope phases were combined for this sampling. However, the number of points varied according to total acreage of the map unit. Two points were randomly located within each selected delineation. The soil type was described at each point. This data was used to determine map unit composition using the statistical calculations described by Hollander and Wolfe (*8*) and Freund and Smith (*4*).

After field sampling was complete, the composition of the map unit was determined by one of three procedures, or calculations, depending on the number of data points gathered for the map unit. “Statistical method—random points” was used if 30 or more points of data were collected. This method used results directly from statistical calculations. “Informed judgement” was used if 10 to 30 points of data were collected. This method used results of statistical calculations combined with predictions based on experience and judgement of field soil scientists. “Subjective judgement” was used if less than 10 points of data were collected. This method used results partly from statistical calculations but mainly from predictions based on the experience and judgement of field soil scientists.

The results are given in Table 4 and under “Composition” in the detailed soil map unit descriptions.

General Soil Map Units

The general soil map at the back of this publication shows the 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, an association consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The components of one unit can occur in another, 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.

Geology and Soil Relationships

Geologic strata in Lee County consist of systems ranging in age from Pennsylvanian to Cambrian. The rocks are sedimentary in origin, and they consist mainly of sandstone, shale, siltstone, or limestone. In a few places they consist of an interbedded limestone and shale or interbedded sandstone and shale.

The sandstone is generally moderately hard or hard, and medium grained or coarse grained. It ranges from gray to brown. Some prominent mountains, such as Powell, Cumberland, and Stone Mountains and Wallen Ridge, are underlain partly by sandstone. The sandstone bedrock commonly crops out near the summits of these mountains.

The lower foothills formed on shale and siltstone. These areas are at the base of mountains in the northeast and southeast parts of the county and in Poor Valley Ridge. Shale is in shades of brown, gray, black, or olive, and is generally soft. It generally does not crop out above the soil surface in Lee County.

The valleys of Lee County are underlain by both pure and cherty limestone. The limestone valley is the largest area of limestone in Lee County. It lies within an area northwest of Wallen Ridge and southeast of Poor Valley Ridge, where it extends, southwest to northeast, nearly the entire length of the county. The limestone is hard and generally light grayish. Outcrops of limestone bedrock are common throughout the limestone valley.

Soil and geology in Lee County are directly related. The soils in Lee County inherited their properties from the underlying geologic strata. The weathered bedrock has formed soils unique to each geologic formation. Table 5 shows which soils occur on each geologic formation in the county (*3,5,6,9,10*). Figures 2, 3, and 4 show the relationship of soil map units, topography, and parent material of three different kinds of geology in Lee County.

Soil Descriptions

1. Gilpin-Bethesda-Pineville

Nearly level to very steep, moderately deep and very deep, well drained soils that have a loamy subsoil; formed in residuum, mine spoil regolith, and colluvium derived from shale, siltstone, and sandstone; on hillslopes, on mountain slopes, and in areas that have been strip-mined for coal

Setting

Physiographic province: Appalachian Plateau, Cumberland Plateau and Cumberland Mountain section
Landscape: Mountains and foothills (fig. 2)
Landform: Mountain slopes and hillslopes
Slope range: 0 to 80 percent

Composition

Percent of survey area: 13 percent
Gilpin and similar soils—60 percent
Bethesda and similar soils—17 percent
Pineville and similar soils—10 percent
Soils of minor extent—13 percent

Soil Properties and Qualities

Gilpin

Depth class: Moderately deep
Drainage class: Well drained

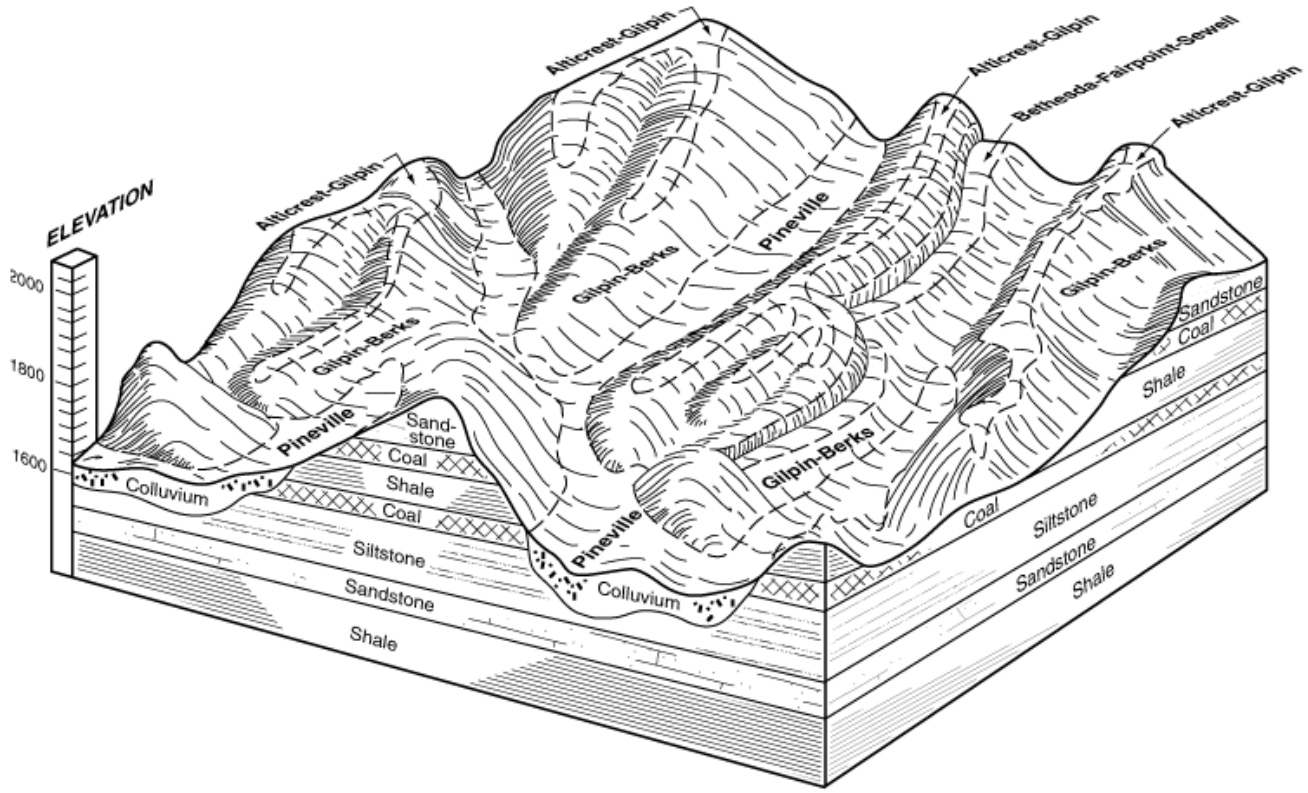


Figure 2.—Typical pattern of soils and parent material in the Gilpin-Bethesda-Pineville general soil map unit, located in the Appalachian Plateaus, Cumberland Plateau and Cumberland Mountain section.

Permeability: Moderate
Parent material: Residuum derived from shale, siltstone, and some sandstone
Slope: 7 to 70 percent

Bethesda

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Parent material: Acid regolith that is from strip-mining for coal and that contains partly weathered fine earth and fragments of bedrock
Slope: 0 to 80 percent

Pineville

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Parent material: Colluvium derived from shale and sandstone
Slope: 15 to 55 percent

Soils of minor extent

- Alticrest soils, which are moderately deep and somewhat excessively drained, have a coarse-loamy subsoil, and formed in residuum derived from sandstone
- Itmann soils, which are very deep and somewhat excessively drained, have a loamy-skeletal subsoil, and formed in acid regolith, waste materials from deep-mined coal
- Pope and Philo soils, which are very deep and well drained and moderately well drained, have a coarse-loamy subsoil, and formed in alluvium derived from sandstone and shale on flood plains

2. Tumbling-Berks-Wallen

Moderately steep to very steep, moderately deep and very deep, somewhat excessively drained and well drained soils that have a loamy or clayey subsoil; formed in colluvium and residuum derived from shale and sandstone; on footslopes, hillslopes, and mountain slopes

Setting

Physiographic province: Valley and Ridge

Landscape: Mountains, the limestone valley, and foothills
Landform: Mountain slopes and hillslopes
Slope range: 15 to 85 percent

Composition

Percent of survey area: 31 percent
Tumbling and similar soils—33 percent
Berks and similar soils—30 percent
Wallen and similar soils—17 percent
Soils of minor extent—20 percent

Soil Properties and Qualities

Tumbling

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Parent material: Colluvium derived from sandstone, quartzite, and shale
Slope: 15 to 35 percent

Berks

Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderate or moderately rapid
Parent material: Residuum derived from shale and siltstone
Slope: 35 to 80 percent

Wallen

Depth class: Moderately deep
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid
Parent material: Residuum derived from sandstone, siltstone, and some shale
Slope: 35 to 85 percent

Soils of minor extent

- Poplimento soils, which are very deep and well drained, have a clayey subsoil, and formed in residuum derived from a mixture of shale, limestone, and siltstone
- Oriskany soils, which are very deep and well drained, have a loamy-skeletal subsoil, and formed in colluvium derived from sandstone

3. Carbo-Beech Grove-Rock Outcrop

Gently sloping to very steep, very shallow to moderately deep soils and outcrops of hard limestone bedrock, well drained to excessively drained soils that have a clayey or loamy subsoil; formed in residuum derived from limestone; on hillslopes

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley (fig. 3)
Landform: Hillslopes
Slope range: 3 to 60 percent

Composition

Percent of survey area: 14 percent
Carbo and similar soils—57 percent
Beech Grove and similar soils—24 percent
Rock outcrop—12 percent
Soils of minor extent—7 percent

Soil Properties and Qualities

Carbo

Depth class: Moderately deep
Drainage class: Well drained
Permeability: Slow
Parent material: Residuum derived from limestone
Slope: 7 to 60 percent

Beech Grove

Depth class: Very shallow
Drainage class: Excessively drained
Permeability: Moderate
Parent material: Residuum derived from limestone
Slope: 3 to 60 percent

Rock outcrop

Outcrops of limestone bedrock that rise 0.5 to 5 feet above the surface of the soil

Soils of minor extent

- Frederick soils, which are very deep and well drained, have a clayey subsoil, and formed in residuum derived from limestone
- Poplimento soils, which are very deep and well drained, have a clayey subsoil, and formed in residuum derived from a mixture of shale, limestone, and siltstone
- Watahala soils, which are very deep and well drained, have a fine loamy and clayey subsoil, and formed in residuum derived from cherty limestone
- Gently sloping to very steep, very deep, well drained soils that have a mostly clayey subsoil; formed in residuum and colluvium derived from limestone and cherty limestone; on hillslopes and footslopes

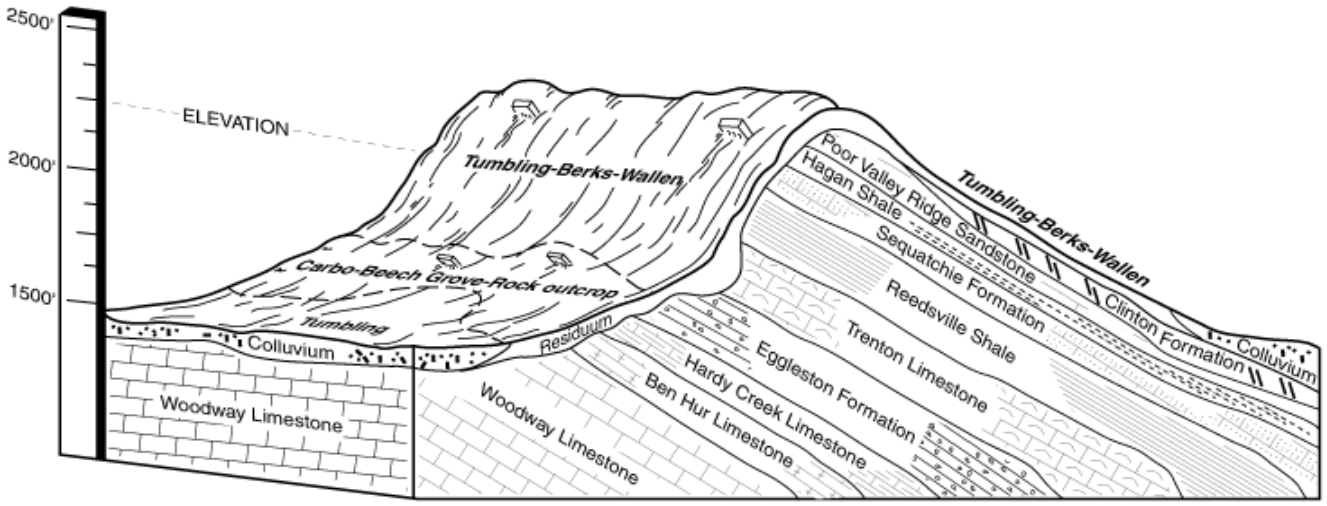


Figure 3.—Typical pattern of the soils and the parent material in the Tumbling-Berks-Wallen and Carbo-Beech Grove-Rock outcrop general soil map units in the area of Powell Mountain, Wallen Ridge, and Poor Valley Ridge.

4. Frederick-Watahala-Timberville

Gently sloping to very steep, very deep, well drained soils that have a mostly clayey subsoil; formed in residuum and colluvium derived from limestone and cherty limestone; on hillslopes and footslopes

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley (fig. 4)
Landform: Hillslopes, some of which are cherty
Slope range: 2 to 60 percent

Composition

Percent of survey area: 33 percent
Frederick and similar soils—68 percent
Watahala and similar soils—20 percent
Timberville and similar soils—9 percent
Soils of minor extent—3 percent

Soil Properties and Qualities

Frederick

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Parent material: Residuum derived from limestone
Slope: 2 to 60 percent

Watahala

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately slow to moderately rapid
Parent material: Residuum derived from cherty limestone overlying pure limestone
Slope: 7 to 55 percent

Timberville

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Parent material: Colluvium derived from limestone
Slope: 2 to 15 percent

Soils of minor extent

- Carbo soils, which are moderately deep and well drained, have a clayey subsoil, and formed in residuum derived from limestone
- Poplimento soils, which are very deep and well drained, have a clayey subsoil, and formed in residuum derived from a mixture of shale, limestone, and siltstone

5. Berks-Carbo-Beech Grove

Gently sloping to very steep, very shallow and moderately deep, excessively drained to well drained soils that have a loamy or clayey subsoil; formed in residuum derived from shale and limestone; on hillslopes

Setting

Physiographic province: Valley and Ridge
Landscape: Foothills
Landform: Hillslopes
Slope range: 3 to 80 percent

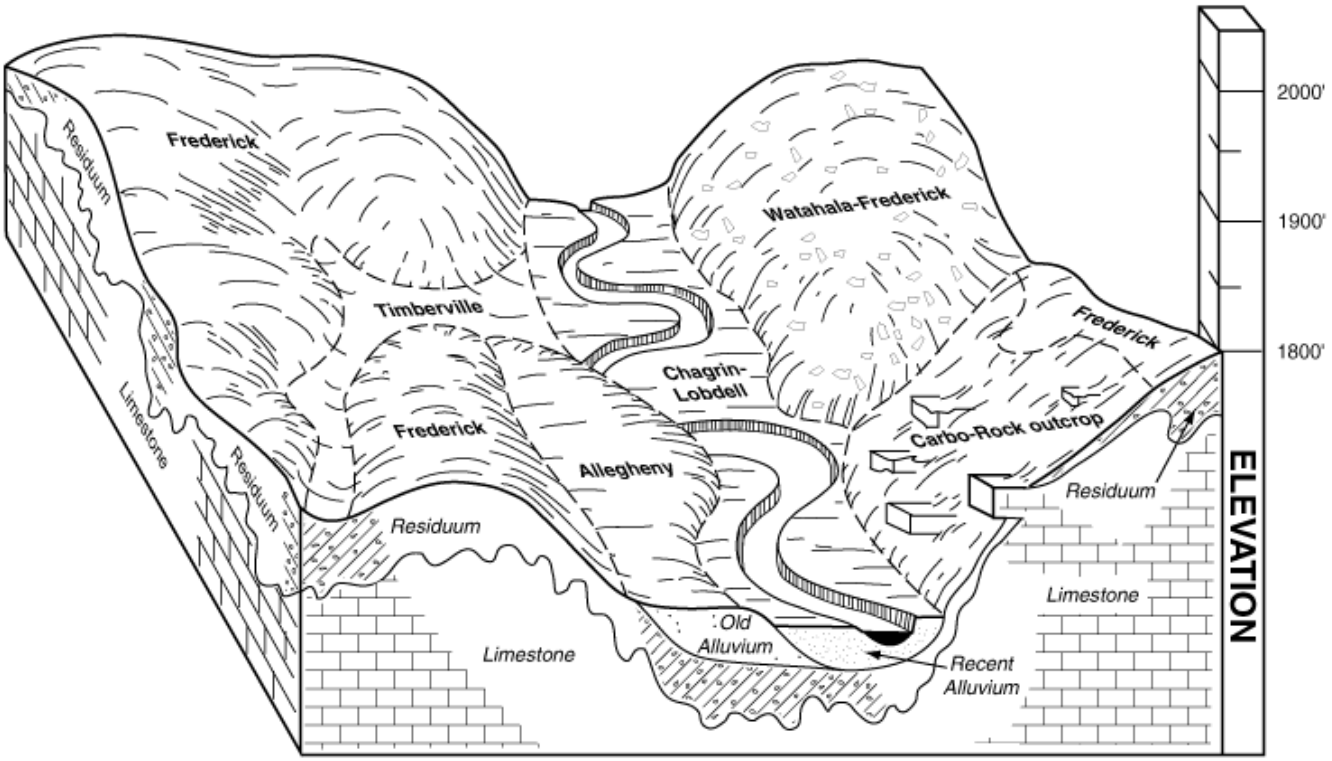


Figure 4.—Typical pattern of the soils and the parent material in the Frederick-Watahala-Timberville general soil map unit.

Composition

Percent of survey area: 3 percent
Berks and similar soils—43
Carbo and similar soils—35 percent
Beech Grove and similar soils—15 percent
Soils of minor extent—7 percent

Soil Properties and Qualities

Berks soil

Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderate or moderately rapid
Parent material: Residuum derived from shale and siltstone
Slope: 35 to 80 percent

Carbo

Depth class: Moderately deep
Drainage class: Well drained
Permeability: Slow
Parent material: Residuum derived from limestone
Slope: 7 to 60 percent

Beech Grove

Depth class: Very shallow
Drainage class: Excessively drained
Permeability: Moderate
Parent material: Residuum derived from limestone
Slope: 3 to 60 percent

Soils of minor extent

- Poplimento soils, which are very deep and well drained, have a clayey subsoil, and formed in residuum derived from a mixture of shale, limestone, and siltstone
- Gilpin soils, which are moderately deep and well drained, have a loamy subsoil, and formed in residuum derived from shale
- Frederick soils, which are very deep and well drained, have a clayey subsoil, and formed in residuum derived from limestone

6. Lobdell-Shottower-Allegheny

Nearly level to moderately steep, very deep, moderately well drained and well drained soils that have a loamy or clayey subsoil; formed in alluvium derived from shale,

sandstone, and limestone; on flood plains and stream terraces

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley and foothills
Landform: Flood plains, high stream terraces, and low stream terraces
Slope range: 0 to 25 percent

Composition

Percent of survey area: 6 percent
Lobdell and similar soils—41 percent
Shottower and similar soils—28 percent
Allegheny and similar soils—19 percent
Soils of minor extent—12 percent

Soil Properties and Qualities

Lobdell

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderate in the solum and moderate or moderately rapid below the solum
Parent material: Recent alluvium derived from limestone, shale, and some sandstone
Slope: 0 to 3 percent

Shottower

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Parent material: Old alluvium derived from sandstone and limestone
Slope: 2 to 25 percent

Allegheny

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Parent material: Alluvium derived from sandstone, siltstone, and shale
Slope: 0 to 7 percent

Soils of minor extent

- Holly soils, which are very deep and poorly drained, have a fine-loamy subsoil, and formed in alluvium derived from limestone, shale, and sandstone on flood plains
- Carbo soils, which are moderately deep and well drained, have a clayey subsoil, and formed in residuum derived from limestone
- Beech Grove soils, which are very shallow and excessively drained, have a loamy subsoil, and formed in residuum derived from limestone

Detailed Soil Map Units

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

A map unit delineation on a map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils or miscellaneous areas. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some "included" areas, or Inclusions, that belong to other taxonomic classes.

Most included soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, inclusions. They may or may not be mentioned in the map unit description. Other included soils and miscellaneous areas, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of included areas in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, 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, slope, stoniness, salinity, 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, Jefferson loam, 15 to 35 percent slopes, very stony, is a phase of the Jefferson series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Frederick-Carbo complex, 25 to 35 percent slopes, rocky, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped

individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Bethesda, Fairpoint, and Sewell soils, 0 to 80 percent slopes, very rocky, is an undifferentiated group in this survey area.

This survey includes *miscellaneous areas.* Such areas have little or no soil material and support little or no vegetation. Pits, quarries, is an example.

Table 6 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 or miscellaneous areas

Soil Descriptions

1A—Allegheny loam, 0 to 2 percent slopes, rarely flooded

Composition (statistical method—random points)

Allegheny and similar soils: 90 to 100 percent
Dissimilar inclusions: 0 to 10 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley, and foothills
Landform: Low stream terraces
Landform position: Treads and risers
Shape of areas: Linear and irregular
Size of areas: 5 to 30 acres
Flooding: Up to a 5 percent chance of flooding in any year

Typical Profile

0 to 5 inches—brown loam
5 to 10 inches—dark yellowish brown loam
10 to 16 inches—yellowish brown clay loam
16 to 30 inches—strong brown clay loam
30 to 62 inches—yellowish brown loam

Inclusions

Dissimilar inclusions:
- Pope soils, which have more sand in the subsoil and are more susceptible to flooding than the Allegheny soil and are on narrow flood plains
- Shottower soils, which have more clay and are redder than the Allegheny soil and are on stream terraces higher than those of the Allegheny soil
- Carbo soils, which are moderately deep to limestone bedrock and are on hillslopes adjacent to the Allegheny soil
- Lobdell soils, which are moderately well drained and are on flood plains in slightly lower positions than those of the Allegheny soil
- Soils that are not subject to flooding and that are on terraces slightly higher than those of the Allegheny soil

Similar inclusions:
- Soils that have less clay throughout the profile than the Allegheny soil but that are in landform positions similar to those of the Allegheny soil

1B—Allegheny loam, 2 to 7 percent slopes, rarely flooded

Composition (statistical method—random points)

Allegheny and similar soils: 90 to 100 percent
Dissimilar inclusions: 0 to 10 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley, and foothills
Landform: Low stream terraces
Landform position: Treads and risers
Shape of areas: Linear and irregular
Size of areas: 5 to 30 acres
Flooding: Up to a 5 percent chance of flooding in any year

Typical Profile

0 to 5 inches—brown loam
5 to 10 inches—dark yellowish brown loam
10 to 16 inches—yellowish brown clay loam
16 to 30 inches—strong brown clay loam
30 to 62 inches—yellowish brown loam

Inclusions

Dissimilar inclusions:
- Pope soils, which have more sand in the subsoil and are more susceptible to flooding than the Allegheny soil and are on narrow flood plains
- Shottower soils, which have more clay and are redder than the Allegheny soil and are on stream terraces higher than those of the Allegheny soil
- Carbo soils, which are moderately deep to limestone bedrock and are on hillslopes adjacent to the Allegheny soil
- Lobdell soils, which are moderately well drained and

are on flood plains, in slightly lower landform positions than the Allegheny soil
• Soils that are not subject to flooding and that are on terraces slightly higher than those of the Allegheny soil
Similar inclusions:
• Soils that have less clay than the Allegheny soil but that are in landform positions similar to those of the Allegheny soil

2D—Alticrest-Gilpin complex, 15 to 35 percent slopes

Composition (statistical method—random points)

Alticrest and similar soils: 61 to 89 percent
Gilpin and similar soils: 9 to 34 percent
Dissimilar inclusions: 0 to 9 percent

Setting

Physiographic province: Appalachian Plateau, Cumberland Plateau and Cumberland Mountain section
Landscape: Foothills
Landform: Hillslopes
Landform position: Summits and shoulders
Shape of areas: Long and narrow
Size of areas: 5 to 75 acres

Typical Profile

Alticrest

0 to 1 inch—partly decomposed leaf litter
1 to 3 inches—very dark grayish brown fine sandy loam
3 to 5 inches—dark yellowish brown sandy loam
5 to 17 inches—yellowish brown sandy loam
17 to 27 inches—strong brown sandy loam
27 to 30 inches—strong brown loamy sand
30 inches—hard sandstone bedrock

Gilpin

0 to 1 inch—partly decomposed leaf litter
1 to 2 inches—dark yellowish brown silt loam
2 to 5 inches—yellowish brown silt loam
5 to 19 inches—yellowish brown silty clay loam
19 to 29 inches—yellowish brown silty clay loam that has strong brown lithochromic mottles
29 inches—shale bedrock

Inclusions

Dissimilar inclusions:
• Soils that are very deep to sandstone bedrock but that are in landform positions similar to those of the Alticrest and Gilpin soils
• Sandstone outcrops in landform positions similar to those of the Alticrest and Gilpin soils
Similar inclusions:
• Soils that are shallow to sandstone bedrock but that are in landform positions similar to those of the Alticrest and Gilpin soils

3E—Beech Grove-Rock outcrop complex, 3 to 60 percent slopes

Composition (statistical method—random points)

Beech Grove and similar soils: 40 to 68 percent
Rock outcrop: 21 to 48 percent
Dissimilar inclusions: 3 to 20 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley, and mountains
Landform: Hillslopes and mountain slopes
Landform position: Broad summits, and backslopes that have nearly vertical cliffs
Shape of areas: Irregular
Size of areas: 5 to 1,000 acres
Surface cover: On average, exposed limestone bedrock covers more than 10 percent of the surface

Typical Profile

Beech Grove

0 to 3 inches—very dark brown silt loam
3 inches—limestone bedrock

Rock outcrop

Outcrops of limestone bedrock that rise 0.5 to 5 feet above the soil surface

Inclusions

Dissimilar inclusions:
• Carbo soils, which are moderately deep to limestone bedrock and are on landscapes similar to those of the Beech Grove soil
• Areas that have fewer rock outcrops than the Beech Grove soil

4E—Berks-Poplimento complex, 35 to 55 percent slopes

Composition (statistical method—random points)

Berks and similar soils: 46 to 68 percent

Poplimento and similar soils: 19 to 39 percent
Dissimilar inclusions: 7 to 22 percent

Setting

Physiographic province: Valley and Ridge
Landscape: Mountains
Landform: Mountain slopes
Landform position: Nose slopes and backslopes
Shape of areas: Irregular
Size of areas: 30 to 500 acres

Typical Profile

Berks soil

0 to 1 inch—partly decomposed leaf litter
1 to 5 inches—dark brown silt loam
5 to 10 inches—dark yellowish brown very channery silt loam
10 to 16 inches—yellowish brown very channery silt loam
16 to 29 inches—yellowish brown extremely channery silt loam
29 inches—shale bedrock

Poplimento soil

0 to 8 inches—brown silt loam
8 to 15 inches—dark yellowish brown silty clay loam
15 to 55 inches—yellowish brown clay
55 to 62 inches—yellowish brown silty clay

Inclusions

Dissimilar inclusions:
• Soils that are shallow to limestone bedrock, that have clay textures in the subsoil, that are in landform positions similar to those of the Berks and Poplimento soils, and that, in some areas, have limestone outcrops
Similar inclusions:
• Weikert soils, which are shallow to shale bedrock and, in the highest areas in the map unit, are in landform positions similar to those of the Berks and Poplimento soils
• Soils that are very deep to bedrock, that have a loamy subsoil, and that, in areas of lowest elevation in the map unit, are in landform positions similar to those of the Berks and Poplimento soils

4F—Berks-Poplimento complex, 55 to 65 percent slopes

Composition (statistical method—random points)

Berks and similar soils: 46 to 68 percent
Poplimento and similar soils: 19 to 39 percent
Dissimilar inclusions: 7 to 22 percent

Setting

Physiographic province: Valley and Ridge
Landscape: Mountains
Landform: Mountain slopes
Landform position: Backslopes
Shape of areas: Irregular
Size of areas: 30 to 100 acres

Typical Profile

Berks soil

0 to 1 inch—partly decomposed leaf litter
1 to 5 inches—dark brown silt loam
5 to 10 inches—dark yellowish brown very channery silt loam
10 to 16 inches—yellowish brown very channery silt loam
16 to 29 inches—yellowish brown extremely channery silt loam
29 inches—shale bedrock

Poplimento soil

0 to 8 inches—brown silt loam
8 to 15 inches—dark yellowish brown silty clay loam
15 to 55 inches—yellowish brown clay
55 to 62 inches—yellowish brown silty clay

Inclusions

Dissimilar inclusions:
• Soils that are shallow to limestone bedrock, that have a clay texture in the subsoil, that are in landform positions similar to those of the Berks and Poplimento soils, and that, in some areas, have limestone rock outcrops
Similar inclusions:
• Weikert soils, which are shallow to shale bedrock and, in areas of highest elevation in the map unit, are in landform positions similar to those of the Berks and Poplimento soils
• Areas of soils that are very deep to bedrock, that have a loamy subsoil, and that are, in the lowest areas in the map unit, in landform positions similar to those of the Berks and Poplimento soils

5D—Berks-Weikert complex, 15 to 35 percent slopes

Composition (statistical method—random points)

Berks and similar soils: 43 to 63 percent

Weikert and similar soils: 25 to 45 percent
Dissimilar inclusions: 5 to 19 percent

Setting

Physiographic province: Valley and Ridge
Landscape: Hills and mountains
Landform: Hillslopes and mountain slopes
Landform position: Summits, shoulders, and nose slopes
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Berks soil

0 to 1 inch—partly decomposed leaf litter
1 to 5 inches—dark brown silt loam
5 to 10 inches—dark yellowish brown very channery silt loam
10 to 16 inches—yellowish brown very channery silt loam
16 to 29 inches—yellowish brown extremely channery silt loam
29 inches—shale bedrock

Weikert soil

0 to 1 inch—partly decomposed leaf litter
1 to 3 inches—dark brown silt loam
3 to 11 inches—dark yellowish brown very channery silt loam
11 to 15 inches—yellowish brown very channery silt loam
15 inches—shale bedrock

Inclusions

Dissimilar inclusions:
• Soils that are deep to shale bedrock, that have fewer rock fragments in the subsoil than the Berks and Weikert soils, and that are in landform positions similar to those of the Berks and Weikert soils
• Soils that are very deep to bedrock, that have fewer rock fragments and more clay in the subsoil than the Berks and Weikert soils, and that are on footslopes and concave head slopes
Similar inclusions:
• Gilpin soils, which have fewer rock fragments in the subsoil than the Berks and Weikert soils and are in landform positions similar to those of the Berks and Weikert soils
• Soils that are shallow to shale bedrock, that have fewer rock fragments in the subsoil than the Berks and Weikert soils, and that are in landform positions similar to those of the Berks and Weikert soils

5E—Berks-Weikert complex, 35 to 55 percent slopes

Composition (statistical method—random points)

Berks and similar soils: 43 to 63 percent
Weikert and similar soils: 25 to 45 percent
Dissimilar inclusions: 5 to 19 percent

Setting

Physiographic province: Valley and Ridge
Landscape: Hills and mountains
Landform: Hillslopes and mountain slopes
Landform position: Nose slopes and backslopes
Shape of areas: Irregular
Size of areas: 10 to 300 acres

Typical Profile

Berks soil

0 to 1 inch—partly decomposed leaf litter
1 to 5 inches—dark brown silt loam
5 to 10 inches—dark yellowish brown very channery silt loam
10 to 16 inches—yellowish brown very channery silt loam
16 to 29 inches—yellowish brown extremely channery silt loam
29 inches—shale bedrock

Weikert soil

0 to 1 inch—partly decomposed leaf litter
1 to 3 inches—dark brown silt loam
3 to 11 inches—dark yellowish brown very channery silt loam
11 to 15 inches—yellowish brown very channery silt loam
15 inches—shale bedrock

Inclusions

Dissimilar inclusions:
• Soils that are deep to shale bedrock, that have fewer rock fragments in the subsoil, and that are in landform positions similar to those of the Berks and Weikert soils
• Soils that are very deep to bedrock, that have fewer rock fragments and more clay in the subsoil than the Berks and Weikert soils, and that are on footslopes and concave head slopes
Similar inclusions:
• Gilpin soils, which have fewer rock fragments in the subsoil than the Berks and Weikert soils and are in landform positions similar to those of the Berks and Weikert soils

• Soils that are shallow to shale bedrock, that have fewer rock fragments in the subsoil than the Berks and Weikert soils, and that are in landform positions similar to those of the Berks and Weikert soils

5F—Berks-Weikert complex, 55 to 80 percent slopes

Composition (statistical method—random points)

Berks and similar soils: 43 to 63 percent
Weikert and similar soils: 25 to 45 percent
Dissimilar inclusions: 5 to 19 percent

Setting

Physiographic province: Valley and Ridge
Landscape: Hills and mountains
Landform: Hillslopes and mountain slopes
Landform position: Backslopes
Shape of areas: Irregular
Size of areas: 10 to 300 acres

Typical Profile

Berks soil

0 to 1 inch—partly decomposed leaf litter
1 to 5 inches—dark brown silt loam
5 to 10 inches—dark yellowish brown very channery silt loam
10 to 16 inches—yellowish brown very channery silt loam
16 to 29 inches—yellowish brown extremely channery silt loam
29 inches—shale bedrock

Weikert soil

0 to 1 inch—partly decomposed leaf litter
1 to 3 inches—dark brown silt loam
3 to 11 inches—dark yellowish brown very channery silt loam
11 to 15 inches—yellowish brown very channery silt loam
15 inches—shale bedrock

Inclusions

Dissimilar inclusions:
• Soils that are deep to shale bedrock, that have fewer rock fragments in the subsoil than the Berks and Weikert soils, and that are in landform positions similar to those of the Berks and Weikert soils
• Soils that are very deep to bedrock, that have fewer rock fragments and more clay in the subsoil than the Berks and Weikert soils, and that are on footslopes and concave head slopes
• Soils that are shallow to limestone bedrock, that have more clay in the subsoil than the Berks and Weikert soils, and that are on the north-facing slopes of Wallen Ridge and Powell Mountain, which have some areas of limestone rock outcrops
Similar inclusions:
• Gilpin soils, which have fewer rock fragments in the subsoil than the Berks and Weikers soils and are in landform positions similar to those of the Berks and Weikert soils
• Soils that are shallow to shale bedrock, that have fewer rock fragments in the subsoil than the Berks and Weikert soils, and that are in landform positions similar to those of the Berks and Weikert soils

6E—Bethesda, Fairpoint, and Sewell soils, 0 to 80 percent slopes, very rocky

Composition (informed judgement)

Bethesda and similar soils: 33 to 85 percent
Fairpoint and similar soils: 10 to 60 percent
Sewell and similar soils: 0 to 52 percent
Dissimilar inclusions: 5 to 15 percent

Setting

Physiographic province: Appalachian Plateau, Cumberland Plateau and Cumberland Mountain section
Landscape: Mountains and foothills
Landform: Mountain slopes and hillslopes that have been strip-mined for coal
Landform position: Strip-mined benches, out slopes, highwalls, summits, and backslopes of areas reclaimed to the approximate original contour; Bethesda and Fairpoint soils are in areas where the dominant overburden stratum was shale, and Sewell soils are in areas where the dominant overburden was sandstone.
Shape of areas: Long and narrow, or irregular
Size of areas: 50 to 500 acres
Surface cover: Rock outcrop consists of nearly vertical highwalls in areas of contour stripmining. Sandstone stones and cobbles and a few boulders cover 0.5 to 3 percent of the surface of Sewell soils. Generally, stones cover a very small percentage of the surface of Bethesda and Fairpoint soils.
Slopes: The slope phases of this map unit, which could not be separated because of the scale of mapping, were combined. Generally, in strip-mined landform positions the slope ranges from 0 to 5 percent on

benches and from 55 to 80 percent on out slopes; highwalls are nearly vertical cliffs. Reclaimed areas have their approximate original contour: 0 to 15 percent on summits and 35 to 55 percent on backslopes.

Typical Profile

Bethesda

0 to 7 inches—dark grayish brown gravelly silt loam
7 to 23 inches—mixed brown and yellowish brown very channery silt loam
23 to 62 inches—mixed very dark grayish brown and dark gray extremely channery silty clay loam

Fairpoint

0 to 5 inches—very dark grayish brown shaly silt loam
5 to 9 inches—yellowish brown very channery loam
9 to 21 inches—very dark gray very channery silt loam
21 to 62 inches—brown very channery silt loam

Sewell

0 to 10 inches—yellowish brown stony sandy loam
10 to 62 inches—yellowish brown very stony sandy loam

Inclusions

Dissimilar inclusions:
• Gilpin soils, which are moderately deep to shale bedrock and are on undisturbed hillslopes adjacent to the Bethesda, Fairpoint, and Sewell soils
• Alticrest soils, which are moderately deep to sandstone bedrock and are on undisturbed hillslopes adjacent to the Bethesda, Fairpoint, and Sewell soils
• Areas of depressions that pond water and that are on strip-mined benches at the base of highwalls
• Itmann soils, which contain waste material from deep-mined coal and are generally in hollow fills and in waste dumps of coal mines
Similar inclusions:
• Pineville soils, which formed in very deep colluvium and are in undisturbed drainageways and on undisturbed footslopes

7C—Carbo silt loam, 7 to 15 percent slopes

Composition (statistical method—random points)

Carbo and similar soils: 65 to 86 percent
Dissimilar inclusions: 14 to 35 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley
Landform: Hillslopes
Landform position: Summits
Shape of areas: Irregular
Size of areas: 5 to 30 acres

Typical Profile

0 to 3 inches—brown silt loam
3 to 8 inches—dark yellowish brown silty clay loam
8 to 20 inches—strong brown clay
20 to 28 inches—yellowish red clay
28 inches—limestone bedrock

Inclusions

Dissimilar inclusions:
• Frederick, Watahala, and Poplimento soils, which are very deep to bedrock and are in landform positions similar to those of the Carbo soil
• Limestone rock outcrops in landform positions similar to those of the Carbo soil
Similar inclusions:
• Soils that are shallow to limestone bedrock and that are in landform positions similar to those of the Carbo soil
• Soils that have less clay in the subsoil than the Carbo soil and that are in landform positions similar to those of the Carbo soil

7D—Carbo silt loam, 15 to 25 percent slopes

Composition (statistical method—random points)

Carbo and similar soils: 65 to 86 percent
Dissimilar inclusions: 14 to 35 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley
Landform: Hillslopes
Landform position: Summits, nose slopes, and backslopes
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Typical Profile

0 to 3 inches—brown silt loam
3 to 8 inches—dark yellowish brown silty clay loam
8 to 20 inches—strong brown clay
20 to 28 inches—yellowish red clay
28 inches—limestone bedrock

Inclusions

Dissimilar inclusions:
- Frederick, Watahala, and Poplimento soils, which are very deep to bedrock and are on landscapes similar to those of the Carbo soil
- Limestone rock outcrops in landform positions similar to those of the Carbo soil

Similar inclusions:
- Soils that are shallow to limestone bedrock and that are in landform positions similar to those of the Carbo soil
- Soils that have less clay in the subsoil and that are in landform positions similar to those of the Carbo soil

8C—Carbo-Beech Grove complex, 7 to 15 percent slopes, rocky

Composition (statistical method—random points)

Carbo and similar soils: 63 to 83 percent
Beech Grove and similar soils: 10 to 27 percent
Dissimilar inclusions: 3 to 15 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley
Landform: Hillslopes
Landform position: Summits and nose slopes
Shape of areas: Irregular
Size of areas: 10 to 50 acres
Surface cover: Exposed limestone bedrock covers 0.1 to 2 percent of the surface

Typical Profile

Carbo

0 to 3 inches—brown silt loam
3 to 8 inches—dark yellowish brown silty clay loam
8 to 20 inches—strong brown clay
20 to 28 inches—yellowish red clay
28 inches—limestone bedrock

Beech Grove

0 to 3 inches—very dark brown silt loam
3 inches—limestone bedrock

Inclusions

Dissimilar inclusions:
- Frederick soils, which are very deep to bedrock and are in landform positions similar to those of the Carbo and Beech Grove soils
- Areas that have more rock outcrops than the Carbo and Beech Grove soils

Similar inclusions:
- Soils that are shallow to limestone bedrock and that are in landform positions similar to those of the Carbo and Beech Grove soils
- Soils that have less clay in the subsoil, that are moderately deep to limestone bedrock, and that are in landform positions similar to those of the Carbo and Beech Grove soils

8D—Carbo-Beech Grove complex, 15 to 25 percent slopes, rocky

Composition (statistical method—random points)

Carbo and similar soils: 63 to 83 percent
Beech Grove and similar soils: 10 to 27 percent
Dissimilar inclusions: 3 to 15 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley
Landform: Hillslopes
Landform position: Summits, nose slopes, and backslopes
Shape of areas: Irregular
Size of areas: 10 to 50 acres
Surface cover: Exposed limestone bedrock covers 0.1 to 2 percent of the surface

Typical Profile

Carbo

0 to 3 inches—brown silt loam
3 to 8 inches—dark yellowish brown silty clay loam
8 to 20 inches—strong brown clay
20 to 28 inches—yellowish red clay
28 inches—limestone bedrock

Beech Grove

0 to 3 inches—very dark brown silt loam
3 inches—limestone bedrock

Inclusions

Dissimilar inclusions:
- Frederick soils, which are very deep to bedrock and are in landform positions similar to those of the Carbo and Beech Grove soils
- Areas that have more rock outcrops than Carbo and Beech Grove soils

Similar inclusions:
- Soils that are shallow to limestone bedrock and that are in landform positions similar those of the Carbo and Beech Grove soils

• Soils that have less clay in the subsoil, that are moderately deep to limestone bedrock, and that are in landform positions similar those of the Carbo and Beech Grove soils

8E—Carbo-Beech Grove complex, 25 to 60 percent slopes, rocky

Composition (statistical method—random points)

Carbo and similar soils: 51 to 72 percent
Beech Grove and similar soils: 19 to 38 percent
Dissimilar inclusions: 4 to 16 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley
Landform: Hillslopes
Landform position: Backslopes
Shape of areas: Irregular
Size of areas: 10 to 75 acres
Surface cover: Exposed limestone bedrock covers 0.1 to 2 percent of the surface.

Typical Profile

Carbo

0 to 3 inches—brown silt loam
3 to 8 inches—dark yellowish brown silty clay loam
8 to 20 inches—strong brown clay
20 to 28 inches—yellowish red clay
28 inches—limestone bedrock

Beech Grove

0 to 3 inches—very dark brown silt loam
3 inches—limestone bedrock

Inclusions

Dissimilar inclusions:
• Frederick soils, which are very deep to bedrock and are in landform positions similar to those of the Carbo and Beech Grove soils
• Areas that have more rock outcrops than the Carbo and Beech Grove soils
Similar inclusions:
• Soils that are shallow to limestone bedrock and that are in landform positions similar to those of the Carbo and Beech Grove soils
• Soils that have less clay in the subsoil, that are moderately deep to limestone bedrock, and that are in landform positions similar to those of the Carbo and Beech Grove soils

9C—Carbo-Rock outcrop complex, 7 to 15 percent slopes

Composition (statistical method—random points)

Carbo and similar soils: 68 to 90 percent
Rock outcrop: 2 to 19 percent
Dissimilar inclusions: 2 to 19 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley
Landform: Hillslopes
Landform position: Summits and nose slopes
Shape of areas: Irregular
Size of areas: 5 to 50 acres
Surface cover: On average, exposed limestone bedrock covers more than 10 percent of the surface.

Typical Profile

Carbo

0 to 3 inches—brown silt loam
3 to 8 inches—dark yellowish brown silty clay loam
8 to 20 inches—strong brown clay
20 to 28 inches—yellowish red clay
28 inches—limestone bedrock

Rock outcrop

Outcrops of limestone bedrock that rise 0.5 to 5 feet above the soil surface

Inclusions

Dissimilar inclusions:
• Frederick soils, which are very deep to bedrock and are in landform positions similar to those of the Carbo soil
• Areas that have fewer rock outcrops than the Carbo soil
Similar inclusions:
• Soils that are shallow to limestone bedrock and that are in landform positions similar to those of the Carbo soil
• Beech Grove soils, which are very shallow to limestone bedrock and are near rock outcrops on summits

9D—Carbo-Rock outcrop complex, 15 to 25 percent slopes

Composition (statistical method—random points)

Carbo and similar soils: 68 to 90 percent

Rock outcrop: 2 to 19 percent
Dissimilar inclusions: 2 to 19 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley
Landform: Hillslopes that have many rock outcrops (fig. 5)
Landform position: Summits, nose slopes, and backslopes
Shape of areas: Irregular
Size of areas: 5 to 50 acres
Surface cover: On average, exposed limestone bedrock covers more than 10 percent of the surface.

Typical Profile

Carbo

0 to 3 inches—brown silt loam
3 to 8 inches—dark yellowish brown silty clay loam
8 to 20 inches—strong brown clay
20 to 28 inches—yellowish red clay
28 inches—limestone bedrock

Rock outcrop

Limestone bedrock outcrops, which rise 0.5 to 5 feet above the soil surface

Inclusions

Dissimilar inclusions:
• Frederick soils, which are very deep to bedrock and are in landscapes similar to those of the Carbo soil
• Areas that have fewer rock outcrops than the Carbo soil
Similar inclusions:
• Soils that are shallow to limestone bedrock and that are in landform positions similar to those of the Carbo soil
• Beech Grove soils, which are very shallow to limestone bedrock and are near rock outcrops on summits

9E—Carbo-Rock outcrop complex, 25 to 35 percent slopes

Composition (statistical method—random points)

Carbo and similar soils: 68 to 90 percent
Rock outcrop: 2 to 19 percent
Dissimilar inclusions: 2 to 19 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley
Landform: Hillslopes
Landform position: Nose slopes and backslopes
Shape of areas: Irregular
Size of areas: 5 to 50 acres
Surface cover: On average, exposed limestone bedrock covers more than 10 percent of the surface.

Figure 5.—Outcrops of limestone bedrock in an area of the Carbo-Rock outcrop complex, 15 to 25 percent slopes, in the foreground. Many sinkholes are in the area of Frederick silt loam, karst, 7 to 15 percent slopes, in the background. This site is southwest of Dot.

Typical Profile

Carbo

0 to 3 inches—brown silt loam
3 to 8 inches—dark yellowish brown silty clay loam
8 to 20 inches—strong brown clay
20 to 28 inches—yellowish red clay
28 inches—limestone bedrock

Rock outcrop

Outcrops of limestone bedrock that rise 0.5 to 5 feet above the soil surface

Inclusions

Dissimilar inclusions:
• Frederick soils, which are very deep to bedrock and are in landform positions similar to those of the Carbo soil
• Areas that have fewer rock outcrops than the Carbo soil
Similar inclusions:
• Soils that are shallow to limestone bedrock and that are in landform positions similar to those of the Carbo soil
• Beech Grove soils, which are very shallow to limestone bedrock and are near rock outcrops

10A—Chagrin-Lobdell complex, 0 to 3 percent slopes, occasionally flooded

Composition (statistical method—random points)

Chagrin and similar soils: 61 to 81 percent
Lobdell and similar soils: 17 to 37 percent
Dissimilar inclusions: 0 to 5 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley, and foothills
Landform: Flood plains (fig. 6)
Landform position: Treads
Shape of areas: Long and narrow
Size of areas: 5 to 25 acres
Flooding: 5 to 50 percent chance of flooding in any year

Typical Profile

Chagrin

0 to 6 inches—brown loam
6 to 18 inches—dark yellowish brown loam
18 to 42 inches—strong brown sandy clay loam
42 to 62 inches—brown sandy loam

Lobdell

0 to 8 inches—brown silt loam
8 to 20 inches—yellowish brown silt loam that has mottles in shades of brown
20 to 48 inches—yellowish brown and brown loam that has mottles in shades of brown and gray
48 to 62 inches—mixed yellowish brown and gray loam

Inclusions

Dissimilar inclusions:
• Holly soils, which are poorly drained and are in landform positions slightly lower than those of the Chagrin and Lobdell soils
• Allegheny soils, which are well drained, are less subject to flooding, and are on low stream terraces higher than the Chagrin and Lobdell soils
• Timberville soils, which are well drained, have more clay in the subsoil than that of the Chagrin and Lobdell soils, and are on colluvial footslopes and in colluvial drainageways
Similar inclusions:
• Orrville soils, which are somewhat poorly drained and are in landform positions similar to those of the Chagrin and Lobdell soils
• Pope soils, which are well drained, have less clay in the subsoil, and are in landform positions similar to those of the Chagrin and Lobdell soils but are closer to creek banks than the Chagrin and Lobdell soils

11B—Escatawba-Jefferson complex, 2 to 7 percent slopes

Composition (informed judgement)

Escatawba and similar soils: 49 to 73 percent
Jefferson and similar soils: 16 to 40 percent
Dissimilar inclusions: 3 to 19 percent

Setting

Physiographic province: Valley and Ridge
Landscape: Foothills
Landform: Hillslopes
Landform position: Toeslopes, footslopes, and drainageways
Shape of areas: Irregular
Size of areas: 5 to 40 acres

Typical Profile

Escatawba

0 to 5 inches—dark brown loam
5 to 17 inches—yellowish brown loam
17 to 38 inches—yellowish brown loam

Figure 6.—The Chagrin-Lobdell complex, 0 to 3 percent slopes, occasionally flooded, on a nearly level flood plain in the foreground. Pasture is on the Carbo-Beech Grove complex, 25 to 60 percent slopes, rocky, and the Poplimento-Berks complex, 35 to 55 percent slopes, in the middleground. Woodland is on the Berks-Weikert complex, 55 to 80 percent slopes, and the Wallen-Alticrest complex, 15 to 35 percent slopes, very stony, in the background.

38 to 47 inches—strong brown clay loam that has mottles in shades of brown
47 to 62 inches—strong brown gravelly clay loam that has mottles in shades of gray and red

Jefferson

0 to 4 inches—brown loam
4 to 11 inches—dark yellowish brown loam
11 to 23 inches—strong brown clay loam
23 to 42 inches—yellowish brown clay loam
42 to 62 inches—yellowish brown gravelly clay loam that has mottles in shades of brown

Inclusions

Dissimilar inclusions:
• Chagrin soils, which are susceptible to flooding and are on flood plains near the edge of toeslopes
Similar inclusions:
• Soils that have less sand than the Escatawba and Jefferson soils and that are in landform positions similar to those of the Escatawba and Jefferson soils
• Soils that have a seasonal water table at a depth of less than 30 inches and that are on head slopes, in drainageways, and in saddles of drainage divides

11C—Escatawba-Jefferson complex, 7 to 15 percent slopes

Composition (statistical method—random points)

Escatawba and similar soils: 39 to 63 percent
Jefferson and similar soils: 26 to 50 percent
Dissimilar inclusions: 3 to 19 percent

Setting

Physiographic province: Valley and Ridge
Landscape: Foothills
Landform: Hillslopes
Landform position: Footslopes and toeslopes
Shape of areas: Irregular
Size of areas: 5 to 60 acres

Typical Profile

Escatawba

0 to 5 inches—dark brown loam
5 to 17 inches—yellowish brown loam
17 to 38 inches—yellowish brown loam
38 to 47 inches—strong brown clay loam that has mottles in shades of brown
47 to 62 inches—strong brown gravelly clay loam that has mottles in shades of gray and red

Jefferson

0 to 4 inches—brown loam
4 to 11 inches—dark yellowish brown loam
11 to 23 inches—strong brown clay loam
23 to 42 inches—yellowish brown clay loam
42 to 62 inches—yellowish brown gravelly clay loam that has mottles in shades of brown

Inclusions

Dissimilar inclusions:
• Oriskany soils, which have more rock fragments in the subsoil and on the surface than the Escatawba and Jefferson soils and are in landform positions higher than those of the Escatawba and Jefferson soils
• Gilpin soils, which are moderately deep to shale bedrock and are on shoulders
Similar inclusions:
• Soils that have less sand than the Excatawba and Jefferson soils and that are in landform positions similar to those of the Escatawba and Jefferson soils
• Soils that have a seasonal high water table at a depth of less than 30 inches and that are on head slopes and in drainageways
• Tumbling soils, which have more clay in the subsoil than the Escatawba and Jefferson soils and are in landform positions similar to those of the Escatawba and Jefferson soils
• Areas that have a stony surface and that are in landform positions similar to those of the Escatawba and Jefferson soils

12B—Frederick gravelly loam, 2 to 7 percent slopes

Composition (statistical method—random points)

Frederick and similar soils: 95 to 100 percent
Dissimilar inclusions: 0 to 5 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley
Landform: Cherty hillslopes
Landform position: Summits
Shape of areas: Rectangular and irregular
Size of areas: 5 to 50 acres

Typical Profile

This is a soil profile of Frederick soils that have a gravelly surface layer. The profile differs from the pedon description given for the Frederick series in the section “Soil Series and Their Morphology.”

0 to 2 inches—dark brown gravelly loam
2 to 8 inches—brown gravelly loam
8 to 24 inches—red clay
24 to 62 inches—red clay that has reddish yellow lithochromic mottles

Inclusions

Dissimilar inclusions:
• Carbo soils, which are moderately deep to limestone bedrock and are on summits and shoulders
• Timberville soils, which have darker colors and generally have less clay in the subsoil than the Frederick soil, are subject to flooding, and are on footslopes, in depressions, and in low-lying areas adjacent to drainageways
• Limestone rock outcrops that are in landform positions similar to those of the Frederick soil
• Sinkholes that are in landform positions similar to those of the Frederick soil
Similar inclusions:
• Soils that have less clay in the subsoil than the Frederick soil and that are in landform positions similar to those of the Frederick soil
• Watahala soils, which have more chert pebbles in the upper part of the subsoil and on the soil surface and are deeper to a clayey subsoil than the Frederick soil and are in landform positions similar to those of the Frederick soil
• Soils that have fewer chert pebbles in the surface layer than the Frederick soil and that are in landform positions similar to those of the Frederick soil

12C—Frederick gravelly loam, 7 to 15 percent slopes

Composition (statistical method—random points)

Frederick and similar soils: 95 to 100 percent
Dissimilar inclusions: 0 to 5 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley
Landform: Hillslopes
Landform position: Summits, nose slopes, and backslopes
Shape of areas: Rectangular and irregular
Size of areas: 5 to 50 acres

Typical Profile

This is a soil profile of Frederick soils that have a gravelly surface layer. The profile differs from the

pedon description given for the Frederick series in the section “Soil Series and Their Morphology.”

0 to 2 inches—dark brown gravelly loam
2 to 8 inches—brown gravelly loam
8 to 24 inches—red clay
24 to 62 inches—red clay with reddish yellow lithochromic mottles

Inclusions

Dissimilar inclusions:
• Carbo soils, which are moderately deep to limestone bedrock and are on summits and shoulders
• Timberville soils, which have darker colors and generally have less clay in the subsoil than the Frederick soil, are subject to flooding, and are on footslopes, in depressions, and in low-lying areas adjacent to drainageways
• Limestone rock outcrops, which are in landform positions similar to those of the Frederick soil
• Sinkholes, which are in landform positions similar to those of the Frederick soil
Similar inclusions:
• Soils that have less clay in the subsoil than the Frederick soil and that are in landform positions similar to those of the Frederick soil
• Watahala soils, which have more chert pebbles in the upper part of the subsoil and on the soil surface and are deeper to a clayey subsoil than the Frederick soil and are in landform positions similar to those of the Frederick soil
• Soils that have fewer chert pebbles in the surface layer than the Frederick soil and that are in positions similar to those of the Frederick soil

12D—Frederick gravelly loam, 15 to 25 percent slopes

Composition (statistical method—random points)

Frederick and similar soils: 95 to 100 percent
Dissimilar inclusions: 0 to 5 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley
Landform: Hillslopes
Landform position: Nose slopes and backslopes
Shape of areas: Rectangular and irregular
Size of areas: 5 to 50 acres

Typical Profile

This is a soil profile of Frederick soils that have a gravelly surface layer. The profile differs from the pedon description given for the Frederick series in the section “Soil Series and Their Morphology.”

0 to 2 inches—dark brown gravelly loam
2 to 8 inches—brown gravelly loam
8 to 24 inches—red clay
24 to 62 inches—red clay that has reddish yellow, lithochromic mottles

Inclusions

Dissimilar inclusions:
• Carbo soils, which are moderately deep to limestone bedrock and are on summits and shoulders
• Timberville soils, which have darker colors and generally have less clay in the subsoil than the Frederick soil, are subject to flooding, and are on footslopes, in depressions, and in low-lying areas adjacent to drainageways
• Limestone rock outcrops, which are in landform positions similar to those of the Frederick soil
• Sinkholes, which are in landform positions similar to those of the Frederick soil
Similar inclusions:
• Soils that have less clay in the subsoil than the Frederick soil and that are in landform positions similar to those of the Frederick soil
• Watahala soils, which have more chert pebbles in the upper part of the subsoil and on the soil surface and are deeper to a clayey subsoil than the Frederick soil and are in landform positions similar to those of the Frederick soil
• Soils that have fewer chert pebbles in the surface layer than the Frederick soil and that are in landform positions similar to those of the Frederick soil

12E—Frederick gravelly loam, 25 to 35 percent slopes

Composition (statistical method—random points)

Frederick and similar soils: 95 to 100 percent
Dissimilar inclusions: 0 to 5 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley
Landform: Hillslopes
Landform position: Nose slopes and backslopes
Shape of areas: Rectangular and irregular
Size of areas: 5 to 50 acres

Typical Profile

This is a soil profile of Frederick soils that have a gravelly surface layer. The profile differs from the pedon description given for the Frederick series in the section “Soil Series and Their Morphology.”

0 to 2 inches—dark brown gravelly loam
2 to 8 inches—brown gravelly loam
8 to 24 inches—red clay
24 to 62 inches—red clay that has reddish yellow, lithochromic mottles

Inclusions

Dissimilar inclusions:
- Carbo soils, which are moderately deep to limestone bedrock and are on summits and shoulders
- Timberville soils, which have darker colors and generally have less clay in the subsoil than the Frederick soil, are subject to flooding, and are on footslopes, in depressions, and in low-lying areas adjacent to drainageways
- Limestone rock outcrops, which are in landform positions similar to those of the Frederick soil
- Sinkholes that are in landform positions similar to those of the Frederick soil

Similar inclusions:
- Soils that have less clay in the subsoil than the Frederick soil and that are in landform positions similar to those of the Frederick soil
- Watahala soils, which have more chert pebbles in the upper part of the subsoil and on the soil surface and are deeper to a clayey subsoil than the Frederick soil and are in landform positions similar to those of the Frederick soil
- Soils that have fewer chert pebbles in the surface layer than the Frederick soil and that are in landform positions similar to those of the Frederick soil

12F—Frederick gravelly loam, 35 to 60 percent slopes

Composition (statistical method—random points)

Frederick and similar soils: 95 to 100 percent
Dissimilar inclusions: 0 to 5 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley
Landform: Hillslopes
Landform position: Backslopes
Shape of areas: Rectangular and irregular
Size of areas: 5 to 50 acres

Typical Profile

This soil profile represents Frederick soils that have a gravelly surface layer. The profile differs from the pedon description given for the Frederick series in the section “Soil Series and Their Morphology.”

0 to 2 inches—dark brown gravelly loam
2 to 8 inches—brown gravelly loam
8 to 24 inches—red clay
24 to 62 inches—red clay that has reddish yellow, lithochromic mottles

Inclusions

Dissimilar inclusions:
- Carbo soils, which are moderately deep to limestone bedrock and are on summits and shoulders
- Timberville soils, which have darker colors and generally have less clay in the subsoil than the Frederick soil, are subject to flooding, and are on footslopes, in depressions, and in low-lying areas adjacent to drainageways
- Limestone rock outcrops, which are in landform positions similar to those of the Frederick soil
- Sinkholes, which are in landform positions similar to those of the Frederick soil

Similar inclusions:
- Soils that have less clay in the subsoil than the Frederick soil and that are in landform positions similar to those of the Frederick soil
- Watahala soils, which have more chert pebbles in the upper part of the subsoil and on the soil surface and are deeper to a clayey subsoil than the Frederick soil and are in landform positions similar to those of the Frederick soil
- Soils that have fewer chert pebbles in the surface layer than the Frederick soil and that are in landform positions similar to those of the Frederick soil

13B—Frederick silt loam, 2 to 7 percent slopes

Composition (statistical method—random points)

Frederick and similar soils: 96 to 100 percent
Dissimilar inclusions: 0 to 4 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley
Landform: Hillslopes
Landform position: Summits

Shape of areas: Rectangular and irregular
Size of areas: 5 to 100 acres

Typical Profile

0 to 9 inches—dark yellowish brown silt loam
9 to 43 inches—yellowish red clay
43 to 62 inches—red gravelly clay

Inclusions

Dissimilar inclusions:
- Carbo soils, which are moderately deep to limestone bedrock and are on summits
- Timberville soils, which have darker colors and generally have less clay in the subsoil than the Frederick soil, are subject to flooding, and are on footslopes, in depressions, and in low-lying areas adjacent to drainageways
- Limestone rock outcrops that are in landform positions similar to those of the Frederick soil
- Sinkholes that are in landform positions similar to those of the Frederick soil

Similar inclusions:
- Soils that have less clay in the subsoil than the Frederick soil and that are in landform positions similar to those of the Frederick soil
- Watahala soils, which have more chert pebbles in the upper part of the subsoil and on the soil surface and are deeper to a clayey subsoil than the Frederick soil and are in landform positions similar to those of the Frederick soil
- Soils that have more chert pebbles in the surface layer than the Frederick soil and that are in landform positions similar to those of the Frederick soil

13C—Frederick silt loam, 7 to 15 percent slopes

Composition (statistical method—random points)

Frederick and similar soils: 96 to 100 percent
Dissimilar inclusions: 0 to 4 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley (fig. 7)
Landform: Hillslopes
Landform position: Summits, nose slopes, and backslopes
Shape of areas: Rectangular and irregular
Size of areas: 5 to 100 acres

Typical Profile

0 to 9 inches—dark yellowish brown silt loam
9 to 43 inches—yellowish red clay
43 to 62 inches—red gravelly clay

Inclusions

Dissimilar inclusions:
- Carbo soils, which are moderately deep to limestone bedrock and are on summits
- Timberville soils, which have darker colors and generally have less clay in the subsoil than the Frederick soil, are subject to flooding, and are on footslopes, in depressions, and in low-lying areas adjacent to drainageways
- Limestone rock outcrops that are in landform positions similar to those of the Frederick soil
- Sinkholes that are in landform positions similar to those of the Frederick soil

Similar inclusions:
- Soils that have less clay in the subsoil than the Frederick soil and that are in landform positions similar to those of the Frederick soil
- Watahala soils, which have more chert pebbles in the upper part of the subsoil and on the soil surface and are deeper to a clayey subsoil than the Frederick soil and are in landform positions similar to those of the Frederick soil
- Soils that have more chert pebbles in the surface layer than the Frederick soil and that are in landform positions similar to those of the Frederick soil

13D—Frederick silt loam, 15 to 25 percent slopes

Composition (statistical method—random points)

Frederick and similar soils: 96 to 100 percent
Dissimilar inclusions: 0 to 4 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley
Landform: Hillslopes
Landform position: Nose slopes and backslopes
Shape of areas: Rectangular and irregular
Size of areas: 5 to 100 acres

Typical Profile

0 to 9 inches—dark yellowish brown silt loam
9 to 43 inches—yellowish red clay
43 to 62 inches—red gravelly clay

Inclusions

Dissimilar inclusions:
- Carbo soils, which are moderately deep to limestone

Figure 7.—An area of Frederick silt loam, 7 to 15 percent slopes, in the foreground. An area of Frederick silt loam, 15 to 25 percent slopes, is in the background.

bedrock and are on summits and shoulders
• Timberville soils, which have darker colors and generally have less clay in the subsoil than the Frederick soil, are subject to flooding, and are on footslopes, in depressions, and in low-lying areas adjacent to drainageways
• Limestone rock outcrops that are in landform positions similar to those of the Frederick soil
• Sinkholes that are in landform positions similar to those of the Frederick soil
Similar inclusions:
• Soils that have less clay in the subsoil than the Frederick soil and that are in landform positions similar to those of the Frederick soil
• Watahala soils, which have more chert pebbles in the upper part of the subsoil and on the soil surface and are deeper to a clayey subsoil than the Frederick soil and are in landform positions similar to those of the Frederick soil
• Soils that have more chert pebbles in the surface layer than the Frederick soil and that are in landform positions similar to those of the Frederick soil
• Soils that have a thinner surface layer than the Frederick soil and that are in landform positions similar to those of the Frederick soil

13E—Frederick silt loam, 25 to 35 percent slopes

Composition (statistical method—random points)

Frederick and similar soils: 96 to 100 percent
Dissimilar inclusions: 0 to 4 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley
Landform: Hillslopes
Landform position: Nose slopes and backslopes
Shape of areas: Rectangular and irregular
Size of areas: 5 to 100 acres

Typical Profile

0 to 9 inches—dark yellowish brown silt loam
9 to 43 inches—yellowish red clay
43 to 62 inches—red gravelly clay

Inclusions

Dissimilar inclusions:
• Carbo soils, which are moderately deep to limestone bedrock and are on summits and shoulders
• Soils that are shallow to limestone bedrock and that are on summits and shoulders
• Timberville soils, which have darker colors and generally have less clay in the subsoil than the Frederick soil, are subject to flooding, and are on footslopes, in depressions, and in low-lying areas adjacent to drainageways
• Limestone rock outcrops, which are in landform positions similar to those of the Frederick soil
Similar inclusions:
• Watahala soils, which have more chert pebbles in the upper part of the subsoil and on the soil surface and are deeper to a clayey layer than the Frederick soil and are in landform positions similar to those of the Frederick soil
• Soils that have less clay in the subsoil than the Frederick soil and that are in landform positions similar to those of the Frederick soil
• Soils that have a thinner surface layer than the Frederick soil and that are in landform positions similar to those of the Frederick soil

• Soils that have more chert pebbles in the surface layer than the Frederick soil and that are in landform positions similar to those of the Frederick soil

13F—Frederick silt loam, 35 to 60 percent slopes

Composition (statistical method—random points)

Frederick and similar soils: 96 to 100 percent
Dissimilar inclusions: 0 to 4 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley
Landform: Hillslopes
Landform position: Backslopes
Shape of areas: Rectangular and irregular
Size of areas: 5 to 100 acres

Typical Profile

0 to 9 inches—dark yellowish brown silt loam
9 to 43 inches—yellowish red clay
43 to 62 inches—red gravelly clay

Inclusions

Dissimilar inclusions:
• Carbo soils, which are moderately deep to limestone bedrock and are on summits and shoulders
• Soils that are shallow to limestone bedrock and that are on summits and shoulders
• Timberville soils, which have darker colors and generally have less clay in the subsoil than the Frederick soil, are subject to flooding, and are on footslopes, in depressions, and in low-lying areas adjacent to drainageways
• Limestone rock outcrops in landform positions similar to those of the Frederick soil
Similar inclusions:
• Watahala soils, which have more chert pebbles in the upper part of the subsoil and on the soil surface and are deeper to a clayey layer than the Frederick soil and are in landform positions similar to those of the Frederick soil
• Soils that have less clay in the subsoil than the Frederick soil and that are in landform positions similar to those of the Frederick soil
• Soils that have a thinner surface layer than the Frederick soil and that are in landform positions similar to those of the Frederick soil
• Soils that have more chert pebbles in the surface layer than the Frederick soil and that are in landform positions similar to those of the Frederick soil

14B—Frederick silt loam, karst, 2 to 7 percent slopes

Composition (statistical method—random points)

Frederick and similar soils: 92 to 100 percent
Dissimilar inclusions: 0 to 8 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley
Landform: Hillslopes in karst topography
Landform position: Broad summits containing many sinkholes
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

0 to 9 inches—dark yellowish brown silt loam
9 to 43 inches—yellowish red clay
43 to 62 inches—red gravelly clay

Inclusions

Dissimilar inclusions:
• Carbo soils, which are moderately deep to limestone bedrock, have common outcrops of limestone bedrock, and are on the rims of sinkholes
• Timberville soils, which have darker colors and generally have less clay throughout the soil profile than the Frederick soil, are subject to flooding, and are in depressions
Similar inclusions:
• Soils that have less clay in the subsoil than the Frederick soil and that are in landform positions similar to those of the Frederick soil
• Watahala soils, which have more chert pebbles in the subsoil and on the soil surface than the Frederick soil and are in landform positions similar to those of the Frederick soil

14C—Frederick silt loam, karst, 7 to 15 percent slopes

Composition (statistical method—random points)

Frederick and similar soils: 92 to 100 percent

Dissimilar inclusions: 0 to 8 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley
Landform: Hillslopes in karst topography
Landform position: Broad summits and backslopes containing many sinkholes
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

0 to 9 inches—dark yellowish brown silt loam
9 to 43 inches—yellowish red clay
43 to 62 inches—red gravelly clay

Inclusions

Dissimilar inclusions:
• Carbo soils, which are moderately deep to limestone bedrock, have common outcrops of limestone bedrock, and are on the rims of sinkholes
• Timberville soils, which have darker colors and generally have less clay throughout the soil profile than the Frederick soil, are subject to flooding, and are in depressions
Similar inclusions:
• Soils that have less clay in the subsoil than the Frederick soil and that are in landform positions similar to those of the Frederick soil
• Watahala soils, which have more chert pebbles in the subsoil and on the soil surface than the Frederick soil and are in landform positions similar to those of the Frederick soil

14D—Frederick silt loam, karst, 15 to 25 percent slopes

Composition (statistical method—random points)

Frederick and similar soils: 92 to 100 percent
Dissimilar inclusions: 0 to 8 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley
Landform: Hillslopes in karst topography
Landform position: Backslopes containing many sinkholes
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

0 to 9 inches—dark yellowish brown silt loam
9 to 43 inches—yellowish red clay
43 to 62 inches—red gravelly clay

Inclusions

Dissimilar inclusions:
• Carbo soils, which are moderately deep to limestone bedrock, have common outcrops of limestone bedrock, and are on the rims of sinkholes
• Timberville soils, which have darker colors and generally have less clay in the soil than the Frederick soil, are subject to flooding, and are in depressions
Similar inclusions:
• Soils that have less clay in the subsoil and that are in landform positions similar to those of the Frederick soil
• Watahala soils, which have more chert pebbles in the subsoil and on the soil surface than the Frederick soil and are in landform positions similar to those of the Frederick soil

14E—Frederick silt loam, karst, 25 to 60 percent slopes

Composition (statistical method—random points)

Frederick and similar soils: 92 to 100 percent
Dissimilar inclusions: 0 to 8 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley
Landform: Hillslopes in karst topography
Landform position: Backslopes that have many sinkholes
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

0 to 9 inches—dark yellowish brown silt loam
9 to 43 inches—yellowish red clay
43 to 62 inches—red gravelly clay

Inclusions

Dissimilar inclusions:
• Carbo soils, which are moderately deep to limestone bedrock, have common outcrops of limestone bedrock, and are on the rims of sinkholes
• Timberville soils, which have darker colors and generally have less clay in the soil than the Frederick soil, are subject to flooding, and are in depressions
• Beech Grove soils, which are very shallow to limestone bedrock and are near sinkholes and rock outcrops

Similar inclusions:
• Soils that have less clay in the subsoil than the Frederick soil and that are in landform positions similar to those of the Frederick soil
• Watahala soils, which have more chert pebbles in the subsoil and on the soil surface than the Frederick soil and are in landform positions similar to those of the Frederick soil

15C—Frederick-Carbo complex, 7 to 15 percent slopes, rocky

Composition (statistical method—random points)

Frederick and similar soils: 59 to 80 percent
Carbo and similar soils: 9 to 26 percent
Dissimilar inclusions: 6 to 21 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley
Landform: Hillslopes
Landform position: Summits
Shape of areas: Irregular
Size of areas: 10 to 200 acres
Surface cover: Exposed limestone bedrock covers 0.1 to 2 percent of the surface.

Typical Profile

Frederick

0 to 9 inches—dark yellowish brown silt loam
9 to 43 inches—yellowish red clay
43 to 62 inches—red gravelly clay

Carbo

0 to 3 inches—brown silt loam
3 to 8 inches—dark yellowish brown silty clay loam
8 to 20 inches—strong brown clay
20 to 28 inches—yellowish red clay
28 inches—limestone bedrock

Inclusions

Dissimilar inclusions:
• Areas that have more outcrops of limestone bedrock than the Frederick and Carbo soils
• Timberville soils, which have darker colors and generally have less clay in the subsoil than the Frederick and Carbo soils, are subject to flooding, and are on footslopes, in depressions, and in low-lying areas adjacent to drainageways
Similar inclusions:
• Watahala soils, which have more chert pebbles in the upper part of the subsoil and on the soil surface and are deeper to a clayey subsoil than the Frederick and Carbo soils and are in landform positions similar to those of the Frederick and Carbo soils

15D—Frederick-Carbo complex, 15 to 25 percent slopes, rocky

Composition (statistical method—random points)

Frederick and similar soils: 59 to 80 percent
Carbo and similar soils: 9 to 26 percent
Dissimilar inclusions: 6 to 21 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley
Landform: Hillslopes
Landform position: Summits, nose slopes, and backslopes
Shape of areas: Irregular
Size of areas: 10 to 200 acres
Surface cover: Exposed limestone bedrock covers 0.1 to 2 percent of the surface.

Typical Profile

Frederick

0 to 9 inches—dark yellowish brown silt loam
9 to 43 inches—yellowish red clay
43 to 62 inches—red gravelly clay

Carbo

0 to 3 inches—brown silt loam
3 to 8 inches—dark yellowish brown silty clay loam
8 to 20 inches—strong brown clay
20 to 28 inches—yellowish red clay
28 inches—limestone bedrock

Inclusions

Dissimilar inclusions:
• Areas that have more outcrops of limestone bedrock than the Frederick and Carbo soils
• Timberville soils, which have darker colors and generally have less clay in the subsoil than the Frederick and Carbo soils, are subject to flooding, and are on footslopes, in depressions, and in low-lying areas adjacent to drainageways
Similar inclusions:
• Watahala soils, which have more chert pebbles in the upper part of the subsoil and on the soil surface and are deeper to a clayey subsoil than the Frederick and Carbo soils and are in landform

positions similar to those of the Frederick and Carbo soils

15E—Frederick-Carbo complex, 25 to 35 percent slopes, rocky

Composition (statistical method—random points)

Frederick and similar soils: 48 to 78 percent
Carbo and similar soils: 22 to 52 percent
Dissimilar inclusions: 0 to 2 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley
Landform: Hillslopes
Landform position: Nose slopes and backslopes
Shape of areas: Irregular
Size of areas: 10 to 200 acres
Surface cover: Exposed limestone bedrock covers 0.1 to 2 percent of the surface.

Typical Profile

Frederick

0 to 9 inches—dark yellowish brown silt loam
9 to 43 inches—yellowish red clay
43 to 62 inches—red gravelly clay

Carbo

0 to 3 inches—brown silt loam
3 to 8 inches—dark yellowish brown silty clay loam
8 to 20 inches—strong brown clay
20 to 28 inches—yellowish red clay
28 inches—limestone bedrock

Inclusions

Dissimilar inclusions:
• Areas that have more outcrops of limestone bedrock than the Frederick and Carbo soils
• Timberville soils, which have darker colors and generally have less clay in the subsoil than the Frederick and Carbo soils, are subject to flooding, and are on footslopes, in depressions, and in low-lying areas adjacent to drainageways
Similar inclusions:
• Watahala soils, which have more chert pebbles in the upper part of the subsoil and on the soil surface and are deeper to a clayey subsoil than the Frederick and Carbo soils and are in landform positions similar to those of the Frederick and Carbo soils

15F—Frederick-Carbo complex, 35 to 60 percent slopes, rocky

Composition (statistical method—random points)

Frederick and similar soils: 48 to 78 percent
Carbo and similar soils: 22 to 52 percent
Dissimilar inclusions: 0 to 2 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley
Landform: Hillslopes
Landform position: Backslopes
Shape of areas: Irregular
Size of areas: 10 to 200 acres
Surface cover: Exposed limestone bedrock covers 0.1 to 2 percent of the surface.

Typical Profile

Frederick

0 to 9 inches—dark yellowish brown silt loam
9 to 43 inches—yellowish red clay
43 to 62 inches—red gravelly clay

Carbo

0 to 3 inches—brown silt loam
3 to 8 inches—dark yellowish brown silty clay loam
8 to 20 inches—strong brown clay
20 to 28 inches—yellowish red clay
28 inches—limestone bedrock

Inclusions

Dissimilar inclusions:
• Areas that have more outcrops of limestone bedrock than the Frederick and Carbo soils
• Beech Grove soils, which are very shallow to limestone bedrock and are in landform positions similar to those of the Frederick and Carbo soils
Similar inclusions:
• Watahala soils, which have more chert pebbles in the upper part of the subsoil and on the soil surface and are deeper to a clayey subsoil than the Frederick and Carbo soils and are in landform positions similar to those of the Frederick and Carbo soils

16C—Gilpin silt loam, 7 to 15 percent slopes

Composition (statistical method—random points)

Gilpin and similar soils: 84 to 98 percent

Dissimilar inclusions: 2 to 16 percent

Setting

Physiographic province: Valley and Ridge
Landscape: Mountains and foothills
Landform: Mountain slopes and hillslopes
Landform position: Summits and shoulders
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Typical Profile

This is a soil profile of Gilpin soils in the southern Appalachian Highlands, Valley and Ridge physiographic province, in Lee County. The profile differs from the pedon description of the Gilpin series in the section "Soil Series and Their Morphology."

0 to 2 inches—dark brown silt loam
2 to 8 inches—dark yellowish brown silt loam
8 to 17 inches—yellowish brown silty clay loam
17 to 30 inches—brownish yellow silty clay loam
30 inches—shale bedrock

Inclusions

Dissimilar inclusions:
• Wallen soils, which have more rock fragments and more sand in the subsoil than the Gilpin soil, are near areas of sandstone bedrock, and are in landform positions similar to those of the Gilpin soil
• Weikert soils, which are shallow to shale bedrock and are in landform positions similar to those of the Gilpin soil
• Colluvial soils, which are very deep to bedrock, have many stones on the surface, and are in drainageways and on head slopes
Similar inclusions:
• Berks soils, which have more rock fragments in the subsoil and are in landform positions similar to those of the Gilpin soil
• Soils that have more sand and less silt in the subsoil than the Gilpin soil and that are in landform positions similar to those of the Gilpin soil

16D—Gilpin silt loam, 15 to 35 percent slopes

Composition (statistical method—random points)

Gilpin and similar soils: 84 to 98 percent
Dissimilar inclusions: 2 to 16 percent

Setting

Physiographic province: Valley and Ridge
Landscape: Mountains and foothills
Landform: Mountain slopes and hillslopes
Landform position: Summits, shoulders, and backslopes
Shape of areas: Irregular
Size of areas: 5 to 80 acres

Typical Profile

This is a soil profile of Gilpin soils in the southern Appalachian Highlands, Valley and Ridge physiographic province, in Lee County. This profile differs from the pedon description of the Gilpin series in the section "Soil Series and Their Morphology."

0 to 2 inches—dark brown silt loam
2 to 8 inches—dark yellowish brown silt loam
8 to 17 inches—yellowish brown silty clay loam
17 to 30 inches—brownish yellow silty clay loam
30 inches—shale bedrock

Inclusions

Dissimilar inclusions:
• Wallen soils, which have more rock fragments and more sand in the subsoil than the Gilpin soil, are in areas of sandstone bedrock, and generally are on summits and shoulders
• Weikert soils, which are shallow to shale bedrock and are in landform positions similar to those of the Gilpin soil
• Colluvial soils, which are very deep to bedrock, have many stones on the surface, and are in drainageways and on head slopes
Similar inclusions:
• Berks soils, which have more rock fragments in the subsoil and are in landform positions similar to those of the Gilpin soil
• Soils that have more sand and less silt in the subsoil than the Gilpin soil and that are in landform positions similar to those of the Gilpin soil

16E—Gilpin silt loam, 35 to 55 percent slopes

Composition (statistical method—random points)

Gilpin and similar soils: 84 to 98 percent
Dissimilar inclusions: 2 to 16 percent

Setting

Physiographic province: Valley and Ridge
Landscape: Mountains and foothills
Landform: Mountain slopes and hillslopes
Landform position: Backslopes and shoulders

Shape of areas: Irregular
Size of areas: 10 to 200 acres

Typical Profile

This is a soil profile of Gilpin soils in the southern Appalachian Highlands, Valley and Ridge physiographic province, in Lee County. This profile differs from the pedon description of the Gilpin series in the section "Soil Series and Their Morphology."

0 to 2 inches—dark brown silt loam
2 to 8 inches—dark yellowish brown silt loam
8 to 17 inches—yellowish brown silty clay loam
17 to 30 inches—brownish yellow silty clay loam
30 inches—shale bedrock

Inclusions

Dissimilar inclusions:
- Wallen soils, which have more rock fragments and more sand in the subsoil than the Gilpin soil, are in areas of sandstone bedrock, and generally are on shoulders
- Weikert soils, which are shallow to shale bedrock and are in landform positions similar to those of the Gilpin soil
- Colluvial soils that are very deep to bedrock, that have many stones on the surface, and that are in drainageways and on head slopes

Similar inclusions:
- Berks soils, which have more rock fragments in the subsoil and are in landform positions similar to those of the Gilpin soil
- Soils that have more sand and less silt in the subsoil than the Gilpin soil and that are in landform positions similar to those of the Gilpin soil

17D—Gilpin-Berks complex, 15 to 35 percent slopes

Composition (informed judgement)

Gilpin and similar soils: 65 to 90 percent
Berks and similar soils: 5 to 28 percent
Dissimilar inclusions: 2 to 19 percent

Setting

Physiographic province: Appalachian Plateau, Cumberland Plateau and Cumberland Mountain section
Landscape: Foothills
Landform: Hillslopes
Landform position: Summits, shoulders, and backslopes
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Gilpin

0 to 1 inch—partly decomposed leaf litter
1 to 2 inches—dark yellowish brown silt loam
2 to 5 inches—yellowish brown silt loam
5 to 19 inches—yellowish brown silty clay loam
19 to 29 inches—yellowish brown silty clay loam with strong brown, lithochromic mottles
29 inches—shale bedrock

Berks

This is a soil profile of Berks soils in the Appalachian Plateau, Cumberland Plateau and Cumberland Mountain section, in Lee County. The profile differs from the pedon description given for the Berks series in the section "Soil Series and Their Morphology."

0 to 1 inch—partly decomposed leaf litter
1 to 5 inches—dark brown silt loam
5 to 27 inches—dark yellowish brown very channery silt loam
27 to 31 inches—yellowish brown very channery silt loam
31 inches—shale bedrock

Inclusions

Dissimilar inclusions:
- Alticrest soils, which have less clay and more sand in the subsoil than the Gilpin and Berks soils, are in areas of sandstone bedrock, and are on shoulders and summits
- Pineville soils, which are very deep to bedrock and are on head slopes, on footslopes, and in drainageways
- Rock outcrops of sandstone bedrock
- Bethesda, Fairpoint, and Sewell soils, which are very deep to bedrock and are on strip-mined benches and out slopes

Similar inclusions:
- Soils that are deep to shale bedrock and that are in landform positions similar to those of the Gilpin and Berks soils
- Weikert soils, which are shallow to shale bedrock and are in landform positions similar to those of the Gilpin and Berks soils

17E—Gilpin-Berks complex, 35 to 55 percent slopes

Composition (statistical method—random points)

Gilpin and similar soils: 55 to 80 percent
Berks and similar soils: 10 to 33 percent
Dissimilar inclusions: 2 to 19 percent

Setting

Physiographic province: Appalachian Plateau, Cumberland Plateau and Cumberland Mountain section
Landscape: Foothills
Landform: Hillslopes
Landform position: Backslopes and shoulders
Shape of areas: Irregular
Size of areas: 50 to 500 acres

Typical Profile

Gilpin

0 to 1 inch—partly decomposed leaf litter
1 to 2 inches—dark yellowish brown silt loam
2 to 5 inches—yellowish brown silt loam
5 to 19 inches—yellowish brown silty clay loam
19 to 29 inches—yellowish brown silty clay loam that has strong brown, lithochromic mottles
29 inches—shale bedrock

Berks

This is a soil profile of Berks soils in the Appalachian Plateau, Cumberland Plateau and Cumberland Mountain section, in Lee County. This profile differs from the pedon description given for the Berks series in the section “Soil Series and Their Morphology.”

0 to 1 inch—partly decomposed leaf litter
1 to 5 inches—dark brown silt loam
5 to 27 inches—dark yellowish brown very channery silt loam
27 to 31 inches—yellowish brown very channery silt loam
31 inches—shale bedrock

Inclusions

Dissimilar inclusions:
- Alticrest soils, which have less clay and more sand in the subsoil than the Gilpin and Berks soils, are in areas of sandstone bedrock, and are on shoulders and summits
- Pineville soils, which are very deep to bedrock and are on head slopes, on footslopes, and in drainageways
- Rock outcrops of sandstone bedrock
- Bethesda, Fairpoint, and Sewell soils, which are very deep to bedrock and are on strip-mined benches and out slopes

Similar inclusions:
- Soils that are deep to shale bedrock and that are in landform positions similar to those of the Gilpin and Berks soils
- Weikert soils, which are shallow to shale bedrock and are in landform positions similar to those of the Gilpin and Berks soils

17F—Gilpin-Berks complex, 55 to 70 percent slopes

Composition (statistical method—informed judgement)

Gilpin and similar soils: 45 to 70 percent
Berks and similar soils: 20 to 43 percent
Dissimilar inclusions: 2 to 19 percent

Setting

Physiographic province: Appalachian Plateau, Cumberland Plateau and Cumberland Mountain section
Landscape: Foothills
Landform: Hillslopes
Landform position: Backslopes
Shape of areas: Irregular
Size of areas: 75 to 300 acres

Typical Profile

Gilpin

0 to 1 inch—partly decomposed leaf litter
1 to 2 inches—dark yellowish brown silt loam
2 to 5 inches—yellowish brown silt loam
5 to 19 inches—yellowish brown silty clay loam
19 to 29 inches—yellowish brown silty clay loam that has strong brown, lithochromic mottles
29 inches—shale bedrock

Berks

This is a soil profile of Berks soils on the Appalachian Plateau, Cumberland Plateau and the Cumberland Mountain section, in Lee County. This profile differs from the pedon description given for the Berks series in the section “Soil Series and Their Morphology.”

0 to 1 inch—partly decomposed leaf litter
1 to 5 inches—dark brown silt loam

5 to 27 inches—dark yellowish brown very channery silt loam
27 to 31 inches—yellowish brown very channery silt loam
31 inches—shale bedrock

Inclusions

Dissimilar inclusions:
• Alticrest soils, which have less clay and more sand in the subsoil than the Gilpin and Berks soils, are in areas of sandstone bedrock, and are on shoulders and summits
• Pineville soils, which are very deep to bedrock and are on head slopes, footslopes, and in drainageways
• Rock outcrops of sandstone bedrock
• Bethesda, Fairpoint, and Sewell soils, which are very deep to bedrock and are on benches and out slopes of strip mines
Similar inclusions:
• Soils that are deep to shale bedrock and that are in landform positions similar to those of the Gilpin and Berks soils
• Weikert soils, which are shallow to shale bedrock and are in landform positions similar to those of the Gilpin and Berks soils

18A—Holly loam, 0 to 2 percent slopes, frequently flooded

Composition (statistical method—random points)

Holly and similar components: 88 to 100 percent
Dissimilar inclusions: 0 to 12 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley, and foothills
Landform: Flood plains
Landform position: Treads and backswamps
Shape of areas: Long and narrow
Size of areas: 5 to 50 acres
Flooding: More than a 50 percent chance of flooding in any year

Typical Profile

0 to 4 inches—dark gray loam that has yellowish red mottles
4 to 10 inches—gray loam that has strong brown mottles
10 to 34 inches—dark gray loam that has strong brown mottles
34 to 62 inches—dark gray loam

Inclusions

Dissimilar inclusions:
• Lobdell soils, which are moderately well drained and are in landform positions slightly higher than those of the Holly soils
• Chagrin soils, which are well drained and are in landform positions slightly higher than those of the Holly soils
• Timberville soils, which are well drained, have more clay in the subsoil than the Holly soils, and are on colluvial footslopes and in colluvial drainageways
Similar inclusions:
• Orrville soils, which are somewhat poorly drained and are in landform positions slightly higher than those of the Holly soils
• Soils that have more sand and less clay in the subsoil than the Holly soils and that are in landform positions similar to those of the Holly soils
• Soils that have less sand and more silt, clay, or both in the subsoil than the Holly soils and that are in landform positions similar to those of the Holly soils

19E—Itmann extremely channery sandy loam, 0 to 80 percent slopes

Composition (informed judgement)

Itmann and similar soils: 90 to 100 percent
Dissimilar inclusions: 0 to 10 percent

Setting

Physiographic province: Appalachian Plateau, Cumberland Plateau and Cumberland Mountain section
Landscape: Foothills
Landform: Hillslopes in areas receiving waste material from deep-mined coal
Landform position: Mine dumps, including tailings and tipples. Mine dumps contain impure coal; carbolithic fragments or other dark, shaly material; “red dog,” or the residue of impure coal that has been burned; and other waste from deep-mined coal. Tailings consist of finely pulverized coal and shale washed from mined coal during preparation; tailings are then deposited in basins or tailing ponds. Tipples consist of buildings and equipment used for collecting coal from loaded coal cars or conveyor belts. The Itmann soil consists of the material in the mine dumps. Tailings and tipples are inclusions.
Shape of areas: Irregular

Size of areas: 5 to 30 acres

Typical Profile

0 to 37 inches—mixed black and very dark grayish brown extremely channery sandy loam that has olive yellow and white precipitates on the surface of rock fragments and on the soil material
37 to 62 inches—mixed black and very dark grayish brown extremely channery sandy loam

Inclusions

Dissimilar inclusions:
• Bethesda soils, which have lighter colors and more fine grained material in the soil profile than the Itmann soil, have dominantly light-colored shale rock fragments in the soil profile, and are on reclaimed strip-mined benches, out slopes, and hillslopes that have the approximate original contour
• Sewell soils, which have lighter colors than the Itmann soil, have dominantly brown sandstone rock fragments in the soil profile, and are on reclaimed, strip-mined benches, out slopes, and hillslopes that have the approximate original contour
• Fairpoint soils, which have less acid, lighter colors, and more fine grained material in the soil profile than the Itmann soil, have dominantly light colored shale rock fragments in the soil profile, and are on reclaimed, strip-mined benches, out slopes, and hillslopes that have the approximate original contour
• Water in tailing ponds
• Gilpin soils, which are moderately deep to shale bedrock and are on undisturbed hillslopes adjacent to the Itmann soil
• Alticrest soils, which are moderately deep to sandstone bedrock and are on undisturbed hillslopes adjacent to the Itmann soil
• Pineville soils, which formed in very deep colluvium, have lighter colors and are cooler during the warmer parts of the year than the Itmann soil, and are in drainageways and on undisturbed footslopes
Similar inclusions:
• Finely pulverized coal and shale that were washed from mined coal during preparation and that are in and around tailing ponds
• Tipples, which consist of buildings and equipment used for collecting coal from loaded coal cars or conveyor belts

20D—Jefferson loam, 15 to 35 percent slopes, very stony

Composition (statistical method—random points)

Jefferson and similar soils: 71 to 94 percent
Dissimilar inclusions: 6 to 29 percent

Setting

Physiographic province: Valley and Ridge
Landscape: Mountains and foothills
Landform: Mountain slopes and hillslopes
Landform position: Footslopes and the lower backslopes
Shape of areas: Irregular
Size of areas: 5 to 75 acres
Surface features: Sandstone stones cover 0.1 to 3 percent of the surface.

Typical Profile

0 to 4 inches—brown loam
4 to 11 inches—dark yellowish brown loam
11 to 23 inches—strong brown clay loam
23 to 42 inches—yellowish brown clay loam
42 to 62 inches—yellowish brown gravelly clay loam that has mottles in shades of brown

Inclusions

Dissimilar inclusions:
• Oriskany soils, which have more rock fragments in the subsoil and on the soil surface than the Jefferson soil and are in landform positions similar to or higher than those of the Jefferson soil
• Gilpin soils, which are moderately deep to shale bedrock and are on hillslopes
• Escatawba soils, which have a seasonal water table at a depth of 30 to 48 inches and are in landform positions similar to or lower than those of the Jefferson soil
Similar inclusions:
• Tumbling soils, which have more clay in the subsoil than the Jefferson soil and are in landform positions similar to those of the Jefferson soil
• Areas that are less stony than the Jefferson soil and that are in landform positions similar to those of the Jefferson soil

21A—Lobdell-Orrville complex, 0 to 3 percent slopes, occasionally flooded

Composition (statistical method—random points)

Lobdell and similar soils: 55 to 75 percent

Orrville and similar soils: 21 to 40 percent
Dissimilar inclusions: 0 to 9 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley, and foothills
Landform: Flood plains
Landform position: Treads
Shape of areas: Long and narrow
Size of areas: 5 to 40 acres
Flooding: 5 to 50 percent chance of flooding in any year

Typical Profile

Lobdell

0 to 8 inches—brown silt loam
8 to 20 inches—yellowish brown silt loam that has mottles in shades of brown
20 to 35 inches—yellowish brown loam that has mottles in shades of brown and gray
35 to 48 inches—brown loam that has mottles in shades of brown and gray
48 to 62 inches—mixed yellowish brown and light brownish gray loam

Orrville

0 to 6 inches—dark grayish brown loam
6 to 13 inches—yellowish brown loam that has mottles in shades of brown
13 to 34 inches—grayish brown loam that has mottles in shades of brown and yellow
34 to 47 inches—gray loam that has mottles in shades of yellow
47 to 62 inches—dark gray sandy loam

Inclusions

Dissimilar inclusions:
• Pope soils, which are well drained and have less clay in the subsoil than and are in landform positions closer to creek banks than the Lobdell and Orrville soils
• Timberville soils, which are well drained, have more clay in the subsoil than the Lobdell and Orrville soils, and are on colluvial footslopes and in colluvial drainageways
• Chagrin soils, which are well drained and are in landform positions similar to those of the Lobdell and Orrville soils
Similar inclusions:
• Holly soils, which are poorly drained and are in landform positions slightly lower than those of the Lobdell and Orrville soils
• Soils that have less clay in the soil profile than the Lobdell and Orrville soils and that are in landform positions similar to those of the Lobdell and Orrville soils

22C—Oriskany cobbly loam, 7 to 15 percent slopes, extremely stony

Composition (statistical method—random points)

Oriskany and similar soils: 77 to 97 percent
Dissimilar inclusions: 3 to 23 percent

Setting

Physiographic province: Valley and Ridge
Landscape: Mountains and foothills
Landform: Mountain slopes and hillslopes
Landform position: Footslopes, head slopes, and the lower and middle backslopes
Shape of areas: Irregular
Size of areas: 5 to 50 acres
Surface features: Sandstone stones cover 3 to 15 percent of the surface; a few boulders are also in some areas.

Typical Profile

0 to 2 inches—dark yellowish brown cobbly loam
2 to 12 inches—strong brown very cobbly loam
12 to 35 inches—strong brown very cobbly clay loam
35 to 62 inches—strong brown, yellowish red, and very pale brown very cobbly loam

Inclusions

Dissimilar inclusions:
• Escatawba, which have a seasonal high water table at a depth of 30 to 48 inches and are in the lower landform positions
• Tumbling soils, which have more clay and fewer rock fragments in the subsoil than the Oriskany soil and are in landform positions similar to or lower than those of the Oriskany soil
• Gilpin and Wallen soils, which are moderately deep to shale or sandstone bedrock and are on hillslopes
• Jefferson soils, which have fewer rock fragments in the subsoil and on the soil surface than the Oriskany soil and are in landform positions similar to or lower than those of the Oriskany soil
Similar inclusions:
• Areas that are stonier than the Oriskany soil and that are in landform positions similar to those of the Oriskany soil

22E—Oriskany cobbly loam, 35 to 55 percent slopes, extremely stony

Composition (statistical method—random points)

Oriskany and similar soils: 77 to 97 percent
Dissimilar inclusions: 3 to 23 percent

Setting

Physiographic province: Valley and Ridge
Landscape: Mountains and foothills
Landform: Mountain slopes and hillslopes
Landform position: Footslopes, head slopes, and the lower and middle backslopes, commonly downslope of sandstone bedrock outcrops
Shape of areas: Irregular
Size of areas: 25 to 200 acres
Surface features: Sandstone stones cover 3 to 15 percent of the surface; a few boulders are also in some areas (fig. 8).

Typical Profile

0 to 2 inches—dark yellowish brown cobbly loam
2 to 12 inches—strong brown very cobbly loam
12 to 35 inches—strong brown very cobbly clay loam
35 to 62 inches—strong brown, yellowish red, and very pale brown very cobbly loam

Figure 8.—An area of Oriskany cobbly loam, 35 to 55 percent slopes, extremely stony, at the northern base of Powell Mountain. Many semirounded sandstone fragments are on the soil surface.

Inclusions

Dissimilar inclusions:
- Escatawba, which have a seasonal high water table at a depth of 30 to 48 inches and are in the lower landform positions
- Tumbling soils, which have more clay in the subsoil than the Oriskany soil and are in landform positions similar to or lower than those of the Oriskany soil
- Gilpin and Wallen soils, which are moderately deep to shale or sandstone bedrock and are on hillslopes
- Jefferson soils, which have fewer rock fragments in the subsoil and on the soil surface than the Oriskany soil and are in landform positions similar to or lower than those of the Oriskany soil

Similar inclusions:
- Areas that are stonier than the Oriskany soil and that are in landform positions similar to those of the Oriskany soil
- Areas that have slopes of 15 to 35 percent

23A—Philo fine sandy loam, 0 to 3 percent slopes, occasionally flooded

Composition (informed judgement)

Philo and similar soils: 74 to 100 percent
Dissimilar inclusions: 0 to 26 percent

Setting

Physiographic province: Appalachian Plateau, Cumberland Plateau and Cumberland Mountain section
Landscape: Foothills
Landform: Flood plains
Landform position: Treads
Shape of areas: Long and narrow
Size of areas: 5 to 25 acres
Flooding: 5 to 50 percent chance of flooding in any year

Typical Profile

0 to 8 inches—brown fine sandy loam
8 to 16 inches—dark yellowish brown fine sandy loam
16 to 30 inches—yellowish brown fine sandy loam that has mottles in shades of brown
30 to 62 inches—light olive brown sandy loam that has mottles in shades of brown

Inclusions

Dissimilar inclusions:
- Pope soils, which are well drained and are in landform positions slightly higher than those of the Philo soil
- Allegheny soils, which are well drained, have more clay in the subsoil and are less susceptible to flooding than the Philo soil, and are on the higher landforms of low terraces
- Gilpin soils, which are moderately deep to bedrock and are on hillslopes adjacent to those of the Philo soil
- Soils that are poorly drained and that are in landform positions slightly lower than those of the Philo soil

Similar inclusions:
- Soils that are somewhat poorly drained and that are in landform positions similar to those of the Philo soil
- Soils that have more rock fragments in the subsoil and on the surface than the Philo soil

24D—Pineville channery loam, 15 to 35 percent slopes, very stony

Composition (statistical method—random points)

Pineville and similar soils: 80 to 97 percent
Dissimilar inclusions: 3 to 20 percent

Setting

Physiographic province: Appalachian Plateau, Cumberland Plateau and Cumberland Mountain section
Landscape: Mountains and foothills
Landform: Mountain slopes and hillslopes
Landform position: Footslopes, head slopes, slightly concave backslopes, and drainageways
Shape of areas: Narrow and irregular
Size of areas: 5 to 45 acres
Surface features: Sandstone stones cover 0.1 to 3 percent of the soil surface.

Typical Profile

0 to 3 inches—brown channery loam
3 to 9 inches—dark yellowish brown channery loam
9 to 35 inches—brown channery clay loam
35 to 52 inches—yellowish brown channery clay loam
52 to 62 inches—brownish yellow channery loam

Inclusions

Dissimilar inclusions:
- Gilpin soils, which are moderately deep to shale bedrock and are on convex hillslopes adjacent to the Pineville soil
- Pope soils, which are susceptible to flooding and are on nearly level flood plains

Similar inclusions:
- Soils that have more rock fragments in the subsoil than the Pineville soil and that are in landform positions similar to those of the Pineville soil
- Soils that have less sand in the subsoil and fewer rock fragments in the subsoil and on the soil surface than the Pineville soil and that are in landform positions similar to those of the Pineville soil
- Soils that are deep to shale bedrock and that are in landform positions similar to those of the Pineville soil

24E—Pineville channery loam, 35 to 55 percent slopes, very stony

Composition (statistical method—random points)

Pineville and similar soils: 80 to 97 percent
Dissimilar inclusions: 3 to 20 percent

Setting

Physiographic province: Appalachian Plateau, Cumberland Plateau and Cumberland Mountain section
Landscape: Mountains and foothills
Landform: Mountain slopes and hillslopes
Landform position: Footslopes, head slopes, slightly concave backslopes, and drainageways
Shape of areas: Narrow and irregular
Size of areas: 5 to 150 acres
Surface features: Sandstone stones cover 0.1 to 3 percent of the soil surface.

Typical Profile

0 to 3 inches—brown channery loam
3 to 9 inches—dark yellowish brown channery loam
9 to 35 inches—brown channery clay loam
35 to 52 inches—yellowish brown channery clay loam
52 to 62 inches—brownish yellow channery loam

Inclusions

Dissimilar inclusions:
- Gilpin soils, which are moderately deep to shale bedrock and are on convex hillslopes adjacent to those of the Pineville soil
- Pope soils, which are susceptible to flooding and are on nearly level flood plains

Similar inclusions:
- Soils that have more rock fragments in the subsoil than the Pineville soil and that are in landform positions similar to those of the Pineville soil
- Soils that have less sand in the subsoil and fewer

rock fragments in the subsoil and on the soil surface than the Pineville soil and that are in landform positions similar to those of the Pineville soil
• Soils that are deep to shale bedrock and that are in landform positions similar to those of the Pineville soil
• Bethesda, Fairpoint, and Sewell soils, which are on benches and out slopes of reclaimed strip mines

25—Pits, quarries

Composition (subjective judgement)

Pits, quarry, and similar components: 90 to 100 percent
Dissimilar inclusions: 0 to 10 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley, and foothills
Landform: Hillslopes
Landform position: Open excavations and dumps of waste material from limestone quarries
Shape of areas: Rectangular
Size of areas: 35 to 150 acres

Typical Profile

The properties and characteristics of the soils and miscellaneous areas in this map unit are so variable that the map unit does not have a typical profile. The map unit consists of disturbed soils, generally some type of fill material derived from limestone, piles of limestone gravel, and open quarry pits.

Inclusions

Dissimilar inclusions:
• Carbo soils, which are moderately deep to limestone bedrock and are on hillslopes
• Beech Grove soils, which are very shallow to limestone bedrock and are on hillslopes
• Timberville soils, which are susceptible to flooding and are on footslopes, in depressions, and in drainageways in the limestone valley
• Water in the bottoms of pits
• Urban land that consists of asphalt, concrete, buildings, and other impervious surfaces

26A—Pope fine sandy loam, 0 to 3 percent slopes, occasionally flooded

Composition (statistical method—random points)

Pope and similar soils: 78 to 97 percent
Dissimilar inclusions: 3 to 22 percent

Setting

Physiographic province: Mainly the Appalachian Plateau, Cumberland Plateau and Cumberland Mountain section, but also, in small areas, Valley and Ridge
Landscape: Foothills
Landform: Flood plains
Landform position: Treads
Shape of areas: Long and narrow
Size of areas: 5 to 25 acres
Flooding: 5 to 50 percent chance of flooding in any year

Typical Profile

0 to 8 inches—brown fine sandy loam
8 to 15 inches—brown and dark yellowish brown fine sandy loam
15 to 40 inches—dark yellowish brown fine sandy loam
40 to 51 inches—yellowish brown fine sandy loam that has mottles in shades of brown
51 to 62 inches—yellowish brown fine sandy loam that has mottles in shades of brown

Inclusions

Dissimilar inclusions:
• Allegheny soils, which are well drained, have more clay in the subsoil and are less susceptible to flooding than the Pope soil, and are on the higher landforms of low terraces
• Philo soils, which are moderately well drained and are in landform positions slightly lower than those of the Pope soil
• Gilpin soils, which are moderately deep to bedrock and are on hillslopes adjacent to the Pope soil
• Pineville soils, which are well drained, are very deep to bedrock, and are on colluvial footslopes
Similar inclusions:
• Soils that have more rock fragments in the subsoil and on the surface than the Pope soil
• Soils that have a seasonal water table at a depth of 40 to 60 inches

27D—Poplimento-Berks complex, 15 to 35 percent slopes

Composition (statistical method—random points)

Poplimento and similar soils: 47 to 77 percent
Berks and similar soils: 14 to 41 percent
Dissimilar inclusions: 1 to 20 percent

Setting

Physiographic province: Valley and Ridge
Landscape: Foothills
Landform: Hillslopes
Landform position: Shoulders, backslopes, and nose slopes
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Typical Profile

Poplimento

0 to 8 inches—brown silt loam
8 to 15 inches—dark yellowish brown silty clay loam
15 to 55 inches—yellowish brown clay
55 to 62 inches—yellowish brown silty clay

Berks

0 to 1 inch—partly decomposed leaf litter
1 to 5 inches—dark brown silt loam
5 to 10 inches—dark yellowish brown very channery silt loam
10 to 16 inches—yellowish brown very channery silt loam
16 to 29 inches—yellowish brown extremely channery silt loam
29 inches—shale bedrock

Inclusions

Dissimilar inclusions:
• Carbo soils, which are moderately deep to limestone bedrock and are in landform positions similar to those of the Poplimento and Berks soils
Similar inclusions:
• Weikert soils, which are shallow to shale bedrock and are in landform positions similar to those of the Poplimento and Berks soils
• Frederick soils, which are redder than and more clayey in the subsoil than the Poplimento and Berks soils and are in landform positions similar to those of the Poplimento and Berks soils
• Soils that are very deep to bedrock, that have a loamy subsoil, and that are in landform positions similar to those of the Poplimento and Berks soils

27E—Poplimento-Berks complex, 35 to 55 percent slopes

Composition (statistical method—random points)

Poplimento and similar soils: 47 to 77 percent
Berks and similar soils: 14 to 41 percent
Dissimilar inclusions: 1 to 20 percent

Setting

Physiographic province: Valley and Ridge
Landscape: Foothills
Landform: Hillslopes
Landform position: Backslopes and nose slopes
Shape of areas: Irregular
Size of areas: 5 to 75 acres

Typical Profile

Poplimento

0 to 8 inches—brown silt loam
8 to 15 inches—dark yellowish brown silty clay loam
15 to 55 inches—yellowish brown clay
55 to 62 inches—yellowish brown silty clay

Berks

0 to 1 inch—partly decomposed leaf litter
1 to 5 inches—dark brown silt loam
5 to 10 inches—dark yellowish brown very channery silt loam
10 to 16 inches—yellowish brown very channery silt loam
16 to 29 inches—yellowish brown extremely channery silt loam
29 inches—shale bedrock

Inclusions

Dissimilar inclusions:
• Carbo soils, which are moderately deep to limestone bedrock and are in landform positions similar to those of the Poplimento and Berks soils
Similar inclusions:
• Weikert soils, which are shallow to shale bedrock and are in landform positions similar to those of the Poplimento and Berks soils
• Frederick soils, which are redder and more clayey in the subsoil and are in landform positions similar to those of the Poplimento and Berks soils
• Soils that are very deep to bedrock, that have a loamy subsoil, and that are in landform positions similar to those of the Poplimento and Berks soils

28B—Shottower silt loam, 2 to 7 percent slopes

Composition (statistical method—random points)

Shottower and similar soils: 91 to 99 percent
Dissimilar inclusions: 1 to 9 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley, and foothills
Landform: High stream terraces
Landform position: Treads
Shape of areas: Irregular
Size of areas: 5 to 30 acres

Typical Profile

0 to 10 inches—dark yellowish brown silt loam
10 to 18 inches—brown silty clay loam
18 to 37 inches—yellowish red clay
37 to 62 inches—red clay

Inclusions

Dissimilar inclusions:
• Allegheny soils, which have less clay in the subsoil and browner colors than the Shottower soil, are susceptible to flooding, and are on low stream terraces
• Carbo soils, which are moderately deep to limestone bedrock, are in landform positions similar to those of the Shottower soil, and are generally near outcrops of limestone bedrock
• Soils that are moderately well drained and in landform positions similar to those of the Shottower soil
Similar inclusions:
• Frederick and Watahala soils, which have more chert pebbles in the subsoil than the Shottower soil, formed in residuum derived from limestone, and are on footslopes adjacent to the Shottower soil
• Soils that have less clay in the soil profile and that are in landform positions similar to those of the Shottower soil
• Areas that contain sinkholes

28C—Shottower silt loam, 7 to 15 percent slopes

Composition (statistical method—random points)

Shottower and similar soils: 91 to 99 percent
Dissimilar inclusions: 1 to 9 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley, and foothills
Landform: High stream terraces
Landform position: Sloping treads
Shape of areas: Irregular
Size of areas: 5 to 30 acres

Typical Profile

0 to 10 inches—dark yellowish brown silt loam
10 to 18 inches—brown silty clay loam
18 to 37 inches—yellowish red clay
37 to 62 inches—red clay

Inclusions

Dissimilar inclusions:
• Allegheny soils, which have less clay in the subsoil and are browner than the Shottower soil, are susceptible to flooding, and are on low stream terraces
• Carbo soils, which are moderately deep to limestone bedrock, are in landform positions similar to those of the Shottower soil, and generally are near outcrops of limestone bedrock
• Soils that are moderately well drained and are in landform positions similar to those of the Shottower soil
Similar inclusions:
• Frederick and Watahala soils, which contain more chert pebbles in the subsoil than the Shottower soil, formed in residuum derived from limestone, and are on hillslopes adjacent to the Shottower soil
• Soils that have less clay in the subsoil than the Shottower soil and that are in landform positions similar to those of the Shottower soil
• Areas that contain sinkholes

28D—Shottower silt loam, 15 to 25 percent slopes

Composition (statistical method—informed judgement)

Shottower and similar soils: 86 to 94 percent
Dissimilar inclusions: 6 to 14 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley, and foothills
Landform: High stream terraces
Landform position: Steep treads
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Typical Profile

0 to 10 inches—dark yellowish brown silt loam
10 to 18 inches—brown silty clay loam
18 to 37 inches—yellowish red clay
37 to 62 inches—red clay

Inclusions

Dissimilar inclusions:
- Allegheny soils, which have less clay in the subsoil and are browner than the Shottower soil, are susceptible to flooding, and are on low stream terraces
- Carbo soils, which are moderately deep to limestone bedrock, are in landform positions similar to those of the Shottower soil, and generally are near outcrops of limestone bedrock
- Soils that are moderately well drained and that are in landform positions similar to those of the Shottower soil

Similar inclusions:
- Frederick and Watahala soils, which have more chert pebbles in the subsoil, formed in residuum derived from limestone, and are on hillslopes adjacent to the Shottower soil
- Soils that have less clay in the subsoil and that are in landform positions similar to those of the Shottower soil
- Areas that contain sinkholes

29B—Timberville silt loam, 2 to 7 percent slopes, frequently flooded

Composition (statistical method—random points)

Timberville and similar soils: 87 to 97 percent
Dissimilar inclusions: 3 to 13 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley
Landform: Hillslopes
Landform position: Footslopes, depressions, and intermittent drainageways
Shape of areas: Long and narrow, or oval
Size of areas: 5 to 30 acres
Flooding: In any year more than a 50 percent chance of flooding of very brief duration and floodwater that may only be a few inches deep

Typical Profile

0 to 3 inches—brown silt loam
3 to 9 inches—brown silt loam
9 to 28 inches—dark yellowish brown silt loam
28 to 37 inches—dark yellowish brown silty clay loam
37 to 48 inches—strong brown clay loam
48 to 62 inches—strong brown clay loam

Inclusions

Dissimilar inclusions:
- Frederick soils, which are redder and have more clay in the subsoil than the Shottower soil and are on backslopes adjacent to the Shottower soil
- Soils that are less susceptible to flooding and that are along the higher edges of delineations
- Soils that are moderately well drained and are in landform positions similar to those of the Shottower soil
- Watahala soils, which have more chert pebbles in the subsoil and on the soil surface than the Shottower soil and are on backslopes adjacent to the Shottower soil

Similar inclusions:
- Chagrin soils, which have more sand in the subsoil than and are subject to flooding of longer duration than the Shottower soil and are on flood plains

29C—Timberville silt loam, 7 to 15 percent slopes

Composition (statistical method—random points)

Timberville and similar soils: 87 to 97 percent
Dissimilar inclusions: 3 to 13 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley
Landform: Foothills
Landform position: Footslopes, depressions, and intermittent drainageways (fig. 9)
Shape of areas: Long and narrow, and oval
Size of areas: 5 to 30 acres
Surface water: Flooding of very brief duration during periods of heavy or intensive rainfall and also ponding of brief duration in the lowest landform positions

Typical Profile

0 to 3 inches—brown silt loam
3 to 9 inches—brown silt loam
9 to 28 inches—dark yellowish brown silt loam
28 to 37 inches—dark yellowish brown silty clay loam
37 to 48 inches—strong brown clay loam
48 to 62 inches—strong brown clay loam

Figure 9.—An area of Timberville silt loam, 7 to 15 percent slopes, in a depression. An area of Frederick gravelly loam, 15 to 25 percent slopes, is on hillslopes in the background.

Inclusions

Dissimilar inclusions:
- Frederick soils, which are redder and have more clay in the subsoil than the Timberville soil and are on backslopes adjacent to the Timberville soil
- Soils that are less susceptible to flooding than the Timberville soil and that are along the higher edges of delineations
- Soils that are moderately well drained and that are in landform positions similar to those of the Timberville soil
- Watahala soils, which have more chert pebbles in the subsoil and on the soil surface than the Timberville soil and that are on backslopes adjacent to the Timberville soil

Similar inclusions:
- Chagrin soils, which have more sand in the subsoil than the Timberville soil and are on flood plains

30C—Tumbling loam, 7 to 15 percent slopes

Composition (statistical method—random points)

Tumbling and similar soils: 85 to 95 percent

Dissimilar inclusions: 5 to 15 percent

Setting

Physiographic province: Valley and Ridge
Landscape: Mountains, the limestone valley, and foothills
Landform: Lower mountain slopes and hillslopes
Landform position: Footslopes and toeslopes
Shape of areas: Irregular
Size of areas: 5 to 30 acres

Typical Profile

0 to 4 inches—dark yellowish brown loam
4 to 8 inches—brown loam
8 to 14 inches—yellowish red gravelly clay loam
14 to 20 inches—red gravelly clay
20 to 61 inches—red gravelly clay that has lithochromic mottles in shades of brown

Inclusions

Dissimilar inclusions:
- Carbo soils, which are moderately deep to limestone bedrock, are in the lower landform positions, and generally are near outcrops of limestone bedrock
- Soils that have a seasonal high water table between depths of 18 and 36 inches and that are

in landform positions similar to those of the Tumbling soil
• Escatawba soils, which have a seasonal high water between depths of 30 and 48 inches and are in landform positions similar to those of the Tumbling soil
Similar inclusions:
• Jefferson soils, which have less clay in the subsoil than the Tumbling soil and are in landform positions similar to those of the Tumbling soil
• Frederick soils, which do not have any sandstone fragments and are in landform positions similar to those of the Tumbling soil
• Areas that have more stones on the surface than the Tumbling soil and that are in landform positions similar to those of the Tumbling soil

30D—Tumbling loam, 15 to 25 percent slopes

Composition (statistical method—random points)

Tumbling and similar soils: 85 to 95 percent
Dissimilar inclusions: 5 to 15 percent

Setting

Physiographic province: Valley and Ridge
Landscape: Mountains, the limestone valley, and foothills
Landform: Lower mountain slopes and hillslopes
Landform position: Footslopes and toeslopes
Shape of areas: Irregular
Size of areas: 5 to 30 acres

Typical Profile

0 to 4 inches—dark yellowish brown loam
4 to 8 inches—brown loam
8 to 14 inches—yellowish red gravelly clay loam
14 to 20 inches—red gravelly clay
20 to 61 inches—red gravelly clay that has lithochromic mottles in shades of brown

Inclusions

Dissimilar inclusions:
• Carbo soils, which are moderately deep to limestone bedrock, are in the lower positions on the landform, and generally are near outcrops of limestone bedrock
• Soils that have a seasonal high water table between depths of 18 and 36 inches and that are in landform positions similar to those of the Tumbling soil
• Escatawba soils, which have a seasonal high water between depths of 30 and 48 inches and are in landform positions similar to those of the Tumbling soil
Similar inclusions:
• Jefferson soils, which have less clay in the subsoil than the Tumbling soil and are in landform positions similar to those of the Tumbling soil
• Frederick soils, which do not have any sandstone rock fragments and are in landform positions similar to those of the Tumbling soil
• Areas that have more stones on the surface than the Tumbling soil and that are in landform positions similar to those of the Tumbling soil

31C—Tumbling loam, 7 to 15 percent slopes, very stony

Composition (statistical method—random points)

Tumbling and similar soils: 83 to 98 percent
Dissimilar inclusions: 2 to 17 percent

Setting

Physiographic province: Valley and Ridge
Landscape: Mountains, the limestone valley, and foothills
Landform: Lower mountain slopes and hillslopes
Landform position: Footslopes and toeslopes
Shape of areas: Irregular
Size of areas: 5 to 30 acres
Surface features: Sandstone stones cover 0.1 to 3 percent of the surface.

Typical Profile

0 to 4 inches—dark yellowish brown loam
4 to 8 inches—brown loam
8 to 14 inches—yellowish red gravelly clay loam
14 to 20 inches—red gravelly clay
20 to 61 inches—red gravelly clay that has lithochromic mottles in shades of brown

Inclusions

Dissimilar inclusions:
• Carbo soils, which are moderately deep to limestone bedrock, are on backslopes, and generally are near outcrops of limestone bedrock
• Soils that have a seasonal high water table between depths of 18 and 36 inches and that are in landform positions similar to those of the Tumbling soil
• Escatawba soils, which have a seasonal high water between depths of 30 and 48 inches and are in landform positions similar to those of the Tumbling soil
Similar inclusions:

• Jefferson soils, which have less clay in the subsoil than the Tumbling soil and are in landform positions similar to those of the Tumbling soil
• Areas that have fewer stones on the surface than the Tumbling soil and that are in landform positions similar to those of the Tumbling soil

31D—Tumbling loam, 15 to 25 percent slopes, very stony

Composition (statistical method—random points)

Tumbling and similar soils: 83 to 98 percent
Dissimilar inclusions: 2 to 17 percent

Setting

Physiographic province: Valley and Ridge
Landscape: Mountains, the limestone valley, and foothills
Landform: Lower mountain slopes and hillslopes
Landform position: Footslopes and toeslopes
Shape of areas: Irregular
Size of areas: 5 to 30 acres
Surface features: Sandstone stones cover 0.1 to 3 percent of the surface

Typical Profile

0 to 4 inches—dark yellowish brown loam
4 to 8 inches—brown loam
8 to 14 inches—yellowish red gravelly clay loam
14 to 20 inches—red gravelly clay
20 to 61 inches—red gravelly clay that has lithochromic mottles in shades of brown

Inclusions

Dissimilar inclusions:
• Carbo soils, which are moderately deep to limestone bedrock, are on backslopes, and generally are near outcrops of limestone bedrock
• Berks soils, which are moderately deep to shale bedrock and are on backslopes
• Escatawba soils, which have a seasonal high water between depths of 30 and 48 inches and are in landform positions similar to those of the Tumbling soil
Similar inclusions:
• Jefferson soils, which have less clay in the subsoil than the Tumbling soil and are in landform positions similar to those of the Tumbling soil
• Poplimento soils, which have a few shale channers, generally have less sand in the soil profile than the Tumbling soil, and are in landform positions, generally convex shaped, similar to those of the Tumbling soil
• Areas that have fewer stones on the surface than the Tumbling soil and that are in landform positions similar to those of the Tumbling soil

31E—Tumbling loam, 25 to 35 percent slopes, very stony

Composition (statistical method—random points)

Tumbling and similar soils: 83 to 98 percent
Dissimilar inclusions: 2 to 17 percent

Setting

Physiographic province: Valley and Ridge
Landscape: Mountains, the limestone valley, and foothills
Landform: Lower mountain slopes and hillslopes
Landform position: Footslopes and toeslopes
Shape of areas: Irregular
Size of areas: 5 to 30 acres
Surface features: Sandstone stones cover 0.1 to 3 percent of the surface.

Typical Profile

0 to 4 inches—dark yellowish brown loam
4 to 8 inches—brown loam
8 to 14 inches—yellowish red gravelly clay loam
14 to 20 inches—red gravelly clay
20 to 61 inches—red gravelly clay that has lithochromic mottles in shades of brown

Inclusions

Dissimilar inclusions:
• Carbo soils, which are moderately deep to limestone bedrock, are on backslopes, and generally are near outcrops of limestone bedrock
• Berks soils, which are moderately deep to shale bedrock and are on backslopes
Similar inclusions:
• Jefferson soils, which have less clay in the subsoil than the Tumbling soil and are in landform positions similar to those of the Tumbling soil
• Poplimento soils, which have a few shale channers, generally have less sand in the soil profile than the Tumbling soil, and are in landform positions, generally convex, that are similar to those of the Tumbling soil
• Areas that have fewer stones on the surface than the Tumbling soil and that are in landform positions similar to those of the Tumbling soil

32—Udorthents

Composition (subjective judgment)

Udorthents and similar components: 80 to 90 percent
Dissimilar inclusions: 10 to 20 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley, and foothills
Landform: Hillslopes
Landform position: Cut and fill areas on summits, backslopes, footslopes, and drainageways disturbed in land use activities; general slopes of 0 to 45 percent
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Typical Profile

The properties and characteristics of the soils in this map unit are variable; hence, the map unit has no typical profile. The map unit comprises disturbed soils, which consist generally of various fill material derived from limestone.

Inclusions

Dissimilar inclusions:
- Carbo soils, which are moderately deep to limestone bedrock and are on hillslopes
- Timberville soils, which are subject to flooding and are on footslopes, in depressions, and in drainageways in the limestone valley
- Frederick and Watahala soils, which are very deep to limestone bedrock and are on hillslopes
- Urban land that consists of areas covered by asphalt, concrete, buildings, and other impervious surfaces

33—Urban land-Udorthents complex

Composition (subjective judgment)

Urban land and similar components: 65 to 75 percent
Udorthents and similar components: 15 to 25 percent
Dissimilar inclusions: 5 to 15 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley, and foothills
Landform: Hillslopes
Landform position: Summits, backslopes, drainageways, and flood plains in areas comprising concrete, asphalt, buildings, and fill material; such areas are in the towns of Jonesville and Pennington Gap. Slopes are generally 0 to 45 percent.
Shape of areas: Irregular
Size of areas: 50 to 500 acres

Typical Profile

Urban land

Urban land consists of areas covered by asphalt, concrete, buildings, and other impervious surfaces.

Udorthents

The properties and characteristics of the soils in this unit are so variable that the map unit does not have a typical profile. The map unit comprises disturbed soils, which consist generally of various fill material derived from limestone.

Inclusions

Dissimilar inclusions:
- Carbo soils, which are moderately deep to limestone bedrock and are on hillslopes
- Timberville soils, which are susceptible to flooding and are on footslopes, in depressions, and in drainageways in the limestone valley
- Frederick and Watahala soils, which are very deep to limestone bedrock and are on hillslopes

34D—Wallen-Alticrest complex, 15 to 35 percent slopes, very stony

Composition (statistical method—random points)

Wallen and similar soils: 38 to 64 percent
Alticrest and similar soils: 21 to 46 percent
Dissimilar inclusions: 6 to 25 percent

Setting

Physiographic province: Valley and Ridge
Landscape: Mountains
Landform: Mountain slopes
Landform position: Summits and shoulders that have many stones (fig. 10)
Shape of areas: Long and narrow
Size of areas: 5 to 80 acres
Surface features: Sandstone stones cover 0.1 to 3 percent of the surface.

Typical Profile

Wallen

0 to 1 inch—partly decomposed leaf litter
1 to 2 inches—dark yellowish brown gravelly loam
2 to 7 inches—yellowish brown very gravelly loam

Figure 10.—An area of Wallen-Alticrest complex, 15 to 35 percent slopes, very stony, on the summit of Wallen Ridge, northwest of Stickleyville.

7 to 26 inches—yellowish brown very gravelly loam
26 inches—hard sandstone bedrock

Alticrest

This is a soil profile of Alticrest soils in the Appalachian Plateau, Valley and Ridge physiographic province, in Lee County. The profile differs from the pedon description given for the Alticrest series in the section “Soil Series and Their Morphology.”

0 to 1 inch—partly decomposed leaf litter
1 to 4 inches—dark brown fine sandy loam
4 to 9 inches—dark yellowish brown fine sandy loam
9 to 21 inches—yellowish brown sandy loam
21 to 29 inches—yellowish brown sandy loam
29 inches—hard sandstone bedrock

Inclusions

Dissimilar inclusions:

- Gilpin soils, which have more clay in the subsoil than the Wallen and Alticrest soils, are in areas of shale bedrock, and are in landform positions similar to those of the Wallen and Alticrest soils, generally in areas of the lowest elevations in the map unit
- Outcrops of sandstone bedrock that are in landform positions similar to those of the Wallen and Alticrest soils

Similar inclusions:

- Soils that have more clay in the subsoil than the Wallen and Alticrest soils, that are in areas of sandstone bedrock, and that are in landform positions similar to those of the Wallen and Alticrest soils

• Soils that are shallow to sandstone bedrock and that are in landform positions similar to those of the Wallen and Alticrest soils

34E—Wallen-Alticrest complex, 35 to 55 percent slopes, very stony

Composition (statistical method—random points)

Wallen and similar soils: 38 to 64 percent
Alticrest and similar soils: 21 to 46 percent
Dissimilar inclusions: 6 to 25 percent

Setting

Physiographic province: Valley and Ridge
Landscape: Mountains
Landform: Mountain slopes
Landform position: Backslopes, summits, and shoulders
Shape of areas: Irregular
Size of areas: 20 to 750 acres
Surface features: Sandstone stones cover 0.1 to 3 percent of the surface.

Typical Profile

Wallen

0 to 1 inch—partly decomposed leaf litter
1 to 2 inches—dark yellowish brown gravelly loam
2 to 7 inches—yellowish brown very gravelly loam
7 to 26 inches—yellowish brown very gravelly loam
26 inches—hard sandstone bedrock

Alticrest

This is a soil profile of the Alticrest soils in the Appalachian Highlands, Valley and Ridge physiographic province, in Lee County. It differs from the pedon description given for the Alticrest series in the section “Soil Series and Their Morphology.”

0 to 1 inch—partly decomposed leaf litter
1 to 4 inches—dark brown fine sandy loam
4 to 9 inches—dark yellowish brown fine sandy loam
9 to 21 inches—yellowish brown sandy loam
21 to 29 inches—yellowish brown sandy loam
29 inches—hard sandstone bedrock

Inclusions

Dissimilar inclusions:
• Gilpin soils, which have more clay in the subsoil than the Wallen and Alticrest soils, are in areas of shale bedrock, and are in landform positions similar to those of the Wallen and Alticrest soils, generally in areas of lowest elevation in the map unit
• Oriskany soils, which are very deep to bedrock and are on head slopes and along drainageways
• Outcrops of sandstone bedrock that are in landform positions similar to those of the Wallen and Alticrest soils
Similar inclusions:
• Soils that have more clay in the subsoil than the Wallen and Alticrest soils, that are in areas of sandstone bedrock, and that are in landform positions similar to those of the Wallen and Alticrest soils
• Soils that are shallow to sandstone bedrock and that are in landform positions similar to those of the Wallen and Alticrest soils

35F—Wallen-Rock outcrop complex, 35 to 85 percent slopes, very stony

Composition (informed judgement)

Wallen and similar soils: 61 to 86 percent
Rock outcrop: 5 to 25 percent
Dissimilar inclusions: 3 to 21 percent

Setting

Physiographic province: Valley and Ridge and Appalachian Plateau, Cumberland Plateau and Cumberland Mountain section
Landscape: Mountains
Landform: Mountain slopes
Landform position: Backslopes, summits, and shoulders close to nearly vertical cliffs (fig. 11)
Shape of areas: Oblong
Size of areas: 50 to 1,000 acres
Surface features: On average, exposed sandstone bedrock covers more than 10 percent of the surface.

Typical Profile

Wallen

0 to 1 inch—partly decomposed leaf litter
1 to 2 inches—dark yellowish brown gravelly loam
2 to 7 inches—yellowish brown very gravelly loam
7 to 26 inches—yellowish brown very gravelly loam
26 inches—hard sandstone bedrock

Rock outcrop

Outcrops of sandstone bedrock that rise 5 to 75 feet above the soil surface and that mostly are nearly vertical cliffs

Figure 11.—An area of the Wallen-Rock outcrop complex, 35 to 85 percent slopes, very stony, on Cumberland Mountain. Many outcrops of sandstone bedrock are on the surface.

Inclusions

Dissimilar inclusions:

- Gilpin soils, which have more clay in the subsoil than the Wallen soil, are in areas of shale bedrock, and are in landform positions similar to those of the Wallen soil, generally in the lowest areas in the map unit
- Oriskany soils, which are very deep to bedrock and are at the base of rock outcrops, on head slopes, and along drainageways

Similar inclusions:

- Alticrest soils, which have fewer rock fragments in the subsoil than the Wallen soil, are in areas of sandstone bedrock, and are in landform positions similar to those of the Wallen soil
- Soils that are shallow to sandstone bedrock and that are in landform positions similar to those of the Wallen soil

36C—Watahala-Frederick complex, 7 to 15 percent slopes

Composition (statistical method—random points)

Watahala and similar soils: 73 to 84 percent
Frederick and similar soils: 14 to 25 percent
Dissimilar inclusions: 0 to 4 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley
Landform: Cherty hillslopes
Landform position: Summits and shoulders
Shape of areas: Irregular
Size of areas: 5 to 20 acres

Typical Profile

Watahala

0 to 2 inches—very dark grayish brown gravelly loam
2 to 22 inches—yellowish brown gravelly loam
22 to 35 inches—yellowish brown gravelly loam
35 to 72 inches—yellowish red clay that has brownish yellow lithochromic mottles

Frederick

This is a soil profile only of Frederick soils in the cherty areas of Lee County. It differs from the pedon description given for the Frederick series in the section “Soil Series and Their Morphology.”

0 to 2 inches—dark brown gravelly loam
2 to 8 inches—brown gravelly loam
8 to 24 inches—red clay
24 to 62 inches—red clay that has reddish yellow, lithochromic mottles

Inclusions

Dissimilar inclusions:

- Carbo soils, which are moderately deep to limestone bedrock and are in landform positions similar to those of the Watahala and Frederick soils, generally near outcrops of limestone bedrock

Similar inclusions:

- Timberville soils, which have fewer rock fragments in the soil profile than the Watahala soil, have less clay in the subsoil than the Frederick soil, and are in depressions, headslopes, and drainageways

36D—Watahala-Frederick complex, 15 to 35 percent slopes

Composition (statistical method—random points)

Watahala and similar soils: 73 to 84 percent
Frederick and similar soils: 14 to 25 percent
Dissimilar inclusions: 0 to 4 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley
Landform: Cherty hillslopes
Landform position: Summits, shoulders, and backslopes
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Typical Profile

Watahala

0 to 2 inches—very dark grayish brown gravelly loam
2 to 22 inches—yellowish brown gravelly loam
22 to 35 inches—yellowish brown gravelly loam
35 to 72 inches—yellowish red clay that has brownish yellow, lithochromic mottles

Frederick

This is a soil profile of Frederick soils only in the cherty areas of Lee County. It differs from the pedon description given for the Frederick series in the section "Soil Series and Their Morphology."

0 to 2 inches—dark brown gravelly loam
2 to 8 inches—brown gravelly loam
8 to 24 inches—red clay
24 to 62 inches—red clay that has reddish yellow, lithochromic mottles

Inclusions

Dissimilar inclusions:
- Carbo soils, which are moderately deep to limestone bedrock and are in landform positions similar to those of the Watahala and Frederick soils, generally near outcrops of limestone bedrock

Similar inclusions:
- Timberville soils, which have fewer rock fragments in the soil profile than the Watahala soil, have less clay in the subsoil than Frederick soil, and are in depressions, on headslopes, and in drainageways

Figure 12.—A typical area of the Watahala-Frederick complex, 35 to 55 percent slopes, southwest of Stickleyville between Powell Mountain and Wallen Ridge. The surface is cherty.

36E—Watahala-Frederick complex, 35 to 55 percent slopes

Composition (statistical method—random points)

Watahala and similar soils: 73 to 84 percent
Frederick and similar soils: 14 to 25 percent
Dissimilar inclusions: 0 to 4 percent

Setting

Physiographic province: Valley and Ridge
Landscape: The limestone valley
Landform: Cherty hillslopes (fig. 12)
Landform position: Backslopes
Shape of areas: Irregular
Size of areas: 5 to 75 acres

Typical Profile

Watahala

0 to 2 inches—very dark grayish brown gravelly loam
2 to 22 inches—yellowish brown gravelly loam
22 to 35 inches—yellowish brown gravelly loam
35 to 72 inches—yellowish red clay that has brownish yellow, lithochromic mottles

Frederick

This is a soil profile of Frederick soils in the cherty areas of Lee County. It differs from the pedon description given for the Frederick series in the section “Soil Series and Their Morphology.”

0 to 2 inches—dark brown gravelly loam
2 to 8 inches—brown gravelly loam
8 to 24 inches—red clay
24 to 62 inches—red clay that has reddish yellow, lithochromic mottles

Inclusions

Dissimilar inclusions:
- Carbo soils, which are moderately deep to limestone bedrock and are in landform positions similar to those of the Watahala and Frederick soils, generally near outcrops of limestone bedrock

Similar inclusions:
- Timberville soils, which have fewer rock fragments in the soil profile than the Watahala soil, have less clay in the subsoil than the Frederick soil, and are in depressions, on headslopes, and in drainageways

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 to prevent 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 behavioral 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 recreational facilities; and for wildlife habitat. It can be used to identify the potentials and 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

General management needed for crops and pasture is suggested in this section. The estimated yields of the main crops and pasture plants are listed for each soil, the system of land capability classification used by the Natural Resources Conservation Service is explained, and prime farmland is described.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under the heading “Detailed Soil Map Units.” Specific information can be obtained from the local office of the Natural Resources Conservation Service or the Cooperative Extension 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 7. 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 land capability classification of each map unit also is shown in the table.

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 ensures 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, however, compared with that of other soils is not likely to change.

Crops other than those shown in table 7 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 Natural Resources Conservation Service

or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those 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 criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include 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 woodland or 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.

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

Class I soils have few limitations that restrict their use.

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

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

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

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

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

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

Class VIII soils and 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 hazard is the 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 capability classification of the map units in this survey area is given in table 7, “Land Capability Classes and Yields per Acre of Crops and Pasture.” The acreage of soils in each capability class and subclass is shown in table 8.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation’s short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation’s prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forest land, or other land, but it is not urban or built-up land or water areas. The soil qualities, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. It is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

The map units in the survey area that are considered prime farmland are listed in table 9. This list

does not constitute a recommendation for a particular land use. On some soils included in the list, measures that overcome a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures. The extent of each listed map unit is shown in table 6. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading “Detailed Soil Map Units” and in the tables.

Woodland Management and Productivity

Table 10 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 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 an indicator tree species. The number indicates the volume, in board feet per acre per year, which the indicator species can produce in a pure stand under natural conditions. The number 1 indicates low potential productivity; 2 or 3, moderate; 4 or 5, moderately high; 6 to 8, high; 9 to 11, very high; and 12 to 39, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *R* indicates steep slopes; *X*, stoniness or rockiness; *W*, excess water in or on the soil; *T*, toxic substances in the soil; *D*, restricted rooting depth; *C*, clay in the upper part of the soil; *S*, sandy texture; *F*, a high content of rock fragments in the soil; *L*, low strength; and *N*, snowpack. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, C, S, F, L, and N.

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

Erosion hazard is the probability that damage will occur as a result of site preparation and cutting where the soil is exposed along roads, skid trails, and fire lanes and in log-handling areas. Forests that have been burned or overgrazed are also subject to erosion. Ratings of the erosion hazard are based on the percent of the slope. A rating of *slight* indicates that no particular prevention measures are needed under ordinary conditions. A rating of *moderate* indicates that erosion-control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities.

Equipment limitation reflects the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. The chief characteristics and conditions considered in the ratings are slope, stones on the surface, rock outcrops, soil wetness, and texture of the surface layer. A rating of *slight* indicates that under normal conditions the kind of equipment and season of use are not significantly restricted by soil factors. Soil wetness can restrict equipment use, but the wet period does not exceed 1 month. A rating of *moderate* indicates that equipment use is moderately restricted because of one or more soil factors. If the soil is wet, the wetness restricts equipment use for a period of 1 to 3 months. A rating of *severe* indicates that equipment use is severely restricted either as to the kind of equipment that can be used or the season of use. If the soil is wet, the wetness restricts equipment use for more than 3 months.

Seedling mortality refers to the death of naturally occurring or planted tree seedlings, as influenced by the kinds of soil, soil wetness, or topographic conditions. The factors used in rating the soils for seedling mortality are texture of the surface layer, depth to a seasonal high water table and the length of the period when the water table is high, rock fragments in the surface layer, effective rooting depth, and slope aspect. A rating of *slight* indicates that seedling mortality is not likely to be a problem under normal conditions. Expected mortality is less than 25 percent. A rating of *moderate* indicates that some problems from seedling mortality can be expected. Extra precautions are advisable. Expected mortality is 25 to 50 percent. A rating of *severe* indicates that seedling mortality is a serious problem. Extra precautions are important. Replanting may be necessary. Expected mortality is more than 50 percent.

Plant competition ratings indicate the degree to which undesirable species are expected to invade and grow when openings are made in the tree canopy. The main factors that affect plant competition are depth to the water table and the available water capacity. A rating of *slight* indicates that competition from undesirable plants is not likely to prevent natural regeneration or suppress the more desirable species. Planted seedlings can become established without undue competition. A rating of *moderate* indicates that competition may delay the establishment of desirable species. Competition may hamper stand development, but it will not prevent the eventual development of fully stocked stands. A rating of *severe* indicates that competition can be expected to prevent

regeneration unless precautionary measures are applied.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index* and as a *productivity* number. The site index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. 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.

The *productivity class*, a number, is the yield likely to be produced by the most important trees. This number, expressed as board feet per acre per year, indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand.

The first species listed under *common trees* for a soil is the indicator species for that soil. It generally is the most common species on the soil and is the one that determines the ordination class.

Trees to plant are those that are suitable for commercial wood production.

Woodland Understory Vegetation

Understory vegetation consists of grasses, forbs, shrubs, and other plants. If well managed, some woodland can produce enough understory vegetation to support grazing of livestock or wildlife, or both, without damage to the trees.

The quantity and quality of understory vegetation vary with the kind of soil, the age and kind of trees in the canopy, the density of the canopy, and the depth and condition of the litter. The density of the canopy determines the amount of light that understory plants receive.

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Recreation

The soils of the survey area are rated in table 11 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 sewer lines. 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 recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential

In the table, 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 a combination of these measures.

The information in the table can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 14 and interpretations for dwellings without basements and for local roads and streets in table 13.

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.

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 and horseback riding 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

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 12, 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.

Elements of Wildlife Habitat

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 flooding. 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, flooding, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, lovegrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. 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 flooding. 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, 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 juniper.

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, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, saltgrass, cordgrass, 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.

Habitat for Various Kinds of Wildlife

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. 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, deer, and bear.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, 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. Ratings are given for 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 should 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 or 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 kinds 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 evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and 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 13 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 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, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 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 or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials 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 14 shows the degree and 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.

The table also shows the suitability of the soils for use as daily cover for landfill. 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.

The table 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 resulting from rapid permeability in 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 should be considered.

The ratings in the table 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, soil reaction, and content of salts and sodium affect trench 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 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 wind erosion.

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 the 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 15 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 to 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, a 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 a 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 have a water table at a depth of 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. They are used in many kinds of construction. Specifications for each use vary widely. In the table, 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 high 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 16 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 and a high content of stones or boulders, organic matter, or salts or sodium. 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 the potential for 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, and 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 control 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 erosion 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 wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts and sodium, 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 to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, 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 17 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 the heading “Soil Series and Their Morphology.”

USDA 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 the content of particles coarser than sand is as much as about 15 percent, 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, CL-ML.

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 3 to 10 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 ovendry 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 generally 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 18 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, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving 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 and septic tank absorption fields.

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 the basis of 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 classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; *high*, more than 6 percent; and *very high*, greater than 9 percent.

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 0.02 to 0.64. Other factors being equal, 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 the table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in 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 19 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, 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 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, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

The table 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, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of flooding is more than 50 percent in any year). *Common* is used when the occasional and frequent classes are grouped for certain purposes. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 days to 1 month, and *very long* if more than 1 month. Probable dates are expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

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 little or no horizon development.

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 estimates are based mainly on observations of the water table at selected sites and on the evidence of a saturated zone, namely grayish colors or mottles (redoximorphic

features) in the soil. Indicated in the table are the depth to the seasonal high water table; the kind of water table—that is, perched, apparent, or artesian; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in the table.

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. An *artesian* water table is under hydrostatic head, generally below an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

Two numbers in the column showing depth to the water table indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. “More than 6.0” indicates that the water table is below a depth of 6 feet or that it is within a depth of 6 feet for less than a month.

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 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.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

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 results in a severe hazard of corrosion. 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 (*11*). 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. Table 20 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven 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 Alfisol.

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 Udalf (*Ud*, meaning humid, plus *alf*, from Alfisol).

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; type of saturation; 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 Hapludalfs (*Hapl*, meaning minimal horizonation, plus *udalf*, the suborder of the Alfisols that has a udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup 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 taxonomic class. 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 Hapludalfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle size, mineral content, soil temperature regime, soil depth, and reaction. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is very-fine, mixed, mesic Typic Hapludalfs.

SERIES. The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The Carbo series is an example of very-fine, mixed, mesic Typic Hapludalfs.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. Characteristics of the soil and the material in which it formed are identified for each 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" (*13*). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (*11*) and in "Keys to Soil Taxonomy" (*12*). Unless otherwise indicated, 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

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderate
Physiographic province: Valley and Ridge
Landscape: The limestone valley and foothills
Landform: Low stream terraces
Parent material: Alluvium derived from sandstone, siltstone, and shale

Slope range: 0 to 7 percent

Associated Soils

- Pope soils, which have more sand in the subsoil than and are more susceptible to flooding than Allegheny soils, are well drained, and are on flood plains
- Shottower soils, which have more clay in the subsoil than and are redder than Allegheny soils and are on high stream terraces
- Frederick soils, which have more clay in the subsoil than and are redder than Allegheny soils and are on hillslopes

Typical Pedon

Allegheny loam, 0 to 2 percent slopes, rarely flooded; 1.22 miles south-southeast of intersection of VA-854 and VA 661; 1.03 miles northeast of intersection of VA 883 and VA 679; lat. 36 degrees 38 minutes 13 seconds N, long. 83 degrees 14 minutes 28 seconds W; Back Valley quadrangle, Tennessee-Virginia; 100 feet west of farm road, on a low terrace of the Powell River, 225 feet east of river; in a pasture:

Ap—0 to 5 inches; brown (10YR 4/3) loam; weak fine and medium granular structure; very friable; many very fine roots; slightly acid; abrupt smooth boundary.

Bt1—5 to 10 inches; dark yellowish brown (10YR 4/4) loam; moderate medium subangular blocky structure; firm; common very fine roots; few faint clay films on faces of peds; slightly acid; clear smooth boundary.

Bt2—10 to 16 inches; yellowish brown (10YR 5/6) clay loam; moderate medium and coarse subangular blocky structure; firm; few very fine roots; few faint clay films on faces of peds; strongly acid; clear smooth boundary.

Bt3—16 to 30 inches; strong brown (7.5YR 5/6) clay loam; moderate medium subangular blocky structure; friable; few very fine roots; few faint clay films on faces of peds; strongly acid; clear smooth boundary.

BC—30 to 62 inches; yellowish brown (10YR 5/6) loam; weak fine and medium subangular blocky structure; friable; strongly acid.

Range In Characteristics

Solum thickness: 30 to 60 inches or more
Depth to bedrock: More than 60 inches
Reaction: Strongly acid to extremely acid (in unlimed areas)
Rock fragments: 0 to 15 percent in the A and BA horizons, 0 to 30 percent in the Bt horizon, and 0 to 35 percent in the BC horizon and the C horizon, where it occurs

Ap horizon:
Hue—7.5YR to 2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—loam

A horizon: (where it occurs)
Hue—7.5YR to 2.5Y
Value—4 or 5, but 3 to 5 in horizons less than 6 inches thick
Chroma—2 to 4, but 1 to 3 in horizons less than 6 inches thick
Texture—loam

BA horizon: (where it occurs)
Hue—7.5YR to 2.5Y
Value—4 to 6
Chroma—3 to 8
Texture—sandy loam to silt loam in the fine earth fraction

Bt horizon:
Hue—7.5YR to 2.5Y
Value—4 or 5
Chroma—3 to 8
Texture—clay loam, sandy clay loam, loam, silt loam, and silty clay loam that has more than 15 percent sand coarser than very fine sand in the fine earth fraction

BC horizon:
Hue—7.5YR to 2.5Y
Value—4 to 6
Chroma—3 to 8
Texture—fine sandy loam, loam, sandy clay loam, or clay loam in the fine earth fraction

C horizon: (where it occurs)
Hue—7.5YR to 2.5Y
Value—4 to 6
Chroma—3 to 8
Texture—fine sandy loam, loam, sandy clay loam, or clay loam in the fine earth fraction

Alticrest Series

Depth to bedrock: Moderately deep
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid in the solum and rapid below the solum
Physiographic province: Appalachian Plateau, Cumberland Plateau and Cumberland Mountain section; Valley and Ridge
Landscape: Foothills and mountains
Landform: Hillslopes and mountain slopes
Parent material: Residuum derived from sandstone
Slope range: 15 to 55 percent

Associated Soils

• Gilpin soils, which have less sand and more clay in the subsoil than Alticrest soils, are in areas of shale bedrock, and are on landforms similar to those of Alticrest soils
• Wallen soils, which have more rock fragments in the subsoil than Alticrest soils and are on landforms similar to those of Alticrest soils

Typical Pedon

Alticrest fine sandy loam; in an area of the Alticrest-Gilpin complex, 15 to 35 percent slopes, in the Appalachian Plateau in Lee County; 0.46 mile southeast of intersection of VA 628 and VA 720; 1.0 mile north of intersection of VA 720 and VA 606; lat. 36 degrees 47 minutes 58.5 seconds N, long. 83 degrees 1 minute 54.3 seconds W; Ben Hur quadrangle, Virginia; in woodland:

Oe—0 to 1 inch; partly decomposed leaf litter.
A—1 to 3 inches; very dark grayish brown (10YR 3/2) fine sandy loam; moderate fine granular structure; very friable, nonsticky, nonplastic; common very fine roots; 5 percent sandstone pebbles; very strongly acid; abrupt wavy boundary.
BE—3 to 5 inches; dark yellowish brown (10YR 4/4) sandy loam; moderate coarse granular structure; very friable, nonsticky, nonplastic; common very fine roots; 5 percent sandstone pebbles; strongly acid; clear wavy boundary.
Bw1—5 to 17 inches; yellowish brown (10YR 5/4) sandy loam; weak fine subangular blocky structure; very friable, nonsticky, nonplastic; few very fine and coarse roots; few medium vesicular pores; 5 percent sandstone pebbles; strongly acid; clear wavy boundary.
Bw2—17 to 27 inches; strong brown (7.5YR 5/6) sandy loam; weak coarse subangular blocky structure; very friable, nonsticky, nonplastic; few very fine and coarse roots; few medium vesicular pores; 10 percent sandstone pebbles; strongly acid; clear wavy boundary.
C—27 to 30 inches; strong brown (7.5YR 5/6) loamy sand; massive; very friable, nonsticky, nonplastic; few very fine and coarse roots; few medium vesicular pores; 10 percent sandstone pebbles; strongly acid; abrupt smooth boundary.
R—30 inches; hard sandstone bedrock.

Range in Characteristics

Solum thickness: 20 to 40 inches
Depth to bedrock: 20 to 40 inches
Reaction: Very strongly acid or strongly acid
Rock fragments: Sandstone pebbles range, by volume, from 0 to 15 percent in each horizon

A horizon:
Hue—7.5YR or 10YR
Value—3 or 4
Chroma—2 to 4
Texture—fine sandy loam

E horizon: (where it occurs)
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—2 to 8
Texture—sandy loam, loam, or fine sandy loam

BE horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—2 to 8
Texture—sandy loam, loam, or fine sandy loam

BA horizon: (where it occurs)
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—2 to 8
Texture—sandy loam, loam, or fine sandy loam

Bw horizon:
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—3 to 8
Texture—sandy loam, loam, or fine sandy loam

C horizon:
Hue—7.5YR or 10YR
Value—5 to 7
Chroma—3 to 6
Texture—sandy loam, loamy sand, or sand

Beech Grove Series

Depth to bedrock: Very shallow
Drainage class: Excessively drained
Permeability: Moderate
Physiographic province: Valley and Ridge
Landscape: The limestone valley and mountains
Landform: Hillslopes and mountain slopes
Parent material: Residuum derived from limestone
Slope range: 3 to 60 percent

Associated Soils

• Carbo soils, which are moderately deep to limestone bedrock, have more clay in the subsoil than Beech Grove soils, and are on landforms similar to those of Beech Grove soils

Typical Pedon

Beech Grove silt loam; in an area of the Beech Grove-Rock outcrop complex, 3 to 60 percent slopes; 225 feet north of VA 679 at a point 0.9 mile west of intersection of VA 833 and VA 679; lat. 36 degrees 36 minutes 39 seconds N, long. 83 degrees 15 minutes 41 seconds W; Back Valley quadrangle, Tennessee-Virginia; in woodland:

A—0 to 3 inches; very dark brown (10YR 2/2) silt loam; weak fine and medium granular structure; very friable; common medium and many fine and very fine roots; 10 percent limestone channers; moderately alkaline; abrupt smooth boundary.
R—3 inches; limestone bedrock

Range In Characteristics

Solum thickness: 1 to 10 inches
Depth to bedrock: 1 to 10 inches
Rock fragments: 0 to 35 percent
Reaction: Slightly acid to moderately alkaline

A horizon:
Hue—7.5YR or 10YR
Value—2 or 3
Chroma—2 or 3
Texture—silt loam

Berks Series

Depth to bedrock: Moderately deep
Drainage class: Well drained
Permeability: Moderate and moderately rapid
Physiographic province: Valley and Ridge; Appalachian Plateau, Cumberland Plateau and Cumberland Mountain section
Landscape: Mountains and foothills
Landform: Mountain slopes and hillslopes
Parent material: Residuum derived from shale and siltstone
Slope range: 15 to 80 percent

Associated Soils

- Gilpin soils, which have fewer rock fragments in the subsoil than Berks soils and are on landforms similar to those of Berks soils
- Weikert soils, which are shallow to shale bedrock and are on landforms similar to those of Berks soils
- Soils that are very deep to bedrock, that have fewer rock fragments in the subsoil than Berks soils, and that are on footslopes and concave head slopes

Typical Pedon

Berks silt loam, in an area of the Berks-Weikert complex, 15 to 35 percent slopes, in the Valley and Ridge province of Lee County; 800 feet north of VA 610 at a point 0.3 mile east of Tennessee state line; lat. 36 degrees 35 minutes 50 seconds N, long. 83 degrees 5 minutes 51 seconds W; Kyles Ford, quadrangle, Tennessee-Virginia; in woodland:

Oe—0 to 1 inch; partly decomposed leaf litter.
A—1 to 5 inches; dark brown (10YR 3/3) silt loam; moderate fine granular structure; very friable; common very fine and fine roots; 10 percent shale channers; strongly acid; abrupt smooth boundary.
Bw1—5 to 10 inches; dark yellowish brown (10YR 4/4) very channery silt loam; weak fine subangular blocky structure parting to weak fine and medium granular; very friable; common very fine and fine roots; 45 percent shale channers; strongly acid; clear smooth boundary.
Bw2—10 to 16 inches; yellowish brown (10YR 5/4) very channery silt loam; weak fine and medium subangular blocky structure; very friable; few very fine and fine roots; 55 percent shale channers; strongly acid; clear smooth boundary.
C—16 to 29 inches; yellowish brown (10YR 5/6) extremely channery silt loam; massive; very friable; few very fine roots; 70 percent shale channers; strongly acid; abrupt smooth boundary.
R—29 inches; shale bedrock.

Range in Characteristics

Solum thickness: 12 to 40 inches
Depth to bedrock: 20 to 40 inches
Reaction: Extremely acid to slightly acid
Rock fragments: Shale channers range from 10 to 15 percent in the A horizon, 15 to 75 percent in individual subhorizons of the B horizon, and 35 to 90 percent in the C horizon; the average content of rock fragments in the particle size control section is more than 35 percent

A horizon:
Hue—10YR
Value—3 to 5
Chroma—2 to 4
Texture—silt loam

Bw horizon:
Hue—5YR to 2.5Y
Value—4 to 6
Chroma—3 to 8
Texture—loam, silt loam, or silty clay loam in the fine earth fraction

C horizon:
Hue—5YR to 2.5Y
Value—4 to 6
Chroma—2 to 8

Texture—loam or silt loam in the fine earth fraction

Bethesda Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Physiographic province: Appalachian Plateau, Cumberland Plateau and Cumberland Mountain section
Landscape: Mountains and foothills
Landform: Mountain slopes and hillslopes that have been strip-mined for coal
Parent material: Acid regolith that is from the stripmining of coal and that contains partly weathered fine earth and fragments of bedrock, which consist mainly of shale, mudstone, and siltstone but also of some coal and sandstone
Slope range: 0 to 80 percent

Associated Soils

- Fairpoint soils, which are less acid than Bethesda soils and are on landforms similar to those of Bethesda soils
- Sewell soils, which have more sand and less silt and clay in the subsoil than Bethesda soils, have rock fragments that are dominantly coarse-grained sandstone in the soil profile, and are on landforms similar to those of Bethesda soils
- Itmann soils, which have coarse-grained carbolithic fragments from waste material of deep-mined coal, in head-of-hollow fills and in coal mine dumps
- Gilpin soils, which are moderately deep to shale bedrock and are on adjacent, undisturbed hillslopes
- Alticrest soils, which are moderately deep to sandstone bedrock and are on adjacent, undisturbed hillslopes

Typical Pedon

Bethesda gravelly silt loam; in an area of Bethesda, Fairpoint, and Sewell soils, 0 to 80 percent slopes, very rocky; 2.1 miles north-northeast of intersection of VA 765 and U.S. 421; lat. 36 degrees 47 minutes 52.6 seconds N, long. 83 degrees 5 minutes 46.7 seconds W; Pennington Gap quadrangle, Virginia-Kentucky; in a reclaimed area planted to grasses and small shrubs:

A—0 to 7 inches; dark grayish brown (10YR 4/2) gravelly silt loam; moderate fine granular structure; friable, slightly sticky, slightly plastic; many very fine roots; 15 percent irregularly shaped rock fragments oriented in an irregular pattern (95 percent shale pebbles, 5 percent sandstone pebbles and coal fragments); moderately acid; abrupt irregular boundary.

C1—7 to 23 inches; mixed brown (10YR 4/3) and yellowish brown (10YR 5/4) very channery silt loam; massive; friable, slightly sticky, slightly plastic; common very fine roots; 50 percent irregularly shaped rock fragments oriented in an irregular pattern (95 percent shale channers, 5 percent sandstone pebbles and coal fragments); strongly acid; gradual irregular boundary.

C2—23 to 62 inches; mixed very dark grayish brown (10YR 3/2) and dark gray (10YR 4/1) extremely channery silty clay loam; massive; friable, slightly sticky, slightly plastic; few very fine roots; 65 percent irregularly shaped rock fragments oriented in an irregular pattern (85 percent shale channers, 10 percent mudstone stones, 5 percent sandstone pebbles and coal fragments); very strongly acid; few coarse strong brown (7.5YR 5/6) pockets of strongly acid silty clay loam.

Range in Characteristics

Solum thickness: 0 to 7 inches
Depth to bedrock: More than 60 inches
Reaction: Strongly acid to extremely acid (in unlimed areas)
Rock fragments: Dominantly shale, siltstone, and mudstone but also small amounts of sandstone and coal that range in size up to 10 inches or more and by volume from 15 to 35 percent in the A horizon and from 15 to 80 percent in the C horizon

A or Ap horizon:
Hue—7.5YR to 5Y, or neutral
Value—3 to 6
Chroma—0 to 8
Texture—silt loam in the fine earth fraction

C horizon:
Hue—7.5YR to 5Y, or neutral
Value—3 to 6
Chroma—0 to 8
Texture—in the fine earth fraction dominantly silty clay loam, silt loam, or, less commonly, clay loam and loam

Carbo Series

Depth to bedrock: Moderately deep
Drainage class: Well drained
Permeability: Slow
Physiographic province: Valley and Ridge
Landscape: The limestone valley and foothills
Landform: Hillslopes
Parent material: Residuum derived from limestone
Slope range: 7 to 60 percent

Associated Soils

- Frederick soils, which are very deep to limestone bedrock and are on landforms similar to those of Carbo soils
- Timberville soils, which are very deep to bedrock and are in drainageways and in the bottom of sinkholes
- Beech Grove soils, which are very shallow to limestone bedrock and are on landforms similar to those of Carbo soils
- Poplimento soils, which are very deep to interbedded shale and limestone bedrock and are on landforms similar to those of Carbo soils
- Watahala soils, which are very deep to limestone bedrock, have more chert pebbles in the upper part of the soil profile than Carbo soils, and are on landforms similar to those of Carbo soils

Typical Pedon

Carbo silt loam, in an area of the Carbo-Beech Grove complex, 7 to 15 percent slopes, rocky; 0.25 mile southwest of junction of U.S. 421 and VA 642; 0.68 mile east-northeast of junction of VA 642 and VA 638; lat. 36 degrees 43 minutes 40.6 seconds N, long. 82 degrees 59 minutes 47.7 seconds W; Stickleyville quadrangle, Virginia; in a pasture:

Ap—0 to 3 inches; brown (10YR 4/3) silt loam; weak fine granular structure; friable, sticky, plastic; common very fine roots; slightly acid; clear wavy boundary.

BA—3 to 8 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium granular structure; friable, sticky, plastic; few very fine roots; slightly acid; clear wavy boundary.

Bt1—8 to 20 inches; strong brown (7.5YR 5/8) clay; moderate fine subangular blocky structure; friable, sticky, plastic; few very fine roots; many distinct clay films on faces of peds; few fine black manganese stains on faces of peds; slightly acid; clear wavy boundary.

Bt2—20 to 28 inches; yellowish red (5YR 4/6) clay; moderate fine subangular blocky structure; friable, sticky, plastic; few very fine roots; many distinct clay films on faces of peds; few fine black manganese stains on faces of peds; slightly acid; abrupt smooth boundary.

R—28 inches; limestone bedrock.

Range in Characteristics

Solum thickness: 20 to 40 inches
Depth to bedrock: 20 to 40 inches
Reaction: Very strongly acid to neutral in the A, Ap, and BA horizons; moderately acid to slightly alkaline in the Bt and BC horizons
Rock fragments: Limestone, shale, or quartz fragments range, by volume, from 0 to 10 percent in the A horizon and from 0 to 15 percent in the B and C horizons

Ap horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—3 to 6
Texture—silt loam

A horizon: (where it occurs)
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—2 to 6
Texture—silt loam

BA horizon:
Hue—7.5YR or 10YR
Value—3 to 6
Chroma—4 to 8
Texture—silt loam or silty clay loam

Bt horizon:
Hue—5YR to 10YR
Value—4 to 6
Chroma—4 to 8
Texture—clay

BC horizon: (where it occurs)
Hue—7.5YR to 2.5Y
Value—4 or 5
Chroma—4 to 8
Texture—clay or silty clay

Chagrin Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderate
Physiographic province: Valley and Ridge
Landscape: The limestone valley and foothills
Landform: Flood plains
Parent material: Recent alluvium derived from limestone, shale, and sandstone
Slope range: 0 to 3 percent

Associated Soils

- Holly soils, which are poorly drained and are on the lower flood plains
- Orrville soils, which are somewhat poorly drained and are on landforms similar to those of Chagrin soils
- Lobdell soils, which are moderately well drained and are on landforms similar to those of Chagrin soils
- Timberville soils, which are well drained and are on colluvial foot slopes and in colluvial drainageways

Typical Pedon

Chagrin loam, in an area of the Chagrin-Lobdell complex, 0 to 3 percent slopes, occasionally flooded; 400 feet south of Alt. U.S. 58 at a point 2,200 feet east of VA 643; lat. 36 degrees 44 minutes 51 seconds N, long. 83 degrees 2 minutes 49 seconds W; Ben Hur quadrangle, Virginia; on a flood plain of Cane Creek; in hayland:

Ap—0 to 6 inches; brown (10YR 4/3) loam; moderate medium granular structure; very friable, slightly sticky, slightly plastic; many very fine and few fine roots; neutral; abrupt smooth boundary.

Bw1—6 to 18 inches; dark yellowish brown (10YR 4/4) loam; moderate medium subangular blocky structure; friable, slightly sticky, slightly plastic; common very fine roots; many brown (10YR 4/3) organic stains on ped faces and in root channels; 1 percent rounded sandstone pebbles; neutral; abrupt smooth boundary.

Bw2—18 to 42 inches; strong brown (7.5YR 4/6) sandy clay loam; moderate fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few very fine roots; 5 percent rounded sandstone pebbles; neutral; common brown (10YR 4/3) organic stains on ped faces and in root channels in the upper part of the horizon; clear wavy boundary.

C—42 to 62 inches; brown (7.5YR 4/4) sandy loam; massive; very friable, slightly sticky, slightly plastic; 10 percent rounded sandstone pebbles; neutral.

Range in Characteristics

Solum thickness: 24 to 48 inches
Depth to bedrock: More than 60 inches
Reaction: Ranges from moderately acid to neutral
Rock fragments: Rounded sandstone, subrounded chert, or subrounded shale channers that range, by volume, from 0 to 15 percent in the A or Ap horizon and from 0 to 15 percent in the Bw and C horizons; and, below a depth of 40 inches, pebbles that range, by volume, to 25 percent

A or Ap horizon:
Hue—10YR or 7.5YR
Value—2 to 4
Chroma—1 to 4
Texture—loam

Bw horizon:
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—3 to 6
Texture—loam, sandy clay loam, clay loam, or silt loam that has, in some pedons, thin subhorizons or pockets of sandy loam

C horizon:
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—2 to 6
Texture—loam, silt loam, sandy loam, or, in some pedons below a depth of 40 inches, stratified layers of loams and sands, the gravelly analog of loams and sands, or both

Escatawba Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderate in the upper part of the solum and moderately slow in the 2Bt horizon
Physiographic province: Valley and Ridge
Landscape: Foothills
Landform: Hillslopes
Parent material: Colluvium derived from sandstone, shale, and some limestone
Slope range: 2 to 15 percent

Associated Soils

- Jefferson soils, which do not have a seasonal high water table and are on elevated landforms that are similar or higher than those of Escatawba soils
- Oriskany soils, which have more rock fragments in the subsoil and are on the higher landforms
- Gilpin soils, which are moderately deep to shale bedrock and are on hillslopes

Typical Pedon

Escatawba loam; in an area of the Escatawba-Jefferson complex, 7 to 15 percent slopes; 1 mile west-northwest of intersection of VA 724 and VA 860, 1.37 miles north-northwest of easternmost intersection of U.S. 58 and VA 684; lat. 36 degrees 39 minutes 8.2 seconds N, long. 83 degrees 26 minutes 58 seconds W; Ewing quadrangle, Kentucky-Virginia; in woodland:

Ap—0 to 5 inches; dark brown (10YR 3/3) loam; moderate fine granular structure; very friable, nonsticky, nonplastic; common fine roots; 5 percent sandstone pebbles; strongly acid; abrupt smooth boundary.

BE—5 to 17 inches; yellowish brown (10YR 5/4) loam; weak coarse subangular blocky structure; very friable, nonsticky, nonplastic; common fine roots; 5 percent sandstone pebbles; strongly acid; clear wavy boundary.

Bt1—17 to 38 inches; yellowish brown (10YR 5/6) loam; moderate fine and medium subangular

blocky structure; friable, slightly sticky, slightly plastic; few fine roots; common faint clay films on faces of peds; 5 percent sandstone pebbles; very strongly acid; clear wavy boundary.

2Bt2—38 to 47 inches; strong brown (7.5YR 5/6) clay loam; moderate fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; common coarse prominent pale brown (10YR 6/3) iron depletions; common faint clay films on faces of peds; 10 percent sandstone pebbles, 2 percent sandstone cobbles; very strongly acid; gradual wavy boundary.

2Bt3—47 to 62 inches; strong brown (7.5YR 5/6) gravelly clay loam; moderate fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; many coarse prominent light brownish gray (10YR 6/2) iron depletions and yellowish red (5YR 5/8) masses of iron accumulation; common faint clay films on faces of peds; 15 percent sandstone pebbles, 5 percent sandstone cobbles; very strongly acid.

Range in Characteristics

Solum thickness: More than 60 inches
Depth to bedrock: More than 60 inches
Reaction: Extremely acid to strongly acid in the A, E, and BE horizons and very strongly acid or strongly acid in the Bt, 2Bt, and 3Bt horizons
Rock fragments: Pebbles and cobbles range, by volume, from 0 to 15 percent in the A, E, and BE horizons, from 0 to 35 percent in the Bt horizon, from 10 to 35 percent in the upper part of the 2Bt horizon, from 15 to 50 percent in the lower part of the 2Bt horizon, and from 20 to 50 percent in the 3Bt horizon

Ap horizon:
Hue—10YR
Value—3 to 6
Chroma—1 to 3
Texture—loam

A horizon: (where it occurs)
Hue—10YR
Value—3 to 6
Chroma—1 to 3
Texture—loam

E horizon: (where it occurs)
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—3 to 6
Texture—fine sandy loam, loam, or silt loam

BE horizon:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—3 to 6
Texture—fine sandy loam, loam, or silt loam

Bt horizon:
Hue—7.5YR to 2.5Y
Value—5 or 6
Chroma—4 to 8
Texture—loam or silt loam in the fine earth fraction

2Bt horizon:
Hue—2.5YR to 10YR
Value—4 to 6
Chroma—4 to 8
Texture—clay loam or clay in the fine earth fraction

3Bt horizon: (where it occurs)
Hue—2.5YR to 10YR
Value—4 to 6
Chroma—4 to 8
Texture—clay loam or clay in the fine earth fraction

Fairpoint Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Physiographic province: Appalachian Plateau, Cumberland Plateau and Cumberland Mountain section
Landscape: Mountains and foothills
Landform: Mountain slopes and hillslopes that have been strip-mined for coal
Parent material: Nonacid regolith that is from the surface-mining of coal and that contains partly weathered fine earth and fragments of bedrock, which consist mainly shale, mudstone, and siltstone but also of some coal and sandstone
Slope range: 0 to 80 percent

Associated Soils

- Bethesda soils, which are more acid and are on landforms similar to those of Fairpoint soils
- Sewell soils, which have more sand and less silt and clay in the subsoil than Fairpoint soils, have rock fragments that are dominantly coarse-grained sandstone in the soil profile, and are on landforms similar to those of Fairpoint soils
- Itmann soils, which contain coarse-grained carbolithic fragments from waste material of deep mined coal and are in head-of-hollow fills and in coal mine dumps
- Gilpin soils, which are moderately deep to shale bedrock and are on adjacent, undisturbed hillslopes
- Alticrest soils, which are moderately deep to

sandstone bedrock and are on adjacent, undisturbed hillslopes

Typical Pedon

Fairpoint shaly silt loam; in an area of Bethesda, Fairpoint, and Sewell soils, 0 to 80 percent slopes, very rocky; 0.72 mile west-northwest of intersection of VA 765 and VA 754; 2.1 miles north-northeast of intersection of VA 765 and U.S. 421; lat. 36 degrees 47 minutes 55.6 seconds N, long. 83 degrees 5 minutes 36.9 seconds W; Pennington Gap quadrangle, Virginia-Kentucky; in a reclaimed area planted to grasses and small shrubs:

A—0 to 5 inches; very dark grayish brown (10YR 3/2) shaly silt loam; weak fine and medium granular structure; friable, slightly sticky, slightly plastic; common very fine and fine roots; 20 percent irregularly shaped rock fragments oriented in an irregular pattern (70 percent shale channers, 18 percent sandstone pebbles, 10 percent sandstone cobbles, and 2 percent coal fragments); slightly alkaline; clear wavy boundary.

C1—5 to 9 inches; yellowish brown (10YR 5/4) very channery loam; massive; friable, slightly sticky, slightly plastic; common very fine and fine roots; 40 percent irregularly shaped rock fragments oriented in an irregular pattern (70 percent shale channers, 18 percent sandstone pebbles, 10 percent sandstone cobbles, and 2 percent coal fragments); slightly alkaline; abrupt wavy boundary.

C2—9 to 21 inches; very dark gray (10YR 3/1) very channery silt loam; massive; friable, slightly sticky, slightly plastic; few very fine roots; 40 percent irregularly shaped rock fragments oriented in an irregular pattern (70 percent shale channers, 18 percent sandstone pebbles, 10 percent sandstone cobbles, and 2 percent coal fragments); moderately acid; many medium prominent pale olive (5Y 6/4) lithochromic mottles; abrupt wavy boundary.

C3—21 to 62 inches; brown (10YR 4/3) very channery silt loam; massive; firm, slightly sticky, slightly plastic; few very fine roots; 45 percent irregularly shaped rock fragments oriented in an irregular pattern (70 percent shale channers, 18 percent sandstone pebbles, 10 percent sandstone cobbles, and 2 percent coal fragments); neutral; many medium prominent yellowish brown (10YR 5/8) lithochromic mottles.

Range in Characteristics

Solum thickness: 0 to 8 inches
Depth to bedrock: More than 60 inches
Reaction: Moderately acid to neutral, but where limed the surface layer can be slightly alkaline
Rock fragments: Dominantly shale, siltstone, and mudstone and small amounts of sandstone and coal that range in size to 10 inches or more and by volume from 15 to 35 percent in the A horizon and from 35 to 80 percent in the C horizon

A or Ap horizon:
Hue—7.5YR to 5Y, or neutral
Value—3 to 6
Chroma—0 to 6
Texture—silt loam in the fine earth fraction

C horizon:
Hue—7.5YR to 5Y, or neutral
Value—3 to 6
Chroma—0 to 8
Texture—in the fine earth fraction silty clay loam or silt loam, but in some pedons clay loam and loam

Frederick Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderate
Physiographic province: Valley and Ridge
Landscape: The limestone valley
Landform: Hillslopes
Parent material: Residuum derived from limestone
Slope range: 2 to 60 percent

Associated Soils

- Carbo soils, which are moderately deep to limestone bedrock and are on landforms similar to those of Frederick soils
- Watahala soils, which have more chert pebbles in the upper part of the subsoil than Frederick soils, are deeper to a clayey subsoil than Frederick soils, and are on landforms similar to those of Frederick soils
- Timberville soils, which have a zone of accumulated clay more than 20 inches below the surface, are darker than Frederick soils, and are in depressions or adjacent to drainageways

Typical Pedon

Frederick silt loam, karst, 7 to 15 percent slopes; 400 feet west of VA 638 at a point 0.4 mile north of intersection of U.S. 58 and VA 638; lat. 36 degrees 42 minutes 20 seconds N, long. 82 degrees 59 minutes 39 seconds W; Stickleyville quadrangle, Virginia; in a cultivated field:

Ap—0 to 9 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure;

friable; few very fine and fine roots; 10 percent chert pebbles; moderately acid; abrupt smooth boundary.
Bt1—9 to 21 inches; yellowish red (5YR 4/6) clay; moderate medium subangular blocky structure; friable; few very fine roots; few distinct clay films on faces of peds; 5 percent chert pebbles; moderately acid; clear smooth boundary.
Bt2—21 to 43 inches; yellowish red (5YR 4/6) clay; moderate medium subangular blocky structure; firm; few very fine roots; common distinct clay films on faces of peds; 10 percent chert pebbles; strongly acid.
Bt3—43 to 62 inches; red (2.5YR 4/6) gravelly clay; moderate medium subangular blocky structure; firm; few very fine roots; common distinct clay films on faces of peds; 15 percent chert pebbles; strongly acid.

Range In Characteristics

Solum thickness: More than 60 inches
Depth to bedrock: More than 72 inches
Reaction: Very strongly acid to moderately acid (in unlimed areas)
Rock fragments: Dominantly chert that ranges, by volume, from 0 to 35 percent in the A horizon, from 0 to 60 percent in the E, BA, or BE horizons, and from 0 to 35 percent in the Bt, BC, or C horizons

Ap horizon:
Hue—5YR to 10YR
Value—4 to 6
Chroma—2 to 8
Texture—silt loam or loam in the fine earth fraction

A horizon: (where it occurs)
Hue—7.5YR or 10YR
Value—3 or 4
Chroma—1 to 4
Texture—silt loam or loam in the fine earth fraction

E horizon: (where it occurs)
Hue—7.5YR or 10YR
Value—5 to 7
Chroma—3 to 8
Texture—silt loam or loam in the fine earth fraction

BA or BE horizon: (where it occurs)
Hue—2.5YR to 10YR
Value—4 to 6
Chroma—4 to 8
Texture—silt loam, silty clay loam, or clay loam in the fine earth fraction

Bt horizon:
Hue—2.5YR or 5YR
Value—4 to 6
Chroma—4 to 8
Texture—in the fine earth fraction clay loam, silty clay loam, silty clay, or clay in the upper part and silty clay or clay in the lower part

BC horizon: (where it occurs)
Hue—2.5YR to 10YR
Value—3 to 6
Chroma—3 to 8
Texture—silty clay or clay in the fine earth fraction

C horizon: (where it occurs)
Hue—7.5YR or 5YR
Value—4 to 6
Chroma—4 to 8
Texture—silty clay or clay in the fine earth fraction

Gilpin Series

Depth to bedrock: Moderately deep
Drainage class: Well drained
Permeability: Moderate
Physiographic province: Valley and Ridge; Appalachian Plateaus, Cumberland Plateau and Cumberland Mountain section
Landscape: Mountains and foothills
Landform: Mountain slopes and hillslopes
Parent material: Residuum derived from shale, siltstone, and some sandstone
Slope range: 7 to 70 percent

Associated Soils

• Berks soils, which have more rock fragments in the subsoil than Gilpin soils and are on landforms similar to those of Gilpin soils
• Wallen soils, which have more rock fragments and sand in the subsoil than Gilpin soils, are in areas of sandstone bedrock, are on landforms similar to those of Gilpin soils, and are on shoulders and summits
• Alticrest soils, which have more sand and less clay in the subsoil than Gilpin soils, are in areas of sandstone bedrock, are on landforms similar to those of Gilpin soils, and are on shoulders and summits

Typical Pedon

Gilpin silt loam, in an area of the Gilpin-Berks complex, 35 to 55 percent slopes; in the Appalachian Plateau in Lee County; 0.55 mile south-southwest of intersection of U.S. 421 and VA 765; 0.99 mile west-southwest of intersection of U.S. 421 and VA 741; lat. 36 degrees 45 minutes 37.7 seconds N, long. 83 degrees 6 minutes 10.1 seconds W; Pennington Gap quadrangle, Virginia-Kentucky; in woodland:

Oe—0 to 1 inch; partly decomposed leaf litter.
A—1 to 2 inches; dark yellowish brown (10YR 4/4) silt

loam; weak fine granular structure; very friable, slightly sticky, slightly plastic; common very fine to coarse roots; 5 percent shale channers; strongly acid; abrupt smooth boundary.

BE—2 to 5 inches; yellowish brown (10YR 5/4) silt loam; moderate coarse granular structure; very friable, slightly sticky, slightly plastic; common very fine to coarse roots; 5 percent shale channers; strongly acid; clear wavy boundary.

Bt—5 to 19 inches; yellowish brown (10YR 5/6) silty clay loam; moderate very fine and fine subangular blocky structure; friable, slightly sticky, slightly plastic; common fine and medium roots; common distinct clay films on faces of peds; few fine vesicular pores; 5 percent shale channers; strongly acid; gradual wavy boundary.

BC—19 to 29 inches; yellowish brown (10YR 5/6) silty clay loam; common coarse prominent strong brown (7.5YR 5/8) lithochromic mottles; moderate fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine and medium roots; few distinct clay films on faces of peds; few fine vesicular pores; 10 percent shale channers; strongly acid; abrupt wavy boundary.

Cr—29 inches; shale bedrock.

Range in Characteristics

Solum thickness: 18 to 36 inches
Depth to bedrock: 20 to 40 inches
Reaction: Strongly acid to extremely acid
Rock fragments: Mostly shale or siltstone channers and some sandstone channers that range, by volume, from 0 to 15 percent in the A horizon, from 5 to 40 percent in the BA, BE, Bt, and BC horizons, and from 30 to 90 percent in the C horizon; and, in the upper 20 inches of the argillic horizon, are less than 35 percent

A horizon:
Hue—10YR
Value—3 to 5, dry 6 or 7
Chroma—2 to 4
Texture—silt loam

BA horizon: (where it occurs)
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—3 to 5
Texture—silt loam or loam in the fine earth fraction

BE horizon:
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—3 to 5
Texture—silt loam or loam in the fine earth fraction

Bt horizon:
Hue—7.5YR to 2.5Y
Value—4 to 6
Chroma—4 to 8
Texture—silt loam, loam, clay loam, or silty clay loam in the fine earth fraction

BC horizon: (where it occurs)
Hue—7.5YR to 2.5Y
Value—3 to 6
Chroma—2 to 8
Texture—silt loam, loam, or silty clay loam in the fine earth fraction

C horizon: (where it occurs)
Hue—7.5YR to 2.5Y
Value—3 to 5
Chroma—2 to 6
Texture—silt loam, loam, or silty clay loam in the fine earth fraction

Holly Series

Depth to bedrock: Very deep
Drainage class: Poorly drained
Permeability: Moderate or moderately slow in the solum and moderate or moderately rapid below the solum
Physiographic province: Valley and Ridge
Landscape: The limestone valley and foothills
Landform: Flood plains
Parent material: Alluvium derived from limestone, shale, and a very small amount of sandstone
Slope range: 0 to 2 percent

Associated Soils

- Orrville soils, which are somewhat poorly drained and are on the higher flood plains
- Lobdell soils, which are moderately well drained and are on the higher flood plains
- Chagrin soils, which are well drained and are on the higher flood plains

Typical Pedon

Holly loam, 0 to 2 percent slopes, frequently flooded; 0.27 mile south-southeast of intersection of VA 659 and VA 656; lat. 36 degrees 42 minutes 46.1 seconds N, long. 83 degrees 11 minutes 35.9 seconds W; Hubbard Springs quadrangle, Virginia-Kentucky; on a flood plain of Trading Creek in Lee County; in pasture:

Ap—0 to 4 inches; dark gray (10YR 4/1) loam; moderate medium granular structure; friable, slightly sticky, slightly plastic; common fine roots; common fine prominent yellowish red (5YR 4/6) masses of iron accumulation on faces of peds; slightly acid; clear wavy boundary.

Bg1—4 to 10 inches; gray (5Y 5/1) loam; moderate fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; common fine roots; common fine prominent strong brown (7.5YR 5/8) masses of iron accumulation on faces of peds; slightly acid; clear wavy boundary.

Bg2—10 to 34 inches; dark gray (5Y 4/1) loam; weak coarse subangular blocky structure; friable, slightly sticky, slightly plastic; 2 percent rounded sandstone pebbles; few fine prominent strong brown (7.5YR 5/8) masses of iron accumulation on faces of peds; slightly acid; clear wavy boundary.

Cg—34 to 62 inches; dark gray (N 4/0) loam; massive; friable, slightly sticky, slightly plastic; 5 percent rounded sandstone pebbles; slightly acid.

Range in Characteristics

Solum thickness: 20 to 44 inches
Depth to bedrock: More than 60 inches
Reaction: Moderately acid to neutral in the A horizon, strongly acid to neutral in the B horizon, and moderately acid to slightly alkaline in the C horizon
Rock fragments: 0 to 10 percent in the A horizon, 0 to 15 percent in the B horizon, and 0 to 25 percent in the Cg horizon

Ap horizon:
Hue—10YR
Value—4
Chroma—1 or 2
Texture—loam

A horizon: (where it occurs)
Hue—10YR
Value—2 or 3
Chroma—1
Texture—loam

Bg horizon:
Hue—10YR to 5Y, or neutral
Value—4 to 6
Chroma—2 or less
Texture—silt loam, loam, silty clay loam, or sandy loam

Cg horizon:
Hue—10YR to 5Y, or neutral
Value—4 to 7
Chroma—2 or less
Texture—silt loam, loam, or sandy loam in the fine earth fraction and, in some pedons below a depth of 40 inches, stratified layers of loams, clays, sands, and sands and pebbles

Itmann Series

Depth to bedrock: Very deep
Drainage class: Somewhat excessively drained
Permeability: Rapid and moderately rapid
Physiographic province: Appalachian Plateau, Cumberland Plateau and Cumberland Mountain section
Landscape: Foothills
Landform: Hillslopes in areas of mine dumps and tailings receiving waste material from deep-mined coal
Parent material: Acid regolith that is waste materials from deep-mined coal and that contains partly weathered fine earth and fragments of bedrock, which consist mainly of acid carboliths and black or dark colored shale, but also of small amounts of siltstone, sandstone, and light-colored shale
Slope range: 0 to 80 percent

Associated Soils

- Fairpoint soils, which are less acid, are lighter, and have more fine grained material in the soil profile than Itmann soils, have rock fragments that are dominantly light-colored shale in the soil profile, and are on reclaimed strip-mined benches, out slopes, and areas restored to about the original contour
- Bethesda soils, which are lighter than Itmann soils, have more fine grained material in the soil profile, have rock fragments that are dominantly light-colored shale in the soil profile, and are on reclaimed strip-mined benches, out slopes, and areas restored to about the original contour
- Sewell soils, which are lighter than Itmann soils, have rock fragments that are dominantly brown sandstone in the soil profile, and that are on reclaimed strip-mined benches, out slopes, and areas restored to about the original contour
- Gilpin and Alticrest soils, which are moderately deep to bedrock and are on adjacent, undisturbed hillslopes
- Pineville soils, which formed in undisturbed colluvium in drainageways and on foot slopes

Typical Pedon

Itmann extremely channery sandy loam, 0 to 80 percent slopes; 1.52 miles west-northwest of the westernmost intersection of VA 624 and VA 606; lat. 36 degrees 51 minutes 44.4 seconds N, long. 82 degrees 56 minutes 18.7 seconds W; Keokee quadrangle, Virginia-Kentucky; in mine dumps from deep coal mines:

C1—0 to 37 inches; mixed black (10YR 2/1) and very dark grayish brown (10YR 3/2) extremely channery sandy loam; common coarse prominent olive

yellow (2.5Y 6/6) soft masses from the oxidation of sulfur and iron minerals; few prominent white (N 8/0) flaky and crusty precipitates on surfaces of rock fragments in the upper 6 inches of the horizon; massive; loose, nonsticky, nonplastic; 80 percent rock fragments (90 percent dark colored carbolithic channers, 10 percent light-colored shale and sandstone); very strongly acid; diffuse broken boundary.

C2—37 to 62 inches; mixed black (10YR 2/1) and very dark grayish brown (10YR 3/2) extremely channery sandy loam; massive; loose, nonsticky, nonplastic; 80 percent rock fragments (90 percent dark colored carbolithic channers, 10 percent light-colored shale and sandstone); very strongly acid.

Range in Characteristics

Depth to bedrock: More than 60 inches
Reaction: Extremely acid to strongly acid (except for layers that have been limed)
Rock fragments: Dominantly carbolithic fragments and dark colored, shaly material but also some light-colored sandstone and shale that range, by volume, from 60 to 80 percent in the A horizon and from 35 to 80 percent in the AC and C horizons

A horizon: (where it occurs in reclaimed areas where soil material has been stockpiled on refuse piles)
Hue—10YR or 2.5Y
Value—2 to 6
Chroma—2 to 6
Texture—loam or sandy loam in the fine earth fraction

AC horizon: (where it occurs)
Hue—10YR or neutral
Value—2 or 3
Chroma—1 or 2
Texture—in the fine earth fraction sandy loam or loam that has pockets of loamy sand

C horizon:
Hue—10YR or neutral
Value—2 or 3
Chroma—1 or 2
Texture—in the fine earth fraction sandy loam or loam that has pockets of loamy sand

Jefferson Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately rapid
Physiographic province: Valley and Ridge
Landscape: Mountains and foothills
Landform: Mountain slopes and hillslopes
Parent material: Colluvium derived from sandstone and shale
Slope range: 2 to 35 percent

Associated Soils

- Escatawba soils, which have a seasonal high water table at a depth of 30 to 48 inches and are on landforms similar to or lower than those of Jefferson soils
- Oriskany soils, which have more rock fragments in the subsoil and on the soil surface than Jefferson soils and are on landforms similar to or higher than those of Jefferson soils
- Gilpin soils, which are moderately deep to shale bedrock and are on hillslopes

Typical Pedon

Jefferson loam, in an area of the Escatawba-Jefferson complex, 7 to 15 percent slopes; 0.19 mile north of intersection of VA 845 and VA 621, 1.83 miles east-northeast of intersection of VA 621 and VA 726; lat. 36 degrees 47 minutes 53.6 seconds N, long. 82 degrees 55 minutes 19.7 seconds W; Keokee quadrangle, Virginia; in pasture:

Ap—0 to 4 inches; brown (10YR 4/3) loam; moderate medium granular structure; friable, slightly sticky, slightly plastic; common very fine roots; 3 percent subangular sandstone pebbles, 2 percent well rounded, weathered conglomerate pebbles; moderately acid; abrupt smooth boundary.

BA—4 to 11 inches; dark yellowish brown (10YR 4/4) loam; moderate coarse granular structure; friable, slightly sticky, slightly plastic; common very fine roots; few very fine vesicular pores; 3 percent subangular sandstone pebbles, 2 percent well rounded, weathered conglomerate pebbles; moderately acid; abrupt smooth boundary.

Bt1—11 to 23 inches; strong brown (7.5YR 4/6) clay loam; moderate medium subangular blocky structure; friable, slightly sticky, slightly plastic; common very fine roots; common faint clay films on faces of peds; common very fine vesicular pores; 3 percent subangular sandstone pebbles, 2 percent well rounded, weathered conglomerate pebbles; strongly acid; gradual wavy boundary.

Bt2—23 to 42 inches; yellowish brown (10YR 5/8) clay loam; moderate coarse subangular blocky structure; friable, slightly sticky, slightly plastic; few very fine roots; common faint clay films on faces of peds; common very fine vesicular pores; 3 percent subangular sandstone pebbles, 2 percent well rounded, weathered conglomerate pebbles; strongly acid; gradual wavy boundary.

BC—42 to 62 inches; yellowish brown (10YR 5/6)

gravelly clay loam; weak coarse subangular blocky structure; friable, slightly sticky, slightly plastic; few fine faint light yellowish brown (10YR 6/4) iron depletions; few faint clay films on faces of peds; common very fine vesicular pores; 15 percent subangular sandstone pebbles, 5 percent well rounded, weathered conglomerate pebbles; strongly acid.

Range in Characteristics

Solum thickness: More than 40 inches
Depth to bedrock: More than 60 inches
Reaction: Very strongly acid to slightly acid in the A horizon and strongly acid or very strongly acid in the B and C horizons
Rock fragments: By volume, from 0 to 15 percent in the A horizon, from 5 to 35 percent to a depth of about 40 inches, and from 20 to 80 percent below a depth of 40 inches

Ap horizon:
Hue—10YR
Value—4 or 5
Chroma—2 to 4
Texture—loam

A horizon: (where it occurs)
Hue—10YR
Value—3 to 5
Chroma—1 to 3
Texture—loam, sandy loam, fine sandy loam, or silt loam in the fine earth fraction

BA horizon:
Hue—10YR
Value—4 to 6
Chroma—4 to 8
Texture—silt loam, loam, or sandy loam in the fine earth fraction

BE horizon: (where it occurs)
Hue—10YR
Value—4 to 6
Chroma—4 to 8
Texture—silt loam, loam, or sandy loam in the fine earth fraction

Bt horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—4 to 8
Texture—loam, sandy loam, sandy clay loam, or clay loam in the fine earth fraction

BC horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—3 to 8
Texture—sandy loam, fine sandy loam, sandy clay loam, or clay loam in the fine earth fraction

C horizon: (where it occurs)
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—3 to 8
Texture—sandy loam, fine sandy loam, sandy clay loam, or clay loam in the fine earth fraction

2C horizon: (where it occurs)
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—3 to 8
Texture—silt loam or silty clay loam

Lobdell Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Moderate in the solum and moderate or moderately rapid below the solum
Physiographic province: Valley and Ridge
Landscape: The limestone valley and foothills
Landform: Flood plains
Parent material: Recent alluvium derived from limestone, shale, and some sandstone
Slope range: 0 to 3 percent

Associated Soils

- Holly soils, which are poorly drained and are on the lower flood plains
- Orrville soils, which are somewhat poorly drained and are on landforms similar to those of Lobdell soils
- Chagrin soils, which are well drained and are on landforms similar to those of Lobdell soils
- Timberville soils, which are well drained and are on colluvial footslopes and in colluvial drainageways

Typical Pedon

Lobdell silt loam, in an area of the Lobdell-Orrville complex, 0 to 3 percent slopes, occasionally flooded; 400 feet west-southwest of intersection of VA 682 and VA 672; lat. 36 degrees 38 minutes 12 seconds N, long. 83 degrees 22 minutes 4 seconds W; Rose Hill quadrangle, Virginia-Kentucky; on a flood plain of Hamblin Branch; pedon located 50 feet north of creek; in hayland:

Ap—0 to 8 inches; brown (10YR 4/3) silt loam; moderate fine granular structure; friable, slightly sticky, slightly plastic; common very fine and fine roots; slightly acid; abrupt smooth boundary.
Bw1—8 to 20 inches; yellowish brown (10YR 5/4) silt loam; weak fine and medium subangular blocky

structure; friable, slightly sticky, slightly plastic; common very fine and fine roots; few fine faint pale brown (10YR 6/3) iron depletions; few fine faint yellowish brown (10YR 5/6) accumulations of iron masses; slightly acid; clear wavy boundary.

Bw2—20 to 35 inches; yellowish brown (10YR 5/4) loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few very fine roots; common medium prominent light gray (10YR 7/2) iron depletions; common medium prominent yellowish brown (10YR 5/8) accumulations of iron masses; slightly acid; gradual wavy boundary.

Bw3—35 to 48 inches; brown (10YR 5/3) loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; many medium prominent light gray (10YR 7/2) iron depletions; common medium prominent yellowish brown (10YR 5/8) accumulations of iron masses; slightly acid; gradual wavy boundary.

C—48 to 62 inches; mixed yellowish brown (10YR 5/4) and light brownish gray (10YR 6/2) loam; massive; friable, slightly sticky, slightly plastic; common medium very dark brown (10YR 2/2) accumulations of manganese masses: slightly acid.

Range in Characteristics

Solum thickness: 24 to 50 inches
Depth to bedrock: More than 60 inches
Reaction: Strongly acid to neutral in the A and B horizons and moderately acid to neutral in the C horizon
Rock fragments: Rounded sandstone, subrounded chert, or subrounded shale channers that range, by volume, from 0 to 5 percent in the A horizon and from 0 to 15 percent in the B and C horizons

A or Ap horizon:
Hue—7.5YR or 10YR
Value—2 to 4
Chroma—1 to 3
Texture—silt loam

Bw horizon:
Hue—7.5YR to 2.5Y
Value—4 or 5
Chroma—3 or 4
Texture—loam, silt loam, silty clay loam, or clay loam and, in some pedons, thin subhorizons or pockets of sandy loam

Bg horizon: (where it occurs)
Hue—7.5YR or 2.5Y
Value—2 or 3
Chroma—2
Texture—loam, silt loam, silty clay loam, or clay loam and, in some pedons, thin subhorizons or pockets of sandy loam

C horizon:
Hue—7.5YR to 5Y
Value—4 to 6
Chroma—3 to 8
Texture—loam, silt loam, sandy clay loam, clay loam, sandy loam, or, in some pedons, stratified layers of loams and sands, the gravelly analog of loams and sands, or both

Cg horizon: (where it occurs)
Hue—7.5YR to 5Y or is neutral
Value—4 to 6
Chroma—2 or less
Texture—loam, silt loam, sandy clay loam, clay loam, sandy loam, or, in some pedons, stratified layers of loams and sands, the gravelly analog of loams and sands, or both

Oriskany Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately rapid or moderate
Physiographic province: Valley and Ridge
Landscape: Mountains and Foothills
Landform: Mountain slopes and hillslopes
Parent material: Colluvium derived from sandstone, quartzite, and shale
Slope range: 7 to 55 percent

Associated Soils

- Jefferson soils, which have fewer rock fragments in the subsoil and on the soil surface than Oriskany soils and are on landforms adjacent to those of Oriskany soils
- Escatawba soils, which have fewer rock fragments in the soil profile and on the soil surface than Oriskany soils, have a seasonal high water table between depths of 2.5 and 4.0 feet, and are on landforms adjacent to Oriskany soils
- Wallen and Alticrest soils, which are moderately deep to sandstone bedrock and are on mountain slopes at the higher elevations

Typical Pedon

Oriskany cobbly loam, 35 to 55 percent slopes, extremely stony; 1.71 miles west of intersection of VA 621 and VA 622; 2.3 miles northeast of intersection of VA 621 and VA 845; lat. 36 degrees 49 minutes 5.6 seconds N, long. 82 degrees 53 minutes 11.8 seconds W; Keokee quadrangle, Virginia-Kentucky; in woodland:

A—0 to 2 inches; dark yellowish brown (10YR 4/4)

cobbly loam; weak fine granular structure; very friable, slightly sticky, slightly plastic; common very fine and fine roots; 15 percent sandstone cobbles, 5 percent sandstone pebbles; strongly acid; abrupt wavy boundary.

BE—2 to 12 inches; strong brown (7.5YR 4/6) very cobbly loam; weak medium subangular blocky structure; very friable, slightly sticky, slightly plastic; common very fine and fine roots; 35 percent sandstone cobbles, 5 percent sandstone pebbles; strongly acid; clear wavy boundary.

Bt1—12 to 35 inches; strong brown (7.5YR 5/6) very cobbly clay loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; common very fine and fine roots; few distinct clay films on faces of peds; 40 percent sandstone cobbles, 5 percent sandstone pebbles; strongly acid; gradual wavy boundary.

Bt2—35 to 62 inches; 80 percent strong brown (7.5YR 5/6), 15 percent yellowish red (5YR 4/6), and 5 percent very pale brown (10YR 7/3) very cobbly loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few very fine roots; few distinct clay films on faces of peds; 45 percent sandstone cobbles, 5 percent sandstone stones; strongly acid.

Range in Characteristics

Solum thickness: 40 to 60 inches or more
Depth to bedrock: More than 60 inches
Reaction: Very strongly acid or strongly acid
Rock fragments: Sandstone and quartzite sandstone that ranges from 15 to 35 percent in the A horizon, from 15 to 65 percent in the BE horizon, and from 35 to 75 percent in the Bt and C horizons

A horizon:
Hue—7.5YR or 10YR
Value—2 to 4
Chroma—2 to 4
Texture—loam in the fine earth fraction

BE horizon:
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—4 to 8
Texture—sandy loam or loam in the fine earth fraction

Bt horizon:
Hue—5YR to 10YR
Value—4 to 6
Chroma—4 to 8
Texture—loam, sandy clay loam, or clay loam in the fine earth fraction

C horizon: (where it occurs)
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—4 to 8
Texture—sandy loam, loam, or sandy clay loam in the fine earth fraction

Orrville Series

Depth to bedrock: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderate in the solum and moderate or moderately rapid below the solum
Physiographic province: Valley and Ridge
Landscape: The limestone valley and foothills
Landform: Flood plains
Parent material: Recent alluvium derived from limestone, shale, and sandstone
Slope range: 0 to 3 percent

Associated Soils

- Holly soils, which are poorly drained and are on the lower flood plains
- Lobdell soils, which are moderately well drained and are on landforms similar to those of Orrville soils
- Chagrin soils, which are well drained and are on landforms similar to those of Orrville soils
- Timberville soils, which are well drained and are on colluvial foot slopes and in colluvial drainageways

Typical Pedon

Orrville loam, in a area of the Lobdell-Orrville complex, 0 to 3 percent slopes, occasionally flooded; 0.27 mile south of intersection of U.S. 58 and VA 660; lat. 36 degrees 40 minutes 59.9 seconds N, long. 83 degrees 16 minutes 6.4 seconds W; in the Rose Hill quadrangle, Virginia-Kentucky; on a flood plain of Hardy Creek; pedon located 75 feet east of creek; in hayland:

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) loam; moderate fine granular structure; friable, slightly sticky, slightly plastic; common very fine and fine roots; 1 percent rounded sandstone pebbles; moderately acid; clear wavy boundary.

Bw—6 to 13 inches; yellowish brown (10YR 5/4) loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; common very fine roots; few fine distinct grayish brown (10YR 5/2) iron depletions; few medium prominent strong brown (7.5YR 5/8) accumulations of iron masses; 1 percent rounded sandstone pebbles; moderately acid; gradual wavy boundary.

Bg1—13 to 28 inches; grayish brown (2.5Y 5/2) loam; weak moderate subangular blocky structure; friable, slightly sticky, slightly plastic; few very fine

roots; common medium prominent strong brown (7.5YR 5/8) accumulations of iron masses; 1 percent rounded sandstone pebbles; slightly acid; gradual wavy boundary.
Bg2—28 to 34 inches; grayish brown (10YR 5/2) loam; weak coarse subangular blocky structure; friable, slightly sticky, slightly plastic; few very fine roots; common coarse prominent brownish yellow (10YR 6/8) accumulations of iron masses; slightly acid; clear wavy boundary.
Cg1—34 to 47 inches; gray (N 5/0) loam; massive; friable, slightly sticky, slightly plastic; few coarse prominent brownish yellow (10YR 6/8) accumulations of iron masses: moderately acid; abrupt wavy boundary.
Cg2—47 to 62 inches; dark gray (5Y 4/1) sandy loam; massive; very friable, nonsticky, nonplastic; 10 percent rounded sandstone and subrounded chert pebbles; slightly acid.

Range in Characteristics

Solum thickness: 24 to 50 inches
Depth to bedrock: More than 60 inches
Reaction: Strongly acid to slightly acid in the A and B horizons and strongly acid to neutral in the C horizon
Rock fragments: Rounded sandstone, subrounded chert, or subrounded shale channers range, by volume, from 0 to 5 percent in the A horizon, from 0 to 15 percent in the B horizon, and from 0 to 25 percent in the C horizon

A or Ap horizon:
Hue—10YR or 2.5Y
Value—2 to 4
Chroma—1 or 2
Texture—loam

Bw horizon:
Hue—10YR to 5Y
Value—4 to 6
Chroma—3 to 6
Texture—loam, silt loam, silty clay loam, or clay loam, any of which can have thin subhorizons or pockets of sandy loam

Bg horizon:
Hue—10YR to 5Y, or neutral
Value—4 to 6
Chroma—2 or less
Texture—loam, silt loam, silty clay loam, or clay loam, any of which can have thin subhorizons or pockets of sandy loam

Cg horizon:
Hue—10YR to 5Y or neutral
Value—4 to 7
Chroma—2 or less
Texture—loam, silt loam, sandy loam, or, in some pedons, stratified layers of loams and sands, the gravelly analog of loams and sands, or both

C horizon: (where it occurs)
Hue—10YR to 5Y
Value—4 to 7
Chroma—3 to 6
Texture—loam, silt loam, sandy loam, or, in some pedons, stratified layers of loams and sands, the gravelly analog of loams and sands, or both

Philo Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Moderate
Physiographic province: Appalachian Plateau, Cumberland Plateau and Cumberland Mountain section
Landscape: Foothills
Landform: Flood plains
Parent material: Alluvium derived from shale and sandstone
Slope range: 0 to 3 percent

Associated Soils

• Pope soils, which are well drained and are on the higher flood plains
• Gilpin and Alticrest soils, which are moderately deep to bedrock and are on adjacent hillslopes
• Bethesda, Fairpoint, and Sewell soils, which are well drained and are on reclaimed surface mines

Typical Pedon

Philo fine sandy loam, 0 to 3 percent slopes, occasionally flooded; 100 feet south of VA 606 at a point 0.9 mile west of VA 624; lat. 36 degrees 36 minutes 27 seconds N, long. 83 degrees 6 minutes 36 seconds W; Keokee quadrangle, Virginia-Kentucky; in a brushy field:

Ap—0 to 8 inches; brown (10YR 4/3) fine sandy loam; weak fine granular structure; very friable; few very fine and fine and few medium roots; strongly acid; abrupt smooth boundary.
Bw1—8 to 16 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak medium subangular blocky structure; very friable; few very fine roots; strongly acid; clear smooth boundary.
Bw2—16 to 30 inches; yellowish brown (10YR 5/6) fine sandy loam; weak medium subangular blocky structure; friable; few very fine roots; common

coarse distinct grayish brown (10YR 5/2) iron depletions; 5 percent sandstone pebbles; moderately acid; clear smooth boundary.
C—30 to 62 inches; light olive brown (2.5Y 5/4) sandy loam; massive; friable; many medium distinct dark grayish brown (10YR 4/2) iron depletions and yellowish brown (10YR 5/8) iron accumulations; few very fine roots; moderately acid.

Range In Characteristics

Solum thickness: 20 to 48 inches
Depth to bedrock: More than 60 inches
Reaction: Very strongly acid to moderately acid (unless limed)
Rock fragments: 0 to 15 percent in the A, Bw, and C horizons and 0 to 40 percent in the 2C horizon

Ap or A horizon:
Hue—10YR or 7.5YR
Value—3 or 4, 5 or more dry
Chroma—2 or 3
Texture—fine sandy loam

Bw horizon:
Hue—7.5YR or 10YR
Value—3 to 6
Chroma—3 to 6
Texture—fine sandy loam, loam, or sandy loam in the fine earth fraction

C horizon:
Hue—7.5YR to 2.5Y, or neutral
Value—4 to 6
Chroma—0 to 4
Texture—fine sandy loam, loam, or sandy loam in the fine earth fraction

2C horizon: (where it occurs)
Hue—7.5YR to 2.5Y, or neutral
Value—4 to 6
Chroma—0 to 4
Texture—ranges from sand to loam

Pineville Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderate
Physiographic province: Appalachian Plateau, Cumberland Plateau and Cumberland Mountain section
Landscape: Mountains and foothills
Landform: Mountain slopes and hillslopes
Parent material: Colluvium derived from shale and sandstone
Slope range: 15 to 55 percent

Associated Soils

- Gilpin soils, which are moderately deep to shale bedrock and are on adjacent hillslopes
- Berks soils, which are moderately deep to shale bedrock and are on adjacent hillslopes
- Alticrest soils, which are moderately deep to sandstone bedrock and are on adjacent hillslopes

Typical Pedon

Pineville channery loam, 35 to 55 percent slopes, very stony; 1.69 miles north of intersection of VA 720 and VA 606, 0.49 mile northeast of intersection of VA 628 and VA 720; lat. 36 degrees 48 minutes 33.9 seconds N, long. 83 degrees 1 minute 58 seconds W; Pennington Gap quadrangle, Virginia-Kentucky; in woodland:

A—0 to 3 inches; brown (10YR 4/3) channery loam; moderate fine granular structure; friable, slightly sticky, slightly plastic; many fine to coarse roots; 15 percent sandstone and shale pebbles and channers; moderately acid; clear wavy boundary.
BA—3 to 9 inches; dark yellowish brown (10YR 4/4) channery loam; moderate granular structure; friable, slightly sticky, slightly plastic; many fine to coarse roots; few fine vesicular pores; 15 percent sandstone and shale pebbles and channers; moderately acid; clear wavy boundary.
Bt1—9 to 35 inches; brown (7.5YR 4/4) channery clay loam; moderate fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; common fine to coarse roots; common distinct clay films on faces of peds; few fine vesicular pores; 20 percent sandstone and shale pebbles and channers; strongly acid; clear wavy boundary.
Bt2—35 to 52 inches; yellowish brown (10YR 5/6) channery clay loam; moderate fine and medium subangular blocky structure; firm, slightly sticky, slightly plastic; common fine to coarse roots; common distinct clay films on faces of peds; few fine vesicular pores; 20 percent sandstone and shale pebbles and channers; strongly acid; gradual wavy boundary.
BC—52 to 62 inches; brownish yellow (10YR 6/6) channery loam; weak coarse subangular blocky structure; friable, sticky, slightly plastic; common fine to coarse roots; few distinct clay films on faces of peds; few fine vesicular pores; 25 percent sandstone and shale pebbles and channers; strongly acid.

Range in Characteristics

Solum thickness: 40 to 60 inches or more

Depth to bedrock: More than 60 inches
Reaction: Extremely acid to neutral in the A horizon and extremely acid to strongly acid in the B and C horizons
Rock fragments: By volume, 15 to 35 percent in the A horizon, 10 to 60 percent in individual horizons of the BA, Bt, BC, and C horizons, and, on average, 15 to 35 percent in the control section

A horizon:
Hue—7.5YR or 10YR
Value—2 to 4
Chroma—1 to 3
Texture—loam in the fine earth fraction

BA, Bt, and BC horizons:
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—4 to 8
Texture—loam, sandy loam, or clay loam in the fine earth fraction

C horizon: (where it occurs)
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—4 to 8
Texture—loam, sandy loam, or clay loam in the fine earth fraction

Pope Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderate or moderately rapid
Physiographic province: Valley and Ridge; mainly Appalachian Plateau, Cumberland Plateau and Cumberland Mountain section
Landscape: Foothills
Landform: Flood plains
Parent material: Alluvium derived from shale and sandstone
Slope range: 0 to 3 percent

Associated Soils

• Philo soils, which are moderately well drained and are on the lower flood plains
• Alticrest and Gilpin soils, which are moderately deep to bedrock and are on the adjacent hillslopes
• Bethesda, Fairpoint, and Sewell soils, which are well drained and are on reclaimed surface mines

Typical Pedon

Pope fine sandy loam, 0 to 3 percent slopes, occasionally flooded; 375 feet east of VA 625 at a point 3,200 feet south of intersection of VA 862 and VA 626; lat. 36 degrees 49 minutes 43 seconds N, long. 82 degrees 56 minutes 21 seconds W; Big Stone Gap quadrangle, Virginia; in hayland:

Ap—0 to 8 inches; brown (10YR 4/3) fine sandy loam, light yellowish brown (10YR 6/4) dry; weak fine granular structure; very friable; many very fine and fine and few medium roots; strongly acid; abrupt smooth boundary.
Bw1—8 to 15 inches; brown (10YR 4/3) and dark yellowish brown (10YR 4/4) fine sandy loam; weak medium subangular blocky structure; very friable; many fine and few medium roots; strongly acid; abrupt smooth boundary.
Bw2—15 to 40 inches; dark yellowish brown (10YR 4/6) fine sandy loam; weak medium subangular blocky structure; very friable; few very fine roots; strongly acid; clear smooth boundary.
Bw3—40 to 51 inches; yellowish brown (10YR 5/6) fine sandy loam; weak medium subangular blocky structure; friable; few medium distinct light yellowish brown (10YR 6/4) masses of iron accumulation; few very fine roots; strongly acid; abrupt smooth boundary.
C—51 to 62 inches; yellowish brown (10YR 5/6) fine sandy loam; massive; friable; few medium distinct dark yellowish brown (10YR 4/4) and few fine prominent strong brown (7.5YR 5/8) masses of iron accumulation; common medium distinct pale brown (10YR 6/3) iron depletions; strongly acid.

Range In Characteristics

Solum thickness: 30 to 60 inches
Depth to bedrock: More than 60 inches
Reaction: Strongly acid to extremely acid (unless limed)
Rock fragments: By volume, 0 to 15 percent in the A or Ap horizon, 0 to 30 percent to a depth of about 40 inches, and 0 to 75 percent below a depth of 40 inches

Ap horizon:
Hue—10YR
Value—3 to 5; 6 or more dry
Chroma—3 to 6
Texture—fine sandy loam

A horizon: (where it occurs)
Hue—10YR
Value—3 to 5; 6 or more dry
Chroma—3 to 6
Texture—fine sandy loam

Bw horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—3 to 6

Texture—fine sandy loam, sandy loam, or loam in the fine earth fraction

C horizon:
Hue—10YR
Value—4 or 5
Chroma—3 to 6
Texture—in the fine earth fraction fine sandy loam, sandy loam, loam, silt loam, or, in some pedons below a depth of 40 inches, loamy sand or sand

Poplimento Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Physiographic province: Valley and Ridge
Landscape: Foothills and mountains
Landform: Hillslopes and mountain slopes
Parent material: Residuum derived from a mixture of shale, limestone, and siltstone
Slope range: 15 to 65 percent

Associated Soils

- Frederick soils, which have a redder and more clayey subsoil than Poplimento soils and are on landforms similar to those of Poplimento soils in areas where limestone bedrock is predominant
- Berks soils, which are moderately deep to shale bedrock and are on landforms similar to those of Poplimento soils
- Carbo soils, which are moderately deep to limestone bedrock and are on landforms similar to those of Poplimento soils

Typical Pedon

Poplimento silt loam, in an area of the Poplimento-Berks complex, 15 to 35 percent slopes; 0.76 mile north-northwest of eastern junction of U.S. 58 and VA 684; 2.2 miles east-northeast of western junction of U.S. 58 and VA 684; lat. 36 degrees 38 minutes 35 seconds N, long. 83 degrees 27 minutes 00 seconds W; Ewing quadrangle, Kentucky-Virginia; in a pasture:

Ap—0 to 8 inches; brown (10YR 4/3) silt loam; strong coarse granular structure; friable, slightly sticky, slightly plastic; common very fine and fine roots; strongly acid; clear wavy boundary.
BA—8 to 15 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky structure; friable, slightly sticky, slightly plastic; common very fine and fine roots; strongly acid; abrupt wavy boundary.
Bt1—15 to 30 inches; yellowish brown (10YR 5/8) clay; moderate fine and medium subangular blocky structure; firm, sticky, plastic; few very fine roots; common prominent clay films on faces of peds; 1 percent shale channers; strongly acid; gradual wavy boundary.
Bt2—30 to 55 inches; yellowish brown (10YR 5/8) clay; moderate coarse subangular blocky structure; firm, sticky, plastic; few very fine roots; common prominent clay films on faces of peds; common medium faint brownish yellow (10YR 6/8) lithochromic mottles from weathered rock fragments; common coarse prominent black (10YR 2/1) soft manganese accumulations; 1 percent shale channers; strongly acid; gradual wavy boundary.
BC—55 to 62 inches; yellowish brown (10YR 5/4) silty clay; weak fine subangular blocky structure; firm, sticky, plastic; few very fine roots; few distinct clay films on faces of peds; common medium prominent light gray (10YR 7/2) lithochromic mottles from weathered rock fragments; common coarse prominent black (10YR 2/1) soft manganese accumulations; 1 percent shale channers; slightly acid.

Range in Characteristics

Solum thickness: 40 to 70 inches
Depth to bedrock: More than 60 inches, but varies greatly over short, horizontal distances
Reaction: Very strongly acid to slightly acid
Rock fragments: Channers that range, by volume, from 0 to 15 percent in the A and BA horizons, from 0 to 15 percent in the upper part of the Bt horizon, and from 0 to 55 percent in the lower part of the Bt horizon and in the C horizon

Ap or A horizon:
Hue—7.5YR or 10YR
Value—3 to 6
Chroma—2 to 6
Texture—silt loam

BA horizon:
Hue—5YR to 10YR
Value—3 to 6
Chroma—2 to 8
Texture—loam, silt loam, silty clay loam, silty clay, or clay

Bt horizon:
Hue—5YR to 10YR
Value—4 to 6
Chroma—4 to 8
Texture—silty clay loam, silty clay, or clay in the fine earth fraction

BC:
Hue—5YR to 10YR
Value—4 to 6
Chroma—4 to 8
Texture—silty clay loam, silty clay, or clay in the fine earth fraction

C horizon: (where it occurs)
Hue—5YR to 10YR
Value—4 to 6
Chroma—4 to 8
Texture—silty clay loam, silty clay, or clay in the fine earth fraction

Sewell Series

Depth to bedrock: Very deep
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid or rapid
Physiographic province: Appalachian Plateau, Cumberland Plateau and Cumberland Mountain section
Landscape: Mountains and foothills
Landform: Mountain slopes and hillslopes that have been strip-mined for coal
Parent material: Acid regolith that is from the stripmining of coal and that contains partly weathered fine earth and fragments of bedrock, which consist mainly of sandstone and small amounts of siltstone, shale, and coal
Slope range: 0 to 80 percent

Associated Soils

- Fairpoint soils, which are less acid than Sewell soils, have less sand and more silt and clay in the subsoil than Sewell soils, have rock fragments that are dominantly shale in the soil profile, and are on landforms similar to those of Sewell soils
- Bethesda soils, which have less sand and more silt and clay in the subsoil than Sewell soils, have rock fragments in the soil profile, are dominantly shale, and are on landforms similar to those of Sewell soils
- Itmann soils, which contain coarse-grained, carbolithic fragments from waste material from deep-mined coal and are in head-of-hollow fills and coal mine dumps
- Gilpin soils, which are moderately deep to shale bedrock and are on adjacent, undisturbed hillslopes
- Alticrest soils, which are moderately deep to sandstone bedrock and are on adjacent, undisturbed hillslopes

Typical Pedon

Sewell stony sandy loam, in an area of Bethesda, Fairpoint, and Sewell soils, 0 to 80 percent slopes, very rocky; 0.65 mile northwest of the westernmost intersection of VA 624 and VA 606; lat. 36 degrees 51 minutes 38.4 seconds N, long. 82 degrees 55 minutes 17.2 seconds W; Keokee quadrangle, Virginia-Kentucky; in a reclaimed area planted to grasses and small shrubs:

A—0 to 10 inches; yellowish brown (10YR 5/4) stony sandy loam; few coarse distinct brownish yellow (10YR 6/6) lithochromic mottles; moderate coarse granular structure; firm, slightly sticky, slightly plastic; common fine roots; 30 percent rock fragments (98 percent sandstone stones and cobbles, 2 percent shale channers and coal fragments); strongly acid; clear wavy boundary.
C1—10 to 47 inches; yellowish brown (10YR 5/4) very stony sandy loam; few coarse distinct brownish yellow (10YR 6/6) lithochromic mottles; massive; firm, nonsticky, nonplastic; 45 percent rock fragments (98 percent sandstone stones and cobbles; 2 percent shale channers and coal fragments); strongly acid; diffuse irregular boundary.
C2—47 to 62 inches; yellowish brown (10YR 5/4) very stony sandy loam; few coarse distinct brownish yellow (10YR 6/6) lithochromic mottles; massive; firm, nonsticky, nonplastic; 55 percent rock fragments (98 percent sandstone stones and cobbles; 2 percent shale channers and coal fragments); strongly acid; few coarse pockets of loamy sand material.

Range in Characteristics

Solum thickness: 2 to 10 inches
Depth to bedrock: More than 60 inches
Reaction: Extremely acid to strongly acid (except where the surface layer has been limed)
Rock fragments: Dominantly sandstone and small quantities of siltstone, shale, and coal that range, by volume, from 15 to 35 percent in the A horizon and from 35 to 80 percent in the C horizon

A horizon:
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—2 to 6
Texture—sandy loam in the fine earth fraction

C horizon:
Hue—7.5YR or 10YR
Value—2 to 6
Chroma—1 to 8
Texture—in the fine earth fraction sandy loam or loam that has common pockets of loamy sand

Shottower Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderate
Physiographic province: Valley and Ridge
Landscape: The limestone valley and foothills
Landform: High stream terraces
Parent material: Old alluvium derived from sandstone and limestone
Slope range: 2 to 25 percent

Associated Soils

- Allegheny soils, which have less clay in the subsoil and are browner than Shottower soils and are on low stream terraces
- Frederick and Watahala soils, which formed in clayey residuum on adjacent hillslopes
- Carbo soils, which formed in clayey residuum, are moderately deep to limestone bedrock, and are on hillslopes adjacent to Shottower soils

Typical Pedon

Shottower silt loam, 2 to 7 percent slopes; 0.3 mile southwest of intersection of VA 642 and VA 638, 0.27 mile east-southeast of intersection of VA 642 and VA 772; lat. 36 degrees 43 minutes 11.9 seconds N, long. 83 degrees 0 minutes 40.6 seconds W; Ben Hur quadrangle, Virginia; in a cultivated field:

Ap—0 to 10 inches; dark yellowish brown (10YR 4/4) silt loam; moderate coarse granular structure; friable, very sticky, plastic; common very fine roots; common very fine vesicular pores; moderately acid; abrupt wavy boundary.

Bt1—10 to 18 inches; brown (7.5YR 4/4) silty clay loam; weak coarse subangular blocky structure; firm, very sticky, plastic; common very fine roots; few faint clay films on faces of peds; common very fine vesicular pores; moderately acid; gradual wavy boundary.

Bt2—18 to 37 inches; yellowish red (5YR 4/6) clay; moderate medium and coarse subangular blocky structure; firm, very sticky, plastic; few very fine roots; many prominent clay films on faces of peds; common fine black manganese stains on faces of peds; few very fine vesicular pores; moderately acid; gradual wavy boundary.

Bt3—37 to 62 inches; red (2.5YR 4/6) clay; strong fine to coarse subangular blocky structure; firm, sticky, plastic; few very fine roots; many prominent clay films on faces of peds; few fine black manganese stains on faces of peds; few very fine vesicular pores; moderately acid.

Range in Characteristics

Solum thickness: More than 60 inches
Depth to bedrock: More than 60 inches
Reaction: Extremely acid to moderately acid
Rock fragments: By volume, 0 to 15 percent in the A horizon, 0 to 35 percent in the BA and Bt horizons, and 0 to 60 percent below a depth of 40 inches

Ap horizon:
Hue—2.5YR to 10YR
Value—3 to 5
Chroma—3 or 4
Texture—silt loam

A horizon: (where it occurs)
Hue—5YR to 10YR
Value—2 or 3
Chroma—2 or 3
Texture—silt loam

BA horizon: (where it occurs)
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—3 to 6
Texture—loam, silt loam, clay loam, or silty clay loam in the fine earth fraction

Bt horizon:
Hue—2.5YR to 7.5YR
Value—4 or 5
Chroma—4 to 8
Texture—clay, silty clay, silty clay loam, clay loam, or sandy clay loam in the fine earth fraction

Timberville Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderate
Physiographic province: Valley and Ridge
Landscape: The limestone valley
Landform: Hillslopes
Parent material: Local colluvium derived from limestone
Slope range: 2 to 15 percent

Associated Soils

- Carbo soils, which are moderately deep to limestone bedrock and are on adjacent hillslopes
- Frederick soils, which have a clay increase within 20 inches of the surface, are redder than Timberville soils, and are on hillslopes adjacent to those of Timberville soils
- Watahala soils, which have more chert pebbles in the upper part of the soil profile than Timberville soils

and are on hillslopes adjacent to those of Timberville soils

Typical Pedon

Timberville silt loam, 2 to 7 percent slopes, frequently flooded; 1,000 feet west of VA 622 at a point 800 feet north of intersection of Alt. U.S. 58 and VA 622; lat. 36 degrees 48 minutes 13 seconds N, long. 82 degrees 51 minutes 07 seconds W; Big Stone Gap quadrangle, Virginia; in hayland:

Ap—0 to 3 inches; brown (10YR 4/3) silt loam, weak medium granular structure; very friable; many very fine and few fine roots; moderately acid; abrupt smooth boundary.

AB—3 to 9 inches; brown (10YR 4/3) silt loam; strong coarse subangular blocky structure; friable; common fine faint dark yellowish brown (10YR 4/4) masses of iron accumulation; common very fine roots; moderately acid; abrupt smooth boundary.

Bw—9 to 28 inches; dark yellowish brown (10YR 4/4) silt loam; strong coarse subangular blocky structure; friable; few very fine roots; moderately acid; clear smooth boundary.

2Bt1—28 to 37 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky structure; friable; few faint clay films on faces of peds; few very fine roots; slightly acid; clear smooth boundary.

2Bt2—37 to 48 inches; strong brown (7.5YR 5/6) clay loam; moderate medium subangular blocky structure; firm; many faint clay films on faces of peds; slightly acid; gradual smooth boundary.

2Bt3—48 to 62 inches; strong brown (7.5YR 4/6) clay loam; moderate medium subangular blocky structure; firm; few faint clay films on faces of peds; slightly acid.

Range In Characteristics

Solum thickness: More than 60 inches
Depth to bedrock: More than 60 inches
Reaction: Extremely acid to slightly acid (unless limed)
Rock fragments: By volume, 0 to 15 percent in the surface layer, 0 to 60 percent in individual subhorizons of the B horizon, and 0 to 60 percent in the C horizon

Ap horizon:
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—3 to 5
Texture—silt loam

A horizon: (where it occurs)
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—2 to 4
Texture—silt loam

AB horizon:
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—2 to 4
Texture—silt loam, loam, or fine sandy loam in the fine earth fraction

E horizon: (where it occurs)
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—1 to 5
Texture—silt loam, loam, or fine sandy loam in the fine earth fraction

Bw horizon:
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—4 to 8
Texture—loam, silt loam, silty clay loam, or clay loam in the fine earth fraction

Ab horizon: (where it occurs)
Hue—7.5YR or 10YR
Value—3 to 6
Chroma—2 to 4
Texture—silt loam, loam, or silty clay loam in the fine earth fraction

Bwb horizon: (where it occurs)
Hue—7.5YR to 2.5Y
Value—4 to 6
Chroma—4 to 8
Texture—silt loam, loam, silty clay loam, clay loam, or sandy clay loam in the fine earth fraction

2Bt horizon:
Hue—5YR to 10YR
Value—4 or 5
Chroma—4 to 8
Texture—clay, clay loam, silty clay loam, or silty clay in the fine earth fraction

2Btb horizon: (where it occurs)
Hue—5YR to 10YR
Value—4 or 5
Chroma—4 to 8
Texture—clay, clay loam, silty clay loam, silt loam, or silty clay in the fine earth fraction

Tumbling Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderate

Physiographic province: Valley and Ridge
Landscape: Mountains, the limestone valley, and foothills
Landform: Lower mountain slopes and hillslopes
Parent material: Colluvium derived from sandstone, quartzite, and shale
Slope range: 7 to 35 percent

Associated Soils

- Carbo soils, which are moderately deep to limestone bedrock and are on upland landforms in the limestone valley
- Jefferson soils, which have less clay in the subsoil than Tumbling soils and are on landforms similar to those of Tumbling soils
- Wallen soils, which are moderately deep to sandstone bedrock and are on upland landforms in mountainous areas

Typical Pedon

Tumbling loam, 15 to 25 percent slopes; 300 feet south of VA 679 at a point 0.4 mile east of VA 854; lat. 36 degrees 36 minutes 31 seconds N, long. 83 degrees 14 minutes 30 seconds W; Sneedville quadrangle, Tennessee-Virginia; in a pasture:

Ap—0 to 4 inches; dark yellowish brown (10YR 4/4) loam; moderate fine and medium subangular blocky structure; very friable; common very fine roots; 10 percent sandstone pebbles; strongly acid; abrupt smooth boundary.
BA—4 to 8 inches; brown (7.5YR 4/4) loam; weak medium subangular structure; very friable; common very fine roots; 10 percent sandstone pebbles; strongly acid; abrupt smooth boundary.
Bt1—8 to 14 inches; yellowish red (5YR 5/6) gravelly clay loam; weak medium subangular blocky structure; friable; few very fine roots; common faint clay films on faces of peds; 20 percent sandstone pebbles; strongly acid; clear smooth boundary.
Bt2—14 to 20 inches; red (2.5YR 4/6) gravelly clay; moderate medium subangular blocky structure; friable, moderately sticky, moderately plastic; few very fine roots; many distinct clay films on faces of peds; 15 percent sandstone pebbles; strongly acid; clear smooth boundary.
Bt3—20 to 61 inches; red (2.5YR 4/6) gravelly clay; few medium prominent brown (7.5YR 5/4) and common fine and medium prominent strong brown (7.5YR 5/8) and yellowish brown (10YR 5/8) lithochromic mottles; moderate medium subangular blocky structure; firm, moderately sticky, moderately plastic; few very fine roots; many distinct clay films on faces of peds; 20 percent sandstone pebbles; strongly acid.

Range In Characteristics

Solum thickness: More than 60 inches
Depth to bedrock: More than 60 inches
Reaction: Very strongly acid or strongly acid
Rock fragments: By volume, 0 to 15 percent in the A horizon and 0 to 35 percent in the B horizon

Ap horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—3 or 4
Texture—loam

BA horizon:
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—4 to 6
Texture—loam, silt loam, or clay loam in the fine earth fraction

Bt horizon:
Hue—2.5YR to 10YR
Value—4 or 5
Chroma—4 to 8
Texture—clay loam, sandy clay loam, clay, or silty clay loam in the fine earth fraction

Udorthents

Depth to bedrock: Shallow to very deep
Drainage class: Moderately well drained or well drained
Permeability: Slow to rapid
Physiographic province: Valley and Ridge
Landscape: The limestone valley and foothills
Landform: Hillslopes
Parent material: Human-influenced soils resulting from cut and fill operations
Slope range: 0 to 45 percent

Associated Soils

- Frederick soils, which are very deep to limestone bedrock and are on undisturbed hillslopes
- Carbo soils, which are moderately deep to limestone bedrock and are on undisturbed hillslopes
- Timberville soils, which are subject to flooding of frequent or very brief duration and are in undisturbed, intermittent drainageways

Typical Pedon

The properties and characteristics of Udorthents vary to the extent that they do not have a typical profile. Udorthents formed when soils were disturbed by cutting and filling. Udorthents are generally loamy or clayey and are subject to differential subsidence.

Range in Characteristics

Depth to bedrock: 10 to 60 inches or more
Reaction: Extremely acid to slightly acid
Rock fragments: 0 to 35 percent

Wallen Series

Depth to bedrock: Moderately deep
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid
Physiographic province: Valley and Ridge; Appalachian Plateau, Cumberland Plateau and Cumberland Mountain section
Landscape: Mountains
Landform: Mountain slopes
Parent material: Residuum derived from sandstone, siltstone, and some shale
Slope range: 15 to 85 percent

Associated Soils

• Alticrest soils, which have fewer rock fragments in the subsoil than Wallen soils and are on landforms similar to those of Wallen soils
• Gilpin soils, which have fewer rock fragments and more clay in the subsoil than Wallen soils, are in areas of shale bedrock, and are on landforms similar to those of Wallen soils

Typical Pedon

Wallen gravelly loam, in an area of the Wallen-Alticrest complex, 35 to 55 percent slopes, very stony; 1.3 miles southwest of intersection of VA 604 and the Lee-Scott county line; 0.7 mile north-northeast of intersection of VA 603 and the Lee-Scott county line; lat. 36 degrees 39 minutes 25.1 seconds N, long. 82 degrees 57 minutes 59.5 seconds W; Stickleyville quadrangle, Virginia; in woodland:

Oe—0 to 1 inch; partly decomposed leaf litter.
A—1 to 2 inches; dark yellowish brown (10YR 4/4) gravelly loam; weak medium granular structure; very friable, slightly sticky, slightly plastic; many medium roots; 15 percent sandstone pebbles; very strongly acid; abrupt wavy boundary.
BE—2 to 7 inches; yellowish brown (10YR 5/4) very gravelly loam; weak coarse subangular blocky structure; very friable, slightly sticky, slightly plastic; many medium roots; 35 percent sandstone pebbles; very strongly acid; gradual wavy boundary.
Bw—7 to 26 inches; yellowish brown (10YR 5/6) very gravelly loam; weak coarse subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; 40 percent sandstone pebbles; very strongly acid; abrupt smooth boundary.
R—26 inches; hard sandstone bedrock.

Range in Characteristics

Solum thickness: 20 to 40 inches
Depth to bedrock: 20 to 40 inches
Reaction: Extremely acid to moderately acid
Rock fragments: Pebbles to stones that range, by volume, from 15 to 35 percent in the A horizon and from 35 to 70 percent in the B and C horizons

A horizon:
Hue—10YR
Value—3 or 4
Chroma—1 to 4
Texture—loam in the fine earth fraction

BE horizon:
Hue—10YR
Value—4 to 6
Chroma—2 to 4
Texture—loam, silt loam, fine sandy loam, or sandy loam in the fine earth fraction

Bw horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—4 to 6
Texture—loam, silt loam, fine sandy loam, or sandy loam in the fine earth fraction

C horizon: (where it occurs)
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—4 to 6
Texture—loam, silt loam, fine sandy loam, or sandy loam in the fine earth fraction

Watahala Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderate or moderately rapid above the 2Bt horizon and moderate or moderately slow in the 2Bt horizon
Physiographic province: Valley and Ridge
Landscape: The limestone valley
Landform: Cherty hillslopes
Parent material: Residuum derived from cherty limestone overlying pure limestone
Slope range: 7 to 55 percent

Associated Soils

• Frederick soils, which have fewer chert pebbles in the upper part of the subsoil and have clay at

shallower depths than Watahala soils, and are on landforms similar to those of Watahala soils
• Carbo soils, which have fewer chert pebbles in the subsoil than Watahala soils, are moderately deep to limestone bedrock, and are on rocky summits and backslopes
• Timberville soils, which have fewer chert pebbles in the subsoil and are darker than Watahala soils and are in depressions and drainageways

Typical Pedon

Watahala gravelly loam; in an area of the Watahala-Frederick complex, 35 to 55 percent slopes; 0.95 mile north-northeast of intersection of VA 699 and the Virginia-Tennessee state line; 1.41 miles southeast of intersection of U.S. 58 and VA 699; lat. 36 degrees 36 minutes 39 seconds N, long. 83 degrees 31 minutes 15 seconds W; Wheeler quadrangle, Tennessee-Virginia; in woodland:

A—0 to 2 inches; very dark grayish brown (10YR 3/2) gravelly loam; weak medium granular structure; very friable, slightly sticky, slightly plastic; common very fine roots; 25 percent chert pebbles; strongly acid; abrupt smooth boundary.

E—2 to 13 inches; yellowish brown (10YR 5/4) gravelly loam; weak medium and fine granular structure; very friable, slightly sticky, slightly plastic; common very fine and medium roots; 25 percent chert pebbles; very strongly acid; clear wavy boundary.

BE—13 to 22 inches; yellowish brown (10YR 5/6) gravelly loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; common fine and medium roots; 25 percent chert pebbles; very strongly acid; clear wavy boundary.

Bt1—22 to 35 inches; yellowish brown (10YR 5/8) gravelly loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few very fine and fine roots; few faint clay films on faces of peds; 30 percent chert pebbles; very strongly acid; abrupt wavy boundary.

2Bt2—35 to 72 inches; yellowish red (5YR 5/8) clay; few coarse prominent brownish yellow (10YR 6/8) lithochromic mottles; moderate fine and medium subangular blocky structure; friable, sticky, plastic; few very fine and fine roots; common distinct and few prominent clay films on faces of peds; 1 percent chert pebbles; very strongly acid.

Range in Characteristics

Solum thickness: More than 60 inches, but the depth to the 2Bt horizon ranges from 20 to 50 inches
Depth to bedrock: More than 60 inches
Reaction: Extremely acid to strongly acid in the upper part of the solum and very strongly acid to strongly acid in the 2Bt horizon
Rock fragments: Chert pebbles and cobbles that range, by volume, from 15 to 35 percent in the A horizon, from 10 to 35 percent in the E, BE, and Bt horizons, and from 0 to 35 percent in the 2Bt horizon

A horizon:
Hue—10YR
Value—3 or 4
Chroma—2 to 4
Texture—loam in the fine earth fraction

Ap horizon: (where it occurs)
Hue—10YR
Value—3 or 4
Chroma—2 or 3
Texture—loam

E horizon:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—2 to 4
Texture—loam or silt loam in the fine earth fraction

BE horizon:
Hue—10YR
Value—5 or 6
Chroma—4 or 6
Texture—loam or silt loam in the fine earth fraction

Bt horizon:
Hue—10YR or 7.5YR
Value—5 or 6
Chroma—6 to 8
Texture—loam, silt loam, clay loam, or silty clay loam in the fine earth fraction

2Bt horizon:
Hue—2.5YR to 7.5YR
Value—4 to 6
Chroma—6 to 8
Texture—in the fine earth fraction clay or silty clay that has 25 percent more clay than the overlying horizon and that has more than 43 percent clay

Weikert Series

Depth to bedrock: Shallow
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid
Physiographic province: Valley and Ridge
Landscape: Foothills and mountains
Landform: Hillslopes and mountain slopes

Parent material: Residuum derived from shale and siltstone
Slope range: 15 to 80 percent

Associated Soils

- Gilpin soils, which are moderately deep to shale bedrock, have fewer rock fragments in the subsoil than Weikert soils, and are on landforms similar to those of Weikert soils
- Berks soils, which are moderately deep to shale bedrock and are on landforms similar to those of Weikert soils
- Soils that are very deep to bedrock, that have fewer rock fragments in the subsoil than Weikert soils, and that are on footslopes and concave head slopes

Typical Pedon

Weikert silt loam; in an area of the Berks-Weikert complex, 35 to 55 percent slopes; 500 feet east of U.S. 23 at a point 0.4 mile north of VA 611; lat. 36 degrees 46 minutes 32 seconds N, long. 83 degrees 49 minutes 13 seconds W; Big Stone Gap quadrangle, Virginia; in woodland:

Oe—0 to 1 inch; partly decomposed leaf litter.
A—1 to 3 inches; dark brown (10YR 3/3) silt loam; weak fine granular structure; very friable; many very fine and fine roots; 10 percent shale channers; strongly acid; abrupt smooth boundary.
Bw1—3 to 11 inches; dark yellowish brown (10YR 4/4) very channery silt loam; weak fine subangular blocky structure; very friable; common very fine and fine roots; 50 percent shale channers; strongly acid; clear smooth boundary.
Bw2—11 to 15 inches; yellowish brown (10YR 5/6) very channery silt loam; weak fine and medium subangular blocky structure; very friable; common very fine and fine roots; 60 percent shale channers; strongly acid; clear wavy boundary.
R—15 inches; shale bedrock.

Range in Characteristics

Solum thickness: 8 to 20 inches
Depth to bedrock: 10 to 20 inches
Reaction: Very strongly acid to moderately acid
Rock fragments: Shale channers that range, by volume, from 5 to 15 percent in the A horizon, from 35 to 60 percent in individual subhorizons of the B horizon, and from 60 to 85 percent in the C horizon; on average, in the particle size control section from 50 to 80 percent

A horizon:
Hue—10YR
Value—3 or 4
Chroma—2 to 4
Texture—silt loam

Bw horizon:
Hue—7.5YR to 10YR
Value—4 to 6
Chroma—3 to 6
Texture—loam or silt loam in the fine earth fraction

C horizon: (where it occurs)
Hue—7.5YR to 2.5Y
Value—4 to 6
Chroma—3 to 8
Texture—loam or silt loam in the fine earth fraction

Formation of the Soils

In this section the factors and processes of soil formation are described and are related to the soils of Lee County, Virginia.

Soil is the collection of natural bodies on the earth's surface. In places it has been modified or even made by man of earthy materials. Soil contains living matter and supports or is capable of supporting plants outdoors (*13*).

The soils in Lee County exhibit unique features and properties, many of which can be measured in laboratories. Other properties, such as soil temperature, can only be measured or observed in the field. Soils form as certain horizons, or layers, develop in weathered parent material. The interaction of topography, climate, and living organisms, over time, on parent material determines soil formation.

This section describes the factors and processes that have affected the formation and morphology of the soils in Lee County.

Factors of Soil Formation

Soils are intimate mixtures of broken and partly or completely weathered rock, minerals, organic matter, living plants and animals, water, and air. They occur as part of the natural landscape and differ from place to place. They can differ in occurrence, in degree of development of various horizons, in mineral content, in depth over bedrock, and in texture, color, and slope. The characteristics of the soils in any given area depend upon the interaction of the five factors of soil formation, which are parent material, climate, living organisms, topography, and time. Topography over time modifies the effect of climate and living organisms on parent material (*12*).

In theory, if all soil-forming factors were identical at different sites, the soils at these sites would be identical. However, all these factors influence the genesis of every soil, and their relative importance varies from place to place. One factor may outweigh others in the formation of a soil and may determine most of its properties. For example, a very young soil on flood plains may have only faint soil horizonation because soil-forming factors have been active a short time. In contrast, a soil formed in residuum from bedrock on a stable landscape may have distinct horizons. The horizons are distinct because the soil material has remained largely in place and all soil-forming factors have been active for a long time. In general, however, the combined action of the five factors determines the character of each soil. The interaction of the five factors of soil formation is more complex for some soils than for others.

Parent Material

Parent material is the unconsolidated mass in which a soil forms. It is a product of weathering, or decomposition, of underlying bedrock or transported materials. Parent material influences the chemical, mineral, and textural composition of the soil. In the early stages of soil formation, a soil has properties similar to those of the parent material. As weathering takes place, the soil properties are modified and each soil develops its own characteristics. Gilpin and Alticrest soils show how parent material determines the mineral and textural composition. Gilpin soils formed in material weathered mainly from shale. Alticrest soils formed in material weathered mainly from coarse grained sandstone. Gilpin soils have more weatherable minerals and more clay than Alticrest soils. Gilpin soils have a mixed mineralogy and are fine-loamy; Alticrest soils have a siliceous mineralogy and are coarse-loamy.

The four general types of parent material in Lee County are residuum, colluvium, alluvium, and mine spoil. Residual material weathered in place from the underlying bedrock. Colluvial material was moved by gravity from ridges and the upper slopes and was deposited on the lower slopes. Alluvium was deposited on flood plains and terraces by streams. Mine spoil resulted from the disturbance of land during surface mining for coal.

Residual material

Soils formed in residual material generally are on summits, shoulders, and back slopes in Lee County. However, some such soils are also on stable landscapes, such as the limestone valley, and these soils have well developed properties. For example, the very deep Frederick soils are reddish and have a high

clay content because they formed in weathered limestone. Carbo soils, which also formed in weathered limestone, are similar to Frederick soils, but are moderately deep. Other areas of limestone bedrock in the county weathered to form soils that contain numerous chert fragments, for example, Watahala soils.

Residual soils on mountains and foothills are generally shallow or moderately deep to bedrock. Moderately deep Wallen soils and shallow Weikert soils are examples. Wallen soils are loamy-skeletal and formed in sandstone. Weikert soils are loamy-skeletal and formed in shale. Both soils are low in clay content. Sand content is high in Wallen soils but low in Weikert soils. The properties of Wallen and Weikert soils reflect the underlying parent material in which the soils formed.

Colluvial material

Colluvial material is dominantly on the lower back slopes, foot slopes, and toe slopes. Some colluvium is located along intermittent drainageways in mountains. Most soils that formed in this colluvium contain few to many rock fragments, are very deep, and have a subsoil ranging from clayey to loamy-skeletal. The clayey Tumbling soils, for example, formed in colluvial material originated from the upper slopes containing a mixture of sandstone, shale, and limestone. Other colluvial soils, such as Jefferson and Oriskany soils, formed in material containing dominantly sandstone.

Alluvial material

Alluvial material deposited by the Powell River and small streams have properties inherited from the parent material in which the deposits originated. Soils that have a high sand content are on flood plains that receive alluvium from areas containing much sandstone. Some examples are Pope and Philo soils. Some alluvial soils have an even mixture of sand, silt, and clay, are low in acidity, and have mixed mineralogy. These soils received alluvium from areas containing limestone, shale, and some sandstone. Lobdell and Holly soils are examples.

Mine spoil

Mine spoil, or mine soils, is material replaced in disturbed areas during reclamation of areas strip-mined for coal. Mine soils are a mixture of the broken rock and soil material that were originally over the mineable coal seam. Mine soils have properties both of the overburden strata and of the original undisturbed soil. Overburden that consists dominantly of brown sandstone and brown loamy soil material produces rocky, brown, loamy mine soils. Sewell soils are an example of mine soils. Bethesda soils are an example of mine soils formed from a mainly shale overburden. They are gray and have small amounts of sand.

Climate

Climate is a genetic factor that affects the physical, chemical, and biological relationships in soils, mainly through the influence of precipitation and temperature. Water dissolves minerals, supports biological activity, and transports minerals and organic residue through the soil. Temperature determines the type and rate of physical, chemical, and biological activities that take place in the soil. Weathering is more rapid in a warm, humid climate than in a cold or dry climate.

Precipitation in the county exceeds evapotranspiration; consequently, the soils have been intensively leached. Much of the soluble materials originally present or released through weathering have been removed. An exception is alluvial areas, which are recharged with eroded sediments from surrounding uplands. Even though the bedrock in some areas contains calcium, free carbonates of lime have not accumulated in the soils because of leaching. Most of the soils are acid.

Precipitation is the main factor in the formation of the type of subsoil characteristic of most soils in Lee County. In addition to leaching soluble material, water that percolates through the soil has moved clay from the surface layer to the subsoil. Except for those soils formed in recent alluvium or sand or on very steep slopes, all soils in the county typically are more clayey in the subsoil than in the surface layer.

Climate also influences the formation of blocky structure in the subsoil of well developed soils, such as Frederick soils. The development of peds, or aggregates, in the subsoil is caused partly by changes in volume of the soil mass that resulted mainly from alternate wetting and drying. Plentiful moisture also supports a productive forest. A moderate content of humus in the surface layer develops after large amounts of organic material have been returned to the soil.

Climate varies locally with differences in the degree and direction of slope and elevation. Generally, soils on steep uplands facing south are drier than soils on similar landscapes facing north. Soils that form in these areas may differ even if they both have the same parent material. In the higher elevations of mountains, the climate may be cooler, the precipitation, particularly snowfall, is greater, and fogs are more common. In these higher, cooler areas, soils may be slightly darker and contain slightly more organic matter than soils at the lower elevations. In the higher areas, the weathering of parent materials is

slower, and the soils generally are thinner than soils at the lower elevations.

Living Organisms

Biologic forces are important in the formation of soils in Lee County. Trees, shrubs, grasses, and other herbaceous plants, as well as micro-organisms, earthworms, and other plant and animal life, are active agents in the soil-forming process. Climate, parent material, relief, age of the soil, and other environmental factors determine the kinds of plants and animals that live on and in the soil. Where either climate or vegetation varies significantly, the soils vary accordingly.

Plants supply organic matter and transfer moisture and plant nutrients from the lower horizons to the upper horizons. As organic matter decomposes, it is mixed into the soil by micro-organisms and earthworms or by chemical reactions. The rate of decomposition is fairly rapid because of the favorable temperature, the generally abundant soil moisture, and the kinds of micro-organisms in the soil. Organic matter content in the soil is medium or low; it generally ranges from 1 to 3 percent, by volume, in the surface layer.

Originally, the vegetation in the county was dense forest of hardwoods or mixed hardwoods and pine. The density of the stands, the proportion of different species, and the kinds of ground cover was, to some extent, varied. The forests are not likely the reason for all differences in soil properties throughout the county. The leaves of deep-rooted deciduous trees vary in content of plant nutrients, but generally return more bases and phosphorus to the soils than coniferous trees. The litter of conifers, rhododendron, and mountain laurel produces more organic acid than maple and oak litter. Soils that form under layers of acid-forming leaf litter tend to be more highly leached than other soils, and commonly have a very low base saturation. The layer of leaf litter also helps to recycle nutrients, reduces the depth of frost penetration, helps moisture retention, and reduces the hazard of erosion on steep slopes.

As agriculture developed in Lee County, human activities influenced soil formation. They included the clearing of forests and the introduction of new kinds of plants. Cultivation, artificial drainage, and liming and fertilizing changed some soil characteristics. Human activities have also caused accelerated erosion. Hence, the soil in many areas is thinner and vegetation is difficult to establish. Some soil material washed from sloping areas onto depressions and flood plains. Young, or immature, soils, such as Timberville soils, formed in this washed material.

Other human activities that influenced soil formation were coal mining, and the grading, shaping, and filling required for road construction and urban development. Fairpoint, Bethesda, Sewell, and Itmann soils formed in spoil from coalmining. Udorthents formed in urban areas where the surface layer has been disturbed.

Topography

Topography, or lay of the land, causes differences in internal drainage, surface runoff, soil temperature, and geologic erosion, and thus affects the formation of soils. Topography also affects the rate that the soils absorb radiant energy; this absorption rate, in turn, affects native vegetation. Topography alters the effect of parent material on soil formation in that several different kinds of soils can form from the same kind of parent material.

Slope in Lee County ranges from nearly level to very steep. In the steeper areas, runoff is rapid, little water percolates through the soil, the movement of clay and the translocation of bases are both slight, and soil material erodes as fast as it forms. Aspect, which varies greatly in these areas, affects vegetation and soil formation. South-facing slopes are generally drier and north-facing slopes retain more moisture. Berks, Wallen, and Alticrest soils formed under these conditions.

In the gently sloping and strongly sloping areas, the soils are generally well drained and slightly eroded. They are mature and have well-defined horizons. Frederick and Poplimento soils, for example, are mature. Low-lying, flat areas or depressions are wetter and often pond water because of restricted drainage. Soils on colluvial slopes or within drainageways often receive runoff from nearby uplands. Also, lateral underground seepage from the higher areas is fairly common. And, carbonates or other bases in the groundwater may influence the soils. The soils on convex slopes are generally better drained, but those on concave slopes tend to accumulate both runoff and water from internal drainage. Jefferson and Tumbling soils, for example, are well drained soils on convex, colluvial slopes, and Escatawba soils are well drained soils on concave, colluvial slopes.

Time

The length of time that the parent material has been exposed to soil-forming processes influences the kind of soil that forms. The youngest soils in Lee County, such as Holly, Orrville, Lobdell, Chagrin, Pope, and Philo soils, formed in recent alluvium on flood plains. These soils can be stratified and have weakly expressed horizons because the soil-forming processes are interrupted with each new deposition during flooding.

Soil formation is evident even in young mine spoil. Within a few years, a weak structure develops and some rock fragments soften and are more easily crushed. Internal drainage in the mine spoil may increase as these soils continue to develop over time.

Old, strongly developed soils show well-defined genetic horizons. Young, less well-developed soils show only faint or weakly developed horizons. The soils of Lee County range from young soils on flood plains and reclaimed strip mines to old soils on smooth uplands.

In steep and very steep areas, either creep and washing moves soil material or solifluction mixes soil material before it has had sufficient time to develop a deep soil profile. As a result, shallow and weakly developed soils, such as Wallen and Weikert soils, are common on steep slopes.

Morphology of the Soils

The interaction of soil-forming factors result in distinguishable layers, or horizons, in a soil profile. The soil profile extends from the surface of the soil downward to materials little altered by the soil-forming processes.

Most soils have three major horizons, the A, B, and C horizons. Some soils have a fourth major horizon, the E horizon, between the A and B horizons. The major horizons can be further subdivided by the use of subscripts and letters to indicate changes within a horizon. A Bt horizon, for example, represents a layer within the B horizon of translocated clay eluviated from the A and E horizons.

The A horizon, or surface layer, has the largest accumulation of organic matter.

The E horizon is the layer of maximum leaching, or eluviation, of clay and iron.

The B horizon, or subsoil, lies beneath the A horizon and the E horizon. It is the horizon of maximum accumulation, or illuviation, of clay, iron, aluminum, and other elements leached from the layers above. In some soils the B horizon is formed by alteration in place, rather than by illuviation. The oxidation and reduction of iron or the weathering of clay minerals causes the alteration. The Bt horizon is a layer of accumulated clay. Generally, compared to the A horizon, it is firmer, has a finer texture and a stronger structure, and is brighter or redder. Most young soils do not have a developed Bt horizon.

The C horizon is below the A and B horizons. It consists of material that has been little altered by the soil-forming processes, but may have been modified by weathering.

Processes of Horizon Differentiation

Soils are formed as the result of the physical and chemical weathering of parent rocks and organic material, the transfer of materials, the transformation of materials, and the gains and losses of organic matter and minerals.

Soil formation begins with physical weathering of rocks. Frost action, expansion, contraction, and other forces break large pieces of rock into smaller pieces. The rocks and rock fragments are further reduced to sand-, silt-, and clay-sized particles. These particles form the unconsolidated material in which plants can grow. When plants and animals die, organic matter is added to the mineral material.

It is common for materials to transfer from one part of the soil to another. Organic matter in suspension moves from the surface layer to the subsoil. Calcium and other elements are leached from the surface layer. To some extent, the clay in the subsoil or in the substratum hold these elements, but percolating ground water also leaches some elements from the soil. Also, percolating water transfers clay from the upper horizons to the lower horizons.

The roots of plants absorb bases and store them in stems, leaves, and twigs. When plants die and decay, they return to the soil the elements they had absorbed from it. In most soils in the county, the translocation and development in place of clay minerals have strongly influenced the development of soil horizons. As the soil develops, horizons gradually develop recognizable characteristics that make one horizon distinguishable from another.

The accumulation and incorporation of organic matter takes place with the decomposition of plant residue. Organic matter darkens the surface layer and helps to form the A horizon. In many places much of the surface layer has been eroded away or has been mixed with materials from underlying layers through cultivation. Replacing lost organic matter normally takes a long time. In Lee County, the organic matter content of the surface layer is low in Frederick and Weikert soils and medium in Timberville soils.

Some lime and soluble salts must be leached from soils before both the translocation of clay minerals and the formation of a distinct subsoil can occur. Factors that affect leaching include the kind of original salts present in the soils, the depth to which the soil solution percolates, and the texture of the soils.

One transformation is the reduction and solubilization of ferrous iron. This change takes place under wet, saturated conditions in which water replaces molecular oxygen. It mainly occurs in soils that are not well drained. Gleying, or the reduction of iron, is

evident in Holly and Orrville soils, which have a dominantly gray subsoil. The gray color indicates the transformation of iron to the ferrous form and implies wetness. Reduced iron, which is soluble and mobile, commonly has been moved short distances in the soils in Lee County. It has stopped either in the horizon where it originated or in an underlying horizon. It can be partly reoxidized and segregated in the form of stains, concretions, or bright yellow and red redoxiomorphic features.

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Glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep, rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Alpha,alpha-dipyridyl. A dye that when dissolved in 1N ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction indicates a type of redoximorphic feature.

Animal unit month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

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.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Aspect. The direction in which a slope faces.

Association, soil. A group of soils or miscellaneous areas 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 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Back slope. The geomorphic component that forms the steepest inclined surface and principal element of many hillsides. Back slopes in profile are commonly steep, are linear, and may or may not include cliff segments.

Basal area. The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Bedding planes. Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedding system. A drainage system made by plowing, grading, or otherwise shaping the surface of a flat field. It consists of a series of low ridges separated by shallow, parallel dead furrows.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Breaks. The steep and very steep broken land at the border of an upland summit that is dissected by ravines.

Breast height. An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Brush management. Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Cable yarding. A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, felled trees generally are reeled in while one end is lifted or the entire log is suspended.

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 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.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Catsteps. Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.

Cement rock. Shaly limestone used in the manufacture of cement.

Channery soil material. Soil material that is, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a channer.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

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 depletions. Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese and the removal of iron, manganese, and clay. A type of redoximorphic depletion.

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.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that is 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

Colluvium. Soil material or 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

establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas 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 or miscellaneous areas are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane. They typically take the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.

Congeliturbate. Soil material disturbed by frost action.

Conglomerate. A coarse grained, clastic rock composed of rounded or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer textured material. Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the "Soil Survey Manual."

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.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

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.

Creep. Slow mass movement of earth material downslope, primarily under the influence of gravity but facilitated by water saturation and frost action. (See solifluction.)

Cropping system. Growing crops according to a planned system of rotation and management practices.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Dip slope. A slope of the land surface, roughly determined by and approximately conforming to the dip of the underlying bedrock.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divided-slope farming. A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the

slope to reduce the hazard of water erosion. One strip is in a close-growing crop that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit a full stripcropping pattern to be used.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained*. These classes are defined in the "Soil Survey Manual."

Drainage, surface. Runoff, or surface flow of water, from an area.

Duff. A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

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 human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Synonym: scarp.

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.

Excess lime (in tables). Excess carbonates in the soil that restrict the growth of some plants.

Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Excess sodium (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

Excess sulfur (in tables). Excessive amount of sulfur in the soil. The sulfur causes extreme acidity if the soil is drained, and the growth of most plants is restricted.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake (in tables). The rapid movement of water into the soil.

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.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity*.

Fill slope. A sloping surface consisting of excavated soil material from a road cut. It commonly is on the downhill side of the road.

Fine textured soil. Sandy clay, silty clay, or clay.

Firebreak. Area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flaggy soil material. Material that is, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foothill. A steeply sloping upland that has relief of as much as 1,000 feet (300 meters) and fringes a mountain range or high-plateau escarpment.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragile (in tables). A soil that is easily damaged by use or disturbance.

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.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

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 as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

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 uppercase letter represents the major horizons. Numbers or lowercase 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.

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.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

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.

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 overlying soil material. 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, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it 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 potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

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.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Iron depletions. Low-chroma zones having a low content of iron and manganese oxide because of chemical reduction and removal, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic depletion.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Knoll. A small, low, rounded hill rising above adjacent landforms.

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 (7.6 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-residue crops. Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Low strength. The soil is not strong enough to support loads.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. 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).

Mountain. A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides. A mountain can occur as a single, isolated mass or in a group forming a chain or range.

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mudstone. Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Natric horizon. A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules. Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. If formed in place, nodules of iron oxide or manganese oxide are considered types of redoximorphic concentrations.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed

organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

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.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.

Permafrost. Layers of soil, or even bedrock, occurring in arctic or subarctic regions, in which a temperature below freezing has existed continuously for a long time.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as "saturated hydraulic conductivity," which is defined in the "Soil Survey Manual." In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as "permeability." Terms describing permeability, measured in inches per hour, are as follows:

Extremely slow	0.0 to 0.01 inch
Very slow	0.01 to 0.06 inch
Slow	0.06 to 0.2 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, such as slope, stoniness, and flooding.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitting (in tables). Pits caused by melting around ice. They form on the soil after plant cover is removed.

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.

Plateau. An extensive upland mass with relatively flat summit area that is considerably elevated (more than 100 meters) above adjacent lowlands and separated from them on one or more sides by escarpments.

Plinthite. The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents. It commonly appears as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on repeated wetting and drying, especially if it is exposed also to heat from the sun. In a moist soil, plinthite can be cut with a spade. It is a form of laterite.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid or very rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Potential native plant community. See Climax plant community.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants

and promotes the accumulation of litter and mulch necessary to conserve soil and water.

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 degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly 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

Red beds. Sedimentary strata that are mainly red and are made up largely of sandstone and shale.

Redoximorphic concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redoximorphic depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redoximorphic features. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.

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.

Rill. A steep-sided channel resulting from accelerated erosion. A rill generally is a few inches deep and not wide enough to be an obstacle to farm machinery.

Riser. The vertical or steeply sloping surface, commonly one of a series, of natural steplike landforms, such as those of a glacial stairway or of successive stream terraces. (See Tread.)

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

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.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Salty water (in tables). Water that is too salty for consumption by livestock.

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-sized particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saprolite. Unconsolidated residual material underlying the soil and grading to hard bedrock below.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Second bottom. The first terrace above the normal flood plain (or first bottom) of a river.

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.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. 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.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell (in tables). 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.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio. The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

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.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

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.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil generally is silty or clayey, is slippery when wet, and is low in productivity.

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. In this survey, classes for simple slopes are as follows:

Level or nearly level	0 to 2 percent
Very gently sloping	0 to 3 percent
Gently sloping	2 to 7 percent
Moderately sloping	7 to 15 percent
Strongly sloping	15 to 25 percent
Moderately steep	25 to 35 percent
Steep	35 to 55 percent
Very steep	55 percent and higher

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^{+} to $Ca^{++} + Mg^{++}$. The degrees of sodicity and their respective ratios are:

Slight	less than 13:1
Moderate	13-30:1
Strong	more than 30:1

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

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 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

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

Solifluction. Slow, viscous downslope flow of water-saturated regolith. Rates of flow vary widely. The presence of frozen substrate or even freezing and thawing is not implied in the original definition. However, one component of solifluction can be creep of frozen ground. The term is commonly applied to processes operating in both seasonal frost and permafrost areas. (See Creep.)

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, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

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 that provide vegetative barriers to wind erosion 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).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

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."

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Talus. Fragments of rock and other soil material accumulated by gravity at the foot of cliffs or steep slopes.

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 generally is 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 that is 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.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

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.

Toxicity (in tables). Excessive amount of toxic substances, such as sodium or sulfur, that severely hinder establishment of vegetation or severely restrict plant growth.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Tread. The flat or gently sloping surface of natural steplike landforms, commonly one of a series, such as successive stream terraces. (See Riser.)

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

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.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The uprooting and tipping over of trees by the wind.

Tables

Table 1.--Temperature and Precipitation

(Recorded in the period 1931-94 at Pennington Gap, Virginia)

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average daily	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In	In	In
January	45.2	24.0	34.6	68	-6	63	4.62	2.65	6.37	8	5.9
February	49.0	25.4	37.2	71	-1	79	4.64	2.79	6.30	8	4.6
March	57.5	32.3	44.9	80	9	218	5.15	3.16	6.95	8	2.9
April	68.1	40.4	54.3	86	21	434	3.99	2.31	5.48	7	0.4
May	76.4	49.2	62.8	89	30	709	4.23	2.25	5.97	8	0.0
June	83.0	57.4	70.2	94	39	902	4.15	2.50	5.63	7	0.0
July	85.7	61.6	73.6	95	43	1,038	5.05	3.09	6.80	8	0.0
August	84.9	60.5	72.7	95	45	1,013	4.04	2.56	5.38	7	0.0
September	80.7	53.5	67.1	93	34	812	3.12	1.56	4.48	5	0.0
October	70.9	40.9	55.9	86	22	495	2.80	1.25	4.12	5	0.0
November	58.2	32.1	45.2	79	11	206	3.68	2.03	5.13	6	1.0
December	48.0	26.1	37.1	69	1	81	4.37	2.59	5.96	8	3.1
Yearly:											
Average	67.3	42.0	54.6	---	---	---	---	---	---	---	---
Extreme	105	-25	---	97	-9	---	---	---	---	---	---
Total	---	---	---	---	---	6,053	49.83	39.20	56.56	85	18.0

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40 degrees F).

Table 2.--Freeze Dates in Spring and Fall

(Recorded in the period 1931-94 at Kingsport, Tennessee)

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--	Apr. 5	Apr. 15	Apr. 29
2 years in 10 later than--	March 29	Apr. 10	Apr. 25
5 years in 10 later than--	Mar. 17	Mar. 31	Apr. 16
First freezing temperature in fall:			
1 year in 10 earlier than--	Nov. 1	Oct. 19	Oct. 6
2 years in 10 earlier than--	Nov. 6	Oct. 24	Oct. 11
5 years in 10 earlier than--	Nov. 15	Nov. 3	Oct. 21

Table 3.--Growing Season

(Recorded in the period 1931-94 at Pennington Gap, Virginia)

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	194	165	142
8 years in 10	200	173	149
5 years in 10	214	187	163
2 years in 10	227	202	176
1 year in 10	234	209	183

Table 4.--Analysis of Map Unit Composition Data of Selected Map Units

(See description of the map units for composition and behavior characteristics of the components. p=level of probability)

Map symbol and soil components	Number of observations	Mean	Statistical measure of variability: Confidence interval (p=0.90)
		Pct	Pct
1A, 1B:			
Allegheny and similar components--	45	96	90-100
Dissimilar components----------	2	4	0-10
2D:			
Alticrest and similar components--	21	75	61-89
Gilpin and similar components-----	6	21	9-34
Dissimilar components----------	1	4	0-9
3E:			
Beech Grove and similar components	19	55	40-68
Rock outcrop-----------------------	12	34	21-48
Dissimilar components----------	4	11	3-20
4E, 4F:			
Berks and similar components------	32	57	46-68
Poplimento and similar components-	16	29	19-39
Dissimilar components----------	8	14	7-22
5D, 5E, 5F:			
Berks and similar components------	35	53	43-63
Weikert and similar components----	23	35	25-45
Dissimilar components----------	8	12	5-19
7C, 7D:			
Carbo and similar components------	37	76	65-86
Dissimilar components----------	12	24	14-35
8C, 8D:			
Carbo and similar components------	40	73	63-83
Beech Grove and similar components	10	18	10-27
Dissimilar components----------	5	9	3-15
8E:			
Carbo and similar components------	37	62	51-72
Beech Grove and similar components	17	28	19-38
Dissimilar components----------	6	10	4-16
9C, 9D, 9E:			
Carbo and similar components------	30	79	68-90
Rock outcrop-----------------------	4	11	2-19
Dissimilar components----------	4	10	2-19
10A:			
Chagrin and similar components----	40	71	61-81
Lobdell and similar components----	15	27	17-37
Dissimilar components----------	1	2	0-5
11C:			
Escatawba and similar components--	23	51	39-63
Jefferson and similar components--	17	38	26-50
Dissimilar components----------	5	11	3-19
12B, 12C, 12D, 12E, 12F:			
Frederick and similar components--	118	98	95-100
Dissimilar components----------	3	2	0-5

Table 4.--Analysis of Map Unit Composition Data of Selected Map Units--Continued

Map symbol and soil components	Number of observations	Mean	Statistical measure of variability: Confidence interval (p=0.90)
		Pct	Pct
13B, 13C, 13D, 13E, 13F:			
Frederick and similar components--	199	98	96-100
Dissimilar components----------	4	2	0-4
14B, 14C, 14D, 14E:			
Frederick and similar components--	33	97	92-100
Dissimilar components----------	1	3	0-8
15C, 15D:			
Frederick and similar components--	36	69	59-80
Carbo and similar components------	9	17	9-26
Dissimilar components----------	7	14	6-21
15E, 15F:			
Frederick and similar components--	17	63	48-78
Carbo and similar components------	10	37	22-52
Dissimilar components----------	0	0	0-2
16C, 16D, 16E:			
Gilpin and similar components-----	40	91	84-98
Dissimilar components----------	4	9	2-16
17E:			
Gilpin and similar components-----	25	67	55-80
Berks and similar components------	8	22	10-33
Dissimilar components----------	4	11	2-19
18A:			
Holly and similar components------	21	95	88-100
Dissimilar components----------	1	5	0-12
20D:			
Jefferson and similar components--	24	83	71-94
Dissimilar components----------	5	17	6-29
21A:			
Lobdell and similar components----	43	65	55-75
Orrville and similar components---	20	30	21-40
Dissimilar components----------	3	5	0-9
22C, 22E:			
Oriskany and similar components---	27	87	77-97
Dissimilar components----------	4	13	3-23
23A:			
Philo and similar components------	14	88	74-100
Dissimilar components----------	2	12	0-26
24D, 24E:			
Pineville and similar components--	31	89	80-97
Dissimilar components----------	4	11	3-20
26A:			
Pope and similar components-------	28	88	78-97
Dissimilar components----------	4	12	3-22
27D, 27E:			
Poplimento and similar components-	18	62	47-77
Berks and similar components------	8	28	14-41
Dissimilar components----------	3	10	1-20

Table 4.--Analysis of Map Unit Composition Data of Selected Map Units--Continued

Map symbol and soil component	Number of observations	Mean	Statistical measure of variability: Confidence interval (p=0.90)
		Pct	Pct
28B, 28C:			
Shottower and similar components	73	95	91-99
Dissimilar components	4	5	1-9
29B, 29C:			
Timberville and similar components	71	92	87-97
Dissimilar components	6	8	3-13
30C, 30D:			
Tumbling and similar components	83	90	85-95
Dissimilar components	9	10	5-15
31C, 31D, 31E:			
Tumbling and similar components	38	90	83-98
Dissimilar components	4	10	2-17
34D, 34E:			
Wallen and similar components	20	51	38-64
Alticrest and similar components	13	33	21-46
Dissimilar components	6	16	6-25
35F:			
Wallen and similar components	25	73	61-86
Rock outcrop	5	15	5-25
Dissimilar components	4	12	3-21
36C, 36D, 36E:			
Watahala and similar components	117	79	73-84
Frederick and similar components	29	19	14-25
Dissimilar components	3	2	0-4

Table 5.--Correlation of Soils and Geology

(Geologic systems and names were adapted from Englund, K.J., et. al., 1961; Harris and Miller, 1963; Harris, L.D., 1965; Miller and Roen, 1973; and Rader and Evans, 1993)

System	Geology	Dominant soils or miscellaneous areas
Pennsylvanian	Harlan Formation	Gilpin, Berks, Wallen, Bethesda
	Wise Formation	Gilpin, Berks, Alticrest, Bethesda
	Norton Formation	
	Lee Formation	Wallen, Gilpin, Rock outcrop
Mississippian	Bluestone Formation	Berks, Poplimento
	Princeton Sandstone	Berks, Wallen
	Hinton Formation	Berks, Poplimento
	Bluefield Formation	
	Greenbrier Limestone	Berks, Poplimento, Carbo
	Maccrady Shale	Berks, Weikert, Poplimento
	Price Formation	Wallen, Alticrest
Devonian	Chatanooga Shale	Berks, Weikert
Silurian	Hancock Limestone	Carbo, Gilpin
	Clinton Formation	Gilpin
	Clinch Sandstone	
	Poor Valley Ridge Member	Wallen, Alticrest
	Hagan Shale Member	Berks, Weikert
Ordovician	Sequatchie Formation	Berks, Weikert, Poplimento
	Reedsville Shale	Berks, Weikert
	Trenton Limestone	Carbo, Beech Grove, Poplimento
	Eggleston Formation	Rock outcrop
	Hardy Creek Limestone	
	Ben Hur Limestone	
	Woodway Limestone	
	Hurricane Bridge Limestone	Beech Grove, Rock outcrop
	Martin Creek Limestone	Carbo, Beech Grove
	Rob Camp Limestone	
	Poteet Limestone	
Ordovician	Dot Formation	Frederick, Watahala
	Mascot Dolomite	
	Kingsport Dolomite	
	Chepultepec Dolomite	
Cambrian	Copper Ridge Dolomite	Frederick, Watahala
	Maynardville Formation	Frederick, Watahala, Carbo

Table 5.--Correlation of Soils and Geology--Continued

System	Geology	Dominant soils or miscellaneous areas
Cambrian	Nolichucky Shale	Berks, Weikert, Poplimento
	Maryville Limestone	
	Rogersville Shale	
	Rutledge Limestone	
	Pumpkin Valley Shale	
	Rome Formation	
Quaternary	Surficial deposits	
	Colluvium from limestone	Timberville
	Colluvium from sandstone and shale	Tumbling
		Jefferson
		Escatawba
		Oriskany
		Pineville
	Alluvium on flood plains	Holly
		Orrville
		Lobdell
		Chagrin
		Philo
		Pope
	Alluvium on low terraces	Allegheny
	Alluvium on high terraces	Shottower

Table 6.--Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
1A	Allegheny loam, 0 to 2 percent slopes, rarely flooded	1,040	0.4
1B	Allegheny loam, 2 to 7 percent slopes, rarely flooded	1,647	0.6
2D	Alticrest-Gilpin complex, 15 to 35 percent slopes	1,251	0.5
3E	Beech Grove-Rock outcrop complex, 3 to 60 percent slopes	7,645	2.9
4E	Berks-Poplimento complex, 35 to 55 percent slopes	3,477	1.3
4F	Berks-Poplimento complex, 55 to 65 percent slopes	5,838	2.3
5D	Berks-Weikert complex, 15 to 35 percent slopes	677	0.3
5E	Berks-Weikert complex, 35 to 55 percent slopes	5,455	2.1
5F	Berks-Weikert complex, 55 to 80 percent slopes	5,419	2.1
6E	Bethesda, Fairpoint, and Sewell soils, 0 to 80 percent slopes, very rocky	5,732	2.2
7C	Carbo silt loam, 7 to 15 percent slopes	1,334	0.5
7D	Carbo silt loam, 15 to 25 percent slopes	991	0.4
8C	Carbo-Beech Grove complex, 7 to 15 percent slopes, rocky	2,664	1.0
8D	Carbo-Beech Grove complex, 15 to 25 percent slopes, rocky	6,835	2.6
8E	Carbo-Beech Grove complex, 25 to 60 percent slopes, rocky	14,250	5.5
9C	Carbo-Rock outcrop complex, 7 to 15 percent slopes	1,960	0.8
9D	Carbo-Rock outcrop complex, 15 to 25 percent slopes	3,148	1.2
9E	Carbo-Rock outcrop complex, 25 to 35 percent slopes	1,759	0.7
10A	Chagrin-Lobdell complex, 0 to 3 percent slopes, occasionally flooded	2,038	0.8
11B	Escatawba-Jefferson complex, 2 to 7 percent slopes	1,343	0.5
11C	Escatawba-Jefferson complex, 7 to 15 percent slopes	2,992	1.2
12B	Frederick gravelly loam, 2 to 7 percent slopes	595	0.2
12C	Frederick gravelly loam, 7 to 15 percent slopes	3,939	1.5
12D	Frederick gravelly loam, 15 to 25 percent slopes	11,962	4.6
12E	Frederick gravelly loam, 25 to 35 percent slopes	5,381	2.1
12F	Frederick gravelly loam, 35 to 60 percent slopes	2,817	1.1
13B	Frederick silt loam, 2 to 7 percent slopes	462	0.2
13C	Frederick silt loam, 7 to 15 percent slopes	2,988	1.2
13D	Frederick silt loam, 15 to 25 percent slopes	5,115	2.0
13E	Frederick silt loam, 25 to 35 percent slopes	5,703	2.2
13F	Frederick silt loam, 35 to 60 percent slopes	1,089	0.4
14B	Frederick silt loam, karst, 2 to 7 percent slopes	1,968	0.8
14C	Frederick silt loam, karst, 7 to 15 percent slopes	4,105	1.6
14D	Frederick silt loam, karst, 15 to 25 percent slopes	2,060	0.8
14E	Frederick silt loam, karst, 25 to 60 percent slopes	34	*
15C	Frederick-Carbo complex, 7 to 15 percent slopes, rocky	1,659	0.6
15D	Frederick-Carbo complex, 15 to 25 percent slopes, rocky	2,388	0.9
15E	Frederick-Carbo complex, 25 to 35 percent slopes, rocky	5,841	2.2
15F	Frederick-Carbo complex, 35 to 60 percent slopes, rocky	821	0.3
16C	Gilpin silt loam, 7 to 15 percent slopes	270	0.1
16D	Gilpin silt loam, 15 to 35 percent slopes	1,193	0.5
16E	Gilpin silt loam, 35 to 55 percent slopes	8,197	3.1
17D	Gilpin-Berks complex, 15 to 35 percent slopes	1,795	0.7
17E	Gilpin-Berks complex, 35 to 55 percent slopes	15,859	6.1
17F	Gilpin-Berks complex, 55 to 70 percent slopes	4,271	1.6
18A	Holly loam, 0 to 2 percent slopes, frequently flooded	1,017	0.4
19E	Itmann extremely channery sandy loam, 0 to 80 percent slopes	263	0.1
20D	Jefferson loam, 15 to 35 percent slopes, very stony	4,385	1.7
21A	Lobdell-Orrville complex, 0 to 3 percent slopes, occasionally flooded	2,874	1.1
22C	Oriskany cobbly loam, 7 to 15 percent slopes, extremely stony	160	0.1
22E	Oriskany cobbly loam, 35 to 55 percent slopes, extremely stony	7,221	2.8
23A	Philo fine sandy loam, 0 to 3 percent slopes, occasionally flooded	696	0.3
24D	Pineville channery loam, 15 to 35 percent slopes, very stony	2,163	0.8
24E	Pineville channery loam, 35 to 55 percent slopes, very stony	1,689	0.6
25	Pits, quarries	213	0.1
26A	Pope fine sandy loam, 0 to 3 percent slopes, occasionally flooded	510	0.2
27D	Poplimento-Berks complex, 15 to 35 percent slopes	2,179	0.8
27E	Poplimento-Berks complex, 35 to 55 percent slopes	2,681	1.0
28B	Shottower silt loam, 2 to 7 percent slopes	845	0.3
28C	Shottower silt loam, 7 to 15 percent slopes	2,551	1.0
28D	Shottower silt loam, 15 to 25 percent slopes	638	0.2
29B	Timberville silt loam, 2 to 7 percent slopes, frequently flooded	2,576	1.0

See footnote at end of table.

Table 6.--Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
29C	Timberville silt loam, 7 to 15 percent slopes	2,429	0.9
30C	Tumbling loam, 7 to 15 percent slopes	4,194	1.6
30D	Tumbling loam, 15 to 25 percent slopes	215	0.1
31C	Tumbling loam, 7 to 15 percent slopes, very stony	3,500	1.3
31D	Tumbling loam, 15 to 25 percent slopes, very stony	1,218	0.5
31E	Tumbling loam, 25 to 35 percent slopes, very stony	8,662	3.3
32	Udorthents	152	0.1
33	Urban land-Udorthents complex	547	0.2
34D	Wallen-Alticrest complex, 15 to 35 percent slopes, very stony	1,860	0.7
34E	Wallen-Alticrest complex, 35 to 55 percent slopes, very stony	5,199	2.0
35F	Wallen-Rock outcrop complex, 35 to 85 percent slopes, very stony	8,953	3.4
36C	Watahala-Frederick complex, 7 to 15 percent slopes	4,235	1.6
36D	Watahala-Frederick complex, 15 to 35 percent slopes	10,030	3.8
36E	Watahala-Frederick complex, 35 to 55 percent slopes	7,920	3.0
	Water	818	0.3
	Total	260,600	100.0

* Less than 0.05 percent.

Table 7.--Land Capability Classes and 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	Land capability	Corn	Corn silage	Grass-legume hay	Alfalfa hay	Pasture	Tobacco
		Bu	Tons	Tons	Tons	AUM*	Lbs
1A--Allegheny	I	125	25.0	3.5	4.5	7.0	3,000
1B--Allegheny	IIe	115	23.0	3.5	4.5	7.0	3,000
2D--Alticrest-Gilpin	VIe	---	---	---	---	---	---
3E**--Beech Grove-Rock outcrop	VIIs	---	---	---	---	---	---
4E, 4F--Berks-Poplimento	VIIe	---	---	---	---	---	---
5D--Berks-Weikert	VIe	---	---	---	---	---	---
5E, 5F--Berks-Weikert	VIIe	---	---	---	---	---	---
6E--Bethesda, Fairpoint, and Sewell	VIs	---	---	4.4	---	3.0	---
7C--Carbo	IIIe	80	17.0	3.0	4.0	6.5	1,800
7D--Carbo	VIe	---	---	---	---	4.0	---
8C--Carbo-Beech Grove	VIIs	---	---	---	---	2.5	---
8D--Carbo-Beech Grove	VIIs	---	---	---	---	2.0	---
8E--Carbo-Beech Grove	VIIs	---	---	---	---	---	---
9C**--Carbo-Rock outcrop	VIIs	---	---	---	---	---	---
9D**--Carbo-Rock outcrop	VIIs	---	---	---	---	---	---

See footnote at end of table.

Table 7.--Land Capability Classes and Yields per Acre of Crops and Pasture--Continued

Soil name and map symbol	Land capability	Corn	Corn silage	Grass-legume hay	Alfalfa hay	Pasture	Tobacco
		Bu	Tons	Tons	Tons	AUM*	Lbs
9E**--Carbo-Rock outcrop	VIIs	---	---	---	---	---	---
10A--Chagrin-Lobdell	IIw	124	24	4.5	4.5	5.6	2,100
11B--Escatawba-Jefferson	IIe	114	22	3.0	4.4	7.0	2,300
11C--Escatawba-Jefferson	IIIe	101	20	3.0	4.3	6.5	2,800
12B--Frederick	IIe	105	21.0	3.5	4.5	8.5	3,500
12C--Frederick	IIIe	100	20.0	3.0	4.0	7.0	3,000
12D--Frederick	IVe	70	14.0	2.5	3.5	5.5	2,700
12E--Frederick	VIe	---	---	---	---	4.0	---
12F--Frederick	VIIe	---	---	---	---	---	---
13B--Frederick	IIe	130	26.0	3.5	4.5	9.0	3,500
13C--Frederick	IIIe	120	24.0	3.5	4.5	7.6	3,400
13D--Frederick	IVe	80	16.0	3.0	4.0	6.0	3,000
13E--Frederick	VIe	---	---	---	---	4.5	---
13F--Frederick	VIIe	---	---	---	---	---	---
14B--Frederick	IIe	130	26.0	3.5	4.5	9.0	3,000
14C--Frederick	IIIe	120	24.0	3.5	4.5	7.5	2,900
14D--Frederick	IVe	80	16.0	3.0	4.0	6.0	2,500
14E--Frederick	VIIe	---	---	---	---	4.5	---
15C--Frederick-Carbo	IIIe	100	18.0	2.5	3.5	7.0	2,900

See footnote at end of table.

Table 7.--Land Capability Classes and Yields per Acre of Crops and Pasture--Continued

Soil name and map symbol	Land capability	Corn	Corn silage	Grass-legume hay	Alfalfa hay	Pasture	Tobacco
		Bu	Tons	Tons	Tons	AUM*	Lbs
15D---Frederick-Carbo	VIe	---	---	2.5	3.5	5.5	---
15E---Frederick-Carbo	VIIe	---	---	---	---	4.0	---
15F---Frederick-Carbo	VIIe	---	---	---	---	---	---
16C---Gilpin	IIIe	85	17.0	3.0	3.5	6.0	1,700
16D---Gilpin	VIe	---	---	2.5	---	5.0	---
16E---Gilpin	VIIe	---	---	---	---	---	---
17D---Gilpin-Berks	VIe	---	---	---	---	---	---
17E, 17F---Gilpin-Berks	VIIe	---	---	---	---	---	---
18A---Holly	IIIw	100	20.0	---	---	4.5	---
19E---Itmann	VIIIs	---	---	---	---	---	---
20D---Jefferson	VIIs	---	---	2.0	---	4.0	---
21A---Lobdell-Orrville	IIw	117	20.0	3.0	---	5.4	2,000
22C---Oriskany	VIIs	---	---	---	---	2.0	---
22E---Oriskany	VIIs	---	---	---	---	---	---
23A---Philo	IIw	115	20.0	3.5	4.5	5.5	1,800
24D, 24E---Pineville	VIIs	---	---	---	---	---	---
25**---Pits, quarries	VIIIs	---	---	---	---	---	---
26A---Pope	IIw	120	24.0	4.0	---	7.0	2,000
27D---Poplimento-Berks	VIe	---	---	2.5	---	5.0	---

See footnote at end of table.

Table 7.--Land Capability Classes and Yields per Acre of Crops and Pasture--Continued

Soil name and map symbol	Land capability	Corn	Corn silage	Grass-legume hay	Alfalfa hay	Pasture	Tobacco
		Bu	Tons	Tons	Tons	AUM*	Lbs
27E--Poplimento-Berks	VIIe	---	---	---	---	---	---
28B--Shottower	IIe	135	25.0	3.5	4.5	8.5	3,600
28C--Shottower	IIIe	125	24.0	3.5	4.5	8.5	3,400
28D--Shottower	IVe	100	18.0	3.0	4.0	7.5	3,000
29B--Timberville	IIw	150	27.0	4.0	5.0	11.0	3,200
29C--Timberville	IIIe	135	20.0	4.0	4.5	10.0	3,100
30C--Tumbling	IIIe	105	16.0	3.5	4.5	8.5	2,500
30D--Tumbling	IVe	80	14.0	3.0	4.0	8.0	2,000
31C, 31D, 31E--Tumbling	VIs	---	---	---	---	6.5	---
32**. Udorthents							
33**--Urban land-Udorthents	VIIIs	---	---	---	---	---	---
34D--Wallen-Alticrest	VIIs	---	---	---	---	---	---
34E--Wallen-Alticrest	VIIs	---	---	---	---	---	---
35F**--Wallen-Rock outcrop	VIIs	---	---	---	---	---	---
36C--Watahala-Frederick	IIIe	90	15.0	3.0	3.5	6.0	2,500
36D--Watahala-Frederick	IVe	65	12.0	2.0	3.0	4.5	2,000
36E--Watahala-Frederick	VIIe	---	---	---	---	3.5	---

* 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.

** See description of the map unit for composition and behavior characteristics of the map unit.

Table 8.--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	1,040	---	---	---
II	15,554	6,860	8,694	---
III	31,713	30,696	1,017	---
IV	30,020	30,020	---	---
V	---	---	---	---
VI	40,670	21,558	---	19,112
VII	139,610	69,719	---	69,891
VIII	1,023	---	---	1,023

Table 9.--Prime Farmland

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
1A	Allegheny loam, 0 to 2 percent slopes, rarely flooded
1B	Allegheny loam, 2 to 7 percent slopes, rarely flooded
10A	Chagrin-Lobdell complex, 0 to 3 percent slopes, occasionally flooded
12B	Frederick gravelly loam, 2 to 7 percent slopes
13B	Frederick silt loam, 2 to 7 percent slopes
14B	Frederick silt loam, karst, 2 to 7 percent slopes
21A	Lobdell-Orrville complex, 0 to 3 percent slopes, occasionally flooded
23A	Philo fine sandy loam, 0 to 3 percent slopes, occasionally flooded
26A	Pope fine sandy loam, 0 to 3 percent slopes, occasionally flooded
28B	Shottower silt loam, 2 to 7 percent slopes

Table 10.--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: Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
1A, 1B---------- Allegheny	9A	Slight	Moderate	Slight	Severe	Shortleaf pine------	80	710	Eastern white pine, yellow-poplar, black walnut, shortleaf pine, white oak, northern red oak.
						Yellow-poplar-------	93	555	
						Virginia pine-------	72	630	
						Northern red oak----	80	280	
						Red maple----------	---	---	
						Black oak----------	78	280	
						White oak----------	70	280	
2D**:									
Alticrest------	6R	Moderate	Moderate	Slight	Moderate	Northern red oak----	60	240	Shortleaf pine, Virginia pine, eastern white pine.
						Virginia pine-------	60	475	
						Shortleaf pine------	60	475	
						Eastern white pine--	70	630	
						Chestnut oak--------	60	---	
						Scarlet oak---------	60	---	
Gilpin---------	4R	Moderate	Moderate	Slight	Moderate	Northern red oak----	70	280	Virginia pine, eastern white pine, yellow-poplar.
						Yellow-poplar-------	95	555	
4E**, 4F**:									
Berks----------	4R	Moderate	Severe	Moderate	Moderate	Northern red oak----	65	280	Virginia pine, eastern white pine.
						Black oak----------	65	280	
						Virginia pine-------	70	630	
Poplimento-----	4R	Severe	Severe	Slight	Slight	Northern red oak----	80	280	Eastern white pine, yellow-poplar, black walnut.
						Yellow-poplar-------	90	475	
						Hickory------------	---	---	
						Black walnut--------	---	---	
						Ash-----------------	---	---	
5D**:									
Berks----------	4F	Slight	Moderate	Moderate	Moderate	Northern red oak----	65	280	Virginia pine, eastern white pine.
						Black oak----------	65	280	
						Virginia pine-------	70	630	
Weikert--------	3D	Slight	Moderate	Severe	Moderate	Northern red oak----	60	240	Eastern white pine, shortleaf pine, Virginia pine.
						Virginia pine-------	60	475	
5E**, 5F**:									
Berks----------	4R	Moderate	Severe	Moderate	Moderate	Northern red oak----	65	280	Virginia pine, eastern white pine.
						Black oak----------	65	280	
						Virginia pine-------	70	630	
Weikert--------	3R	Moderate	Severe	Severe	Moderate	Northern red oak----	60	240	Eastern white pine, shortleaf pine, Virginia pine.
						Virginia pine-------	60	475	

See footnotes at end of table.

Table 10.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
6E**:									
Bethesda	4R	Moderate	Severe	Moderate	Moderate	Northern red oak	75	280	Eastern white pine, black locust, yellow-poplar.
						Yellow-poplar	90	475	
						White ash	---	---	
						Black locust	75	---	
						Eastern white pine	95	---	
Fairpoint	4R	Slight	Severe	Moderate	Moderate	Northern red oak	75	280	Eastern white pine, black locust, yellow-poplar.
						Yellow-poplar	85	475	
						White ash	74	390	
						Black locust	59	---	
						Eastern white pine	95	---	
Sewell	4R	Severe	Severe	Severe	Moderate	Northern red oak	80	280	Eastern white pine, Virginia pine, shortleaf pine, black locust, American sycamore.
						Eastern white pine	94	950	
						Yellow-poplar	90	475	
						American sycamore	90	---	
						Black locust	50	---	
7C: Carbo	4C	Slight	Moderate	Slight	Moderate	Northern red oak	70	280	Virginia pine, eastern white pine, yellow-poplar.
						Virginia pine	55	475	
7D: Carbo	4R	Moderate	Moderate	Slight	Moderate	Northern red oak	70	280	Yellow-poplar, Virginia pine, eastern white pine.
						Virginia pine	55	390	
8C**:									
Carbo	4C	Slight	Moderate	Slight	Moderate	Northern red oak	70	280	Virginia pine, eastern white pine.
						Virginia pine	55	475	
Beech Grove	2X	Slight	Severe	Severe	Slight	Northern red oak	57	188	Virginia pine, eastern white pine.
						Chestnut oak	52	188	
						Eastern redcedar	---	---	
8D**, 8E**:									
Carbo	4R	Moderate	Moderate	Slight	Moderate	Northern red oak	70	280	Yellow-poplar, Virginia pine, eastern white pine.
						Virginia pine	55	390	
Beech Grove	2X	Moderate	Severe	Severe	Slight	Northern red oak	57	188	
						Chestnut oak	52	188	
						Eastern redcedar	---	---	
9C**:									
Carbo	4C	Slight	Moderate	Slight	Moderate	Northern red oak	70	280	Virginia pine, yellow-poplar, eastern white pine.
						Virginia pine	55	475	
Rock outcrop.									

See footnotes at end of table.

Table 10.--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	Productivity class*	
9D**, 9E**:									
Carbo	4R	Moderate	Moderate	Slight	Moderate	Northern red oak	70	280	Yellow-poplar, Virginia pine, eastern white pine.
						Virginia pine	55	475	
Rock outcrop.									
10A**:									
Chagrin	5A	Slight	Slight	Slight	Severe	Northern red oak	86	390	Eastern white pine, black walnut, yellow-poplar.
						Yellow-poplar	96	555	
						Sugar maple	86	280	
						White oak	---	---	
						Black cherry	---	---	
						White ash	---	---	
						Black walnut	---	---	
Lobdell	5A	Slight	Slight	Slight	Severe	Northern red oak	87	390	Eastern white pine, yellow-poplar, white ash.
						Yellow-poplar	96	555	
						Sugar maple	---	---	
						White ash	---	---	
						White oak	---	---	
						Black cherry	---	---	
11B**, 11C**:									
Escatawba	11A	Slight	Slight	Slight	Severe	Northern red oak	75	280	Eastern white pine, yellow-poplar.
						Eastern white pine	85	870	
						Black oak	75	280	
						White oak	75	280	
						Pitch pine	76	630	
Jefferson	7A	Slight	Slight	Slight	Moderate	Northern red oak	85	280	Eastern white pine, yellow-poplar, white oak, shortleaf pine, black walnut.
						Eastern white pine	85	555	
						Yellow-poplar	98	555	
						Virginia pine	70	630	
						White oak	75	280	
12B, 12C	4C	Slight	Moderate	Moderate	Moderate	Northern red oak	76	280	Eastern white pine, yellow-poplar, black walnut.
Frederick						Yellow-poplar	86	475	
						Black locust	80	280	
						White oak	76	280	
						Black walnut	76	280	
12D, 12E	4R	Moderate	Moderate	Moderate	Moderate	Northern red oak	76	280	Eastern white pine, yellow-poplar, black walnut.
Frederick						Yellow-poplar	86	475	
						Black locust	80	280	
						White oak	76	280	
						Black walnut	76	280	
12F	4R	Severe	Severe	Moderate	Moderate	Northern red oak	76	280	Eastern white pine, yellow-poplar, black walnut.
Frederick						Yellow-poplar	86	475	
						Black locust	80	280	
						White oak	76	280	
						Black walnut	76	280	

See footnotes at end of table.

Table 10.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
13B, 13C-------- Frederick	4C	Slight	Moderate	Slight	Moderate	Northern red oak---- Yellow-poplar------- Black locust-------- White oak----------- Black walnut--------	76 86 80 76 76	280 475 280 280 280	Eastern white pine, yellow-poplar, black walnut.
13D, 13E-------- Frederick	4R	Moderate	Moderate	Slight	Moderate	Northern red oak---- Yellow-poplar------- Black locust-------- White oak----------- Black walnut--------	76 86 80 76 76	280 475 280 280 280	Eastern white pine, yellow-poplar, black walnut.
13F------------- Frederick	4R	Severe	Severe	Slight	Moderate	Northern red oak---- Yellow-poplar------- Black locust-------- White oak----------- Black walnut--------	76 86 80 76 76	280 475 280 280 280	Eastern white pine, yellow-poplar, black walnut.
14B, 14C-------- Frederick	4C	Slight	Moderate	Slight	Moderate	Northern red oak---- Yellow-poplar------- Black locust-------- White oak----------- Black walnut--------	76 86 80 76 76	280 475 280 280 280	Eastern white pine, yellow-poplar, black walnut.
14D, 14E-------- Frederick	4R	Severe	Severe	Slight	Moderate	Northern red oak---- Yellow-poplar------- Black locust-------- White oak----------- Black walnut--------	76 86 80 76 76	280 475 280 280 280	Eastern white pine, yellow-poplar, black walnut.
15C**: Frederick------	4C	Slight	Moderate	Slight	Moderate	Northern red oak---- Yellow-poplar------- Black locust-------- White oak----------- Black walnut--------	76 86 80 76 76	280 475 280 280 280	Eastern white pine, yellow-poplar, black walnut.
Carbo-----------	4C	Slight	Moderate	Slight	Moderate	Northern red oak---- Virginia pine-------	70 55	280 475	Virginia pine, eastern white pine, yellow-poplar.
15D**, 15E**: Frederick------	4R	Moderate	Moderate	Slight	Moderate	Northern red oak---- Yellow-poplar------- Black locust-------- White oak----------- Black walnut--------	76 86 80 76 76	280 475 280 280 280	Eastern white pine, yellow-poplar, black walnut.
Carbo-----------	4R	Moderate	Moderate	Slight	Moderate	Northern red oak---- Virginia pine-------	70 55	280 390	Yellow-poplar, Virginia pine, eastern white pine.
15F**: Frederick------	4R	Severe	Severe	Slight	Moderate	Northern red oak---- Yellow-poplar------- Black locust-------- White oak----------- Black walnut--------	76 86 80 76 76	280 475 280 280 280	Eastern white pine, yellow-poplar, black walnut.

See footnotes at end of table.

Table 10.--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	Productivity class*	
15F**:									
Carbo	4R	Severe	Severe	Slight	Moderate	Yellow-poplar	80	390	Yellow-poplar, eastern white pine, Virginia pine.
						Eastern white pine	80	789	
16C---Gilpin	4A	Slight	Slight	Slight	Moderate	Northern red oak	70	280	Virginia pine, eastern white pine, yellow-poplar.
						Yellow-poplar	95	555	
16D---Gilpin	4R	Moderate	Moderate	Slight	Moderate	Northern red oak	70	280	Virginia pine, eastern white pine, yellow-poplar.
						Yellow-poplar	95	555	
16E---Gilpin	4R	Severe	Severe	Slight	Moderate	Northern red oak	70	280	Virginia pine, eastern white pine, yellow-poplar.
						Yellow-poplar	95	555	
17D**:									
Gilpin	4R	Moderate	Moderate	Slight	Moderate	Northern red oak	70	280	Virginia pine, eastern white pine, yellow-poplar.
						Yellow-poplar	95	555	
Berks	4F	Slight	Moderate	Moderate	Moderate	Northern red oak	65	280	Virginia pine, eastern white pine.
						Black oak	65	280	
						Virginia pine	70	630	
17E**, 17F**:									
Gilpin	4R	Severe	Severe	Slight	Moderate	Northern red oak	70	280	Virginia pine, eastern white pine, yellow-poplar.
						Yellow-poplar	95	555	
Berks	4R	Moderate	Severe	Moderate	Moderate	Northern red oak	65	280	Virginia pine, eastern white pine.
						Black oak	65	280	
						Virginia pine	70	630	
18A---Holly	5W	Slight	Severe	Moderate	Severe	Pin oak	90	390	Red maple, sweetgum, green ash, American sycamore, pin oak, swamp white oak, silver maple.
						Swamp white oak	---	---	
						Red maple	---	---	
						Green ash	---	---	
						Black cherry	---	---	
19E---Itmann	4R	Severe	Severe	Severe	Slight	Sweet birch	---	---	Sweet birch, black locust, black oak, red maple, eastern white pine, shortleaf pine.
						Black locust	30	---	
						Eastern white pine	45	---	
						Virginia pine	---	---	
						Shortleaf pine	---	---	

See footnotes at end of table.

Table 10.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
20D---------- Jefferson	4R	Moderate	Moderate	Slight	Moderate	Northern red oak----	85	280	Yellow-poplar, eastern white pine, shortleaf pine, white oak.
						Yellow-poplar-------	108	630	
						White oak----------	---	---	
						Eastern white pine--	85	---	
21A**:									
Lobdell--------	5A	Slight	Slight	Slight	Severe	Northern red oak----	87	390	Eastern white pine, yellow-poplar, white ash.
						Yellow-poplar-------	96	555	
						Sugar maple---------	---	---	
						White ash----------	---	---	
						White oak----------	---	---	
						Black cherry--------	---	---	
Orrville-------	5A	Slight	Slight	Slight	Severe	Pin oak------------	85	390	Eastern white pine, yellow-poplar, white ash, white oak, northern red oak, black locust, American sycamore.
						Northern red oak----	80	280	
						Yellow-poplar-------	90	475	
						Sugar maple---------	80	280	
						White oak----------	---	---	
						White ash----------	---	---	
						Black cherry--------	---	---	
22C---------- Oriskany	4F	Slight	Slight	Moderate	Slight	Northern red oak----	70	280	Eastern white pine, yellow-poplar, black walnut.
						White oak----------	70	280	
						Eastern white pine--	80	789	
						Yellow-poplar-------	75	555	
						Black walnut--------	---	---	
22E---------- Oriskany	4R	Severe	Severe	Moderate	Slight	Northern red oak----	70	280	Eastern white pine, yellow-poplar.
						White oak----------	70	280	
						Eastern white pine--	80	789	
						Yellow-poplar-------	75	555	
						Black walnut--------	---	---	
23A---------- Philo	4A	Slight	Slight	Slight	Severe	Northern red oak----	86	390	Eastern white pine, yellow-poplar.
						Yellow-poplar-------	102	630	
						Virginia pine-------	74	630	
						Black oak----------	85	390	
						White oak----------	85	390	
						White ash----------	85	630	
24D---------- Pineville	5R	Moderate	Moderate	Moderate	Moderate	Northern red oak----	86	390	Eastern white pine, yellow-poplar, northern red oak, black walnut.
						Yellow-poplar-------	108	630	
						Black oak----------	85	280	
						Hickory------------	---	---	
24E---------- Pineville	5R	Severe	Severe	Moderate	Moderate	Northern red oak----	86	390	Eastern white pine, yellow-poplar, northern red oak, black walnut.
						Yellow-poplar-------	108	630	
						Black oak----------	85	280	
						Hickory------------	---	---	

See footnotes at end of table.

Table 10.--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	Productivity class*	
26A---------- Pope	7A	Slight	Slight	Slight	Severe	Yellow-poplar	96	555	Eastern white pine, yellow-poplar, black walnut, white oak, northern red oak, white ash, shortleaf pine.
						American beech	---	---	
						White oak	80	280	
						Blackgum	---	---	
						American sycamore	---	---	
						Northern red oak	85	280	
27D**:									
Poplimento-----	4R	Moderate	Severe	Slight	Slight	Northern red oak	80	280	Eastern white pine, yellow-poplar, black walnut.
						Yellow-poplar	90	475	
						Hickory	---	---	
						Black walnut	---	---	
						Ash	---	---	
Berks----------	4F	Slight	Moderate	Moderate	Moderate	Northern red oak	65	280	Virginia pine, eastern white pine.
						Black oak	65	280	
						Virginia pine	70	630	
27E**:									
Poplimento-----	4R	Severe	Severe	Slight	Slight	Northern red oak	80	280	Eastern white pine, yellow-poplar, black walnut.
						Yellow-poplar	90	475	
						Hickory	---	---	
						Black walnut	---	---	
						Ash	---	---	
Berks----------	4R	Moderate	Severe	Moderate	Moderate	Northern red oak	65	280	Virginia pine, eastern white pine.
						Black oak	65	280	
						Virginia pine	70	630	
28B, 28C-------- Shottower	12A	Slight	Slight	Slight	Moderate	Eastern white pine	95	950	Eastern white pine, yellow-poplar.
						Northern red oak	80	280	
						Yellow-poplar	90	475	
						Shortleaf pine	76	630	
28D---------- Shottower	12R	Moderate	Moderate	Slight	Moderate	Eastern white pine	95	950	Eastern white pine, yellow-poplar.
						Northern red oak	80	280	
						Yellow-poplar	90	475	
						Shortleaf pine	76	630	
29B, 29C-------- Timberville	5A	Slight	Slight	Slight	Severe	Yellow-poplar	80	390	Yellow-poplar, black walnut, eastern white pine.
						Northern red oak	90	390	
						Shortleaf pine	80	710	
						Virginia pine	70	630	
30C---------- Tumbling	4A	Slight	Slight	Slight	Moderate	Northern red oak	80	280	Eastern white pine, yellow-poplar.
						Yellow-poplar	90	475	
						Eastern white pine	80	789	
30D---------- Tumbling	4R	Moderate	Moderate	Slight	Moderate	Northern red oak	80	280	Eastern white pine, yellow-poplar.
						Yellow-poplar	90	475	
						Eastern white pine	80	789	
31C---------- Tumbling	4X	Slight	Moderate	Slight	Moderate	Northern red oak	80	280	Eastern white pine, yellow-poplar.
						Yellow-poplar	90	475	
						Eastern white pine	80	789	

See footnotes at end of table.

Table 10.--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	Productivity class*	
31D, 31E-------- Tumbling	4X	Moderate	Moderate	Slight	Moderate	Northern red oak---- Yellow-poplar------- Eastern white pine--	80 90 80	280 475 789	Eastern white pine, yellow-poplar.
34D**:									
Wallen----------	3R	Slight	Moderate	Moderate	Slight	Northern red oak---- Shortleaf pine------ Virginia pine------- Scarlet oak--------- Chestnut oak--------	60 60 65 55 55	240 475 555 --- ---	Shortleaf pine, Virginia pine.
Alticrest------	6R	Moderate	Moderate	Slight	Moderate	Virginia pine------- Shortleaf pine------ Eastern white pine-- Scarlet oak--------- Chestnut oak--------	60 60 70 60 60	475 475 630 --- ---	Shortleaf pine, Virginia pine, eastern white pine.
34E**:									
Wallen----------	3R	Moderate	Severe	Moderate	Slight	Northern red oak---- Shortleaf pine------ Virginia pine------- Scarlet oak--------- Chestnut oak--------	60 60 65 55 55	240 475 555 --- ---	Shortleaf pine, Virginia pine.
Alticrest------	6R	Severe	Severe	Slight	Moderate	Virginia pine------- Shortleaf pine------ Eastern white pine-- Scarlet oak--------- Chestnut oak--------	60 60 70 60 60	475 475 630 --- ---	Shortleaf pine, Virginia pine, loblolly pine, eastern white pine.
35F**:									
Wallen----------	3R	Moderate	Severe	Moderate	Slight	Northern red oak---- Shortleaf pine------ Virginia pine------- 	60 60 65 50 50	240 475 555 --- ---	Shortleaf pine, Virginia pine.
Rock outcrop.									
36C**:									
Watahala-------	4A	Slight	Slight	Slight	Moderate	Northern red oak---- Yellow-poplar------- White oak----------- Eastern white pine--	75 85 75 80	280 475 280 789	Eastern white pine, yellow-poplar.
Frederick------	4A	Slight	Slight	Slight	Moderate	Northern red oak---- Yellow-poplar------- Black locust-------- White oak----------- Black walnut--------	76 86 80 76 76	280 475 280 280 280	Eastern white pine, yellow-poplar, black walnut.
36D**:									
Watahala-------	4R	Moderate	Moderate	Slight	Moderate	Northern red oak---- Yellow-poplar------- White oak----------- Eastern white pine--	75 85 75 80	280 475 280 789	Eastern white pine, yellow-poplar.

See footnotes at end of table.

Table 10.--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	Productivity class*	
36D**:									
Frederick	4R	Moderate	Moderate	Moderate	Moderate	Northern red oak	76	280	Eastern white pine, yellow-poplar, black walnut.
						Yellow-poplar	86	475	
						Black locust	80	280	
						White oak	76	280	
						Black walnut	76	280	
36E**:									
Watahala	4R	Severe	Severe	Slight	Moderate	Northern red oak	75	280	Eastern white pine, yellow-poplar.
						Yellow-poplar	85	475	
						White oak	75	280	
						Eastern white pine	80	789	
Frederick	4R	Severe	Severe	Moderate	Moderate	Northern red oak	76	280	Eastern white pine, yellow-poplar, black walnut.
						Yellow-poplar	86	475	
						Black locust	80	280	
						White oak	76	280	
						Black walnut	76	280	

* Productivity class is the yield in board feet per acre per year calculated at the age of culmination of mean annual increment for fully stocked natural stands.

** See description of the map unit for composition and behavior characteristics of the map unit.

Table 11.--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
1A Allegheny	Severe: flooding.	Slight	Moderate: small stones.	Slight	Slight.
1B Allegheny	Severe: flooding.	Slight	Moderate: slope, small stones.	Slight	Slight.
2D*:					
Alticrest	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
3E*:					
Beech Grove	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope.	Severe: slope, depth to rock.
Rock outcrop	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
4E*, 4F*:					
Berks	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Poplimento	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
5D*, 5E*, 5F*:					
Berks	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Weikert	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.	Severe: depth to rock.
6E*:					
Bethesda	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: droughty, slope.
Fairpoint	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.	Severe: small stones, droughty, slope.
Sewell	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope, large stones.
7C Carbo	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope, depth to rock.

See footnote at end of table.

Table 11.--Recreational Development—Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
7D Carbo	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
8C*: Carbo	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope, depth to rock.
Beech Grove	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Slight	Severe: depth to rock.
8D*: Carbo	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Beech Grove	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope.	Severe: slope, depth to rock.
8E*: Carbo	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Beech Grove	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
9C*: Carbo	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope, depth to rock.
Rock outcrop	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Slight	Severe: depth to rock.
9D*: Carbo	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Rock outcrop	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope.	Severe: slope, depth to rock.
9E*: Carbo	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Rock outcrop	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
10A*: Chagrin	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.

See footnote at end of table.

Table 11.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
10A*:					
Lobdell	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Slight	Moderate: flooding.
11B*:					
Escatawba	Severe: too acid.	Severe: too acid.	Severe: too acid.	Slight	Severe: too acid.
Jefferson	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones.
11C*:					
Escatawba	Severe: too acid.	Severe: too acid.	Severe: slope, too acid.	Slight	Severe: too acid.
Jefferson	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: small stones, slope.
12B Frederick	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones, large stones.
12C Frederick	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: slope, small stones.
12D Frederick	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
12E, 12F Frederick	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
13B Frederick	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
13C Frederick	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
13D Frederick	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
13E, 13F Frederick	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
14B Frederick	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
14C Frederick	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
14D Frederick	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.

See footnote at end of table.

Table 11.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
14E---------- Frederick	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
15C*:					
Frederick----------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
Carbo----------	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope, depth to rock.
15D*:					
Frederick----------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Carbo----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
15E*, 15F*:					
Frederick----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Carbo----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
16C---------- Gilpin	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope, thin layer.
16D, 16E---------- Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
17D*, 17E*, 17F*:					
Gilpin----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Berks----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
18A---------- Holly	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
19E---------- Itmann	Severe: large stones, slope.	Severe: large stones, slope.	Severe: large stones. slope.	Severe: too cobbly, slope.	Severe: large stones, slope.
20D---------- Jefferson	Severe: slope.	Severe: slope.	Severe: large stones, small stones, slope.	Severe: slope.	Severe: slope.
21A*:					
Lobdell----------	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Slight----------	Moderate: flooding.

See footnote at end of table.

Table 11.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
21A*:					
Orrville	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
22C	Severe: large stones.	Severe: large stones.	Severe: large stones, slope, small stones.	Severe: large stones.	Severe: large stones, droughty.
22E	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, slope, small stones.	Severe: large stones, slope.	Severe: large stones, droughty, slope.
23A	Severe: flooding.	Moderate: wetness.	Moderate: small stones, flooding.	Moderate: wetness.	Moderate: wetness, flooding.
24D, 24E	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: slope.	Severe: slope.
25*	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
26A	Severe: flooding.	Slight	Moderate: small stones, flooding.	Slight	Moderate: flooding.
27D*, 27E*:					
Poplimento	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Berks	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
28B	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
28C	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
28D	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
29B	Severe: flooding.	Moderate: flooding.	Moderate: slope, small stones.	Moderate: flooding.	Severe: flooding.
29C	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
30C	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
30D	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.

See footnote at end of table.

Table 11.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
31C---------- Tumbling	Moderate: slope, large stones, small stones.	Moderate: slope, large stones, small stones.	Severe: large stones, slope, small stones.	Slight----------	Moderate: small stones, large stones, slope.
31D---------- Tumbling	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Moderate: slope.	Severe: slope.
31E---------- Tumbling	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: slope.
32*. Udorthents					
33*: Urban land----------	Variable--------	Variable--------	Variable--------	Variable--------	Variable.
Udorthents.					
34D*, 34E*: Wallen----------	Severe: slope, too acid.	Severe: slope, too acid.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: too acid, slope.
Alticrest----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
35F*: Wallen----------	Severe: slope, too acid.	Severe: slope, too acid.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: too acid, slope.
Rock outcrop---------	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
36C*: Watahala----------	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Severe: erodes easily, small stones.	Severe: small stones.
Frederick----------	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight----------	Moderate: slope, small stones.
36D*, 36E*: Watahala----------	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, erodes easily.	Severe: small stones, slope.
Frederick----------	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 12.--Wildlife Habitat

(See text for definitions of "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
1A---Allegheny	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
1B---Allegheny	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
2D*:										
Alticrest	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Gilpin	Very poor.	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
3E*:										
Beech Grove	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Rock outcrop	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
4E*, 4F*:										
Berks	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Poplimento	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
5D*:										
Berks	Very poor.	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Weikert	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
5E*, 5F*:										
Berks	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Weikert	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
6E*:										
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.
Sewell	Very poor.	Very poor.	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
7C---Carbo	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
7D---Carbo	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

See footnote at end of table.

Table 12.--Wildlife Habitat—Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hardwood trees	Conif-erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
8C*:										
Carbo	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Beech Grove	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
8D*:										
Carbo	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Beech Grove	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
8E*:										
Carbo	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Beech Grove	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
9C*:										
Carbo	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Rock outcrop	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
9D*:										
Carbo	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Rock outcrop	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
9E*:										
Carbo	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Rock outcrop	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
10A*:										
Chagrin	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Lobdell	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
11B*:										
Escatawba	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Jefferson	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
11C*:										
Escatawba	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

See footnote at end of table.

Table 12.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hardwood trees	Conif-erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
11C*:										
Jefferson	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
12B Frederick	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
12C Frederick	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
12D Frederick	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
12E, 12F Frederick	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
13B Frederick	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
13C Frederick	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
13D Frederick	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
13E, 13F Frederick	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
14B Frederick	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
14C Frederick	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
14D Frederick	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
14E Frederick	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
15C*:										
Frederick	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Carbo	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
15D*:										
Frederick	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Carbo	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
15E*:										
Frederick	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Carbo	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

See footnote at end of table.

Table 12.--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
15F*:										
Frederick	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Carbo	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
16C Gilpin	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
16D Gilpin	Very poor.	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
16E Gilpin	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
17D*:										
Gilpin	Very poor.	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Berks	Very poor.	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
17E*, 17F*:										
Gilpin	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Berks	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
18A Holly	Fair	Fair	Poor	Fair	Fair	Good	Good	Fair	Fair	Good.
19E Itmann	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
20D Jefferson	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
21A*:										
Lobdell	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Orrville	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
22C, 22E Oriskany	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
23A Philo	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
24D Pineville	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
24E Pineville	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
25* Pits, quarries	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.

See footnote at end of table.

Table 12.--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
26A—Pope	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
27D*:										
Poplimento	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Berks	Very poor.	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
27E*:										
Poplimento	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Berks	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
28B—Shottower	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
28C—Shottower	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
28D—Shottower	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
29B—Timberville	Poor	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
29C—Timberville	Poor	Fair	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
30C—Tumbling	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
30D—Tumbling	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
31C—Tumbling	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Very poor.	Good	Very poor.
31D—Tumbling	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Very poor.	Good	Very poor.
31E—Tumbling	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Very poor.	Good	Very poor.
32*. Udorthents										
33*:										
Urban land.										
Udorthents.										
34D*:										
Wallen	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.

See footnote at end of table.

Table 12.--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
34D*:										
Alticrest	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
34E*:										
Wallen	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Alticrest	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
35F*:										
Wallen	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Rock outcrop	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
36C*:										
Watahala	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Frederick	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
36D*:										
Watahala	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Frederick	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
36E*:										
Watahala	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Frederick	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 13.--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
1A, 1B Allegheny	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.
2D*:						
Alticrest	Severe: depth to rock, cutbanks cave, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
3E*:						
Beech Grove	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
Rock outcrop	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
4E*, 4F*:						
Berks	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Poplimento	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
5D*, 5E*, 5F*:						
Berks	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Weikert	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: depth to rock.
6E*:						
Bethesda	Severe: slope.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Severe: slope, slippage.	Severe: slope, unstable fill.	Severe: droughty, slope.
Fairpoint	Severe: slope.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Severe: small stones, droughty, slope.
Sewell	Severe: slope.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Severe: slope, large stones.
7C Carbo	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: slope, depth to rock.

See footnote at end of table.

Table 13.--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
7D Carbo	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
8C*:						
Carbo	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: slope, depth to rock.
Beech Grove	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: depth to rock.
8D*, 8E*:						
Carbo	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
Beech Grove	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
9C*:						
Carbo	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: slope, depth to rock.
Rock outcrop	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: depth to rock.
9D*, 9E*:						
Carbo	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
Rock outcrop	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
10A*:						
Chagrin	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
Lobdell	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, frost action.	Moderate: flooding.
11B*:						
Escatawba	Moderate: too clayey, wetness.	Slight	Moderate: wetness.	Moderate: slope.	Moderate: frost action.	Severe: too acid.
Jefferson	Slight	Slight	Slight	Moderate: slope.	Slight	Moderate: small stones.

See footnote at end of table.

Table 13.--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
11C*:						
Escatawba	Moderate: too clayey, wetness, slope.	Moderate: slope.	Moderate: wetness, slope.	Severe: slope.	Moderate: slope, frost action.	Severe: too acid.
Jefferson	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: small stones, slope.
12B	Moderate:	Severe:	Severe:	Severe:	Severe:	Moderate:
Frederick	too clayey.	shrink-swell.	shrink-swell.	shrink-swell.	shrink-swell, low strength.	small stones, large stones.
12C	Moderate:	Severe:	Severe:	Severe:	Severe:	Moderate:
Frederick	too clayey, slope.	shrink-swell.	shrink-swell.	shrink-swell, slope.	shrink-swell, low strength.	slope, small stones.
12D, 12E, 12F	Severe:	Severe:	Severe:	Severe:	Severe:	Severe:
Frederick	slope.	shrink-swell, slope.	slope, shrink-swell.	shrink-swell, slope.	shrink-swell, low strength, slope.	slope.
13B	Moderate:	Severe:	Severe:	Severe:	Severe:	Slight.
Frederick	too clayey.	shrink-swell.	shrink-swell.	shrink-swell.	shrink-swell, low strength.	
13C	Moderate:	Severe:	Severe:	Severe:	Severe:	Moderate:
Frederick	too clayey, slope.	shrink-swell.	shrink-swell.	slope, shrink-swell.	shrink-swell, low strength.	slope.
13D, 13E, 13F	Severe:	Severe:	Severe:	Severe:	Severe:	Severe:
Frederick	slope.	slope, shrink-swell.	slope, shrink-swell.	slope, shrink-swell.	shrink-swell, low strength, slope.	slope.
14B	Moderate:	Severe:	Severe:	Severe:	Severe:	Slight.
Frederick	too clayey.	shrink-swell.	shrink-swell.	shrink-swell.	shrink-swell, low strength.	
14C	Moderate:	Severe:	Severe:	Severe:	Severe:	Moderate:
Frederick	too clayey, slope.	shrink-swell.	shrink-swell.	slope, shrink-swell.	shrink-swell, low strength.	slope.
14D, 14E	Severe:	Severe:	Severe:	Severe:	Severe:	Severe:
Frederick	slope.	slope, shrink-swell.	slope, shrink-swell.	slope, shrink-swell.	shrink-swell, low strength, slope.	slope.
15C*:						
Frederick	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: slope, shrink-swell.	Severe: shrink-swell, low strength.	Moderate: slope.
Carbo	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: slope, depth to rock.

See footnote at end of table.

Table 13.--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
15D*, 15E*, 15F*:						
Frederick	Severe: slope.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: shrink-swell, low strength, slope.	Severe: slope.
Carbo	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
16C	Moderate: slope, depth to rock.	Moderate: slope.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope, thin layer.
16D, 16E	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
17D*, 17E*, 17F*:						
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Berks	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
18A	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding, frost action.	Severe: wetness, flooding.
19E	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: large stones, slope.
20D	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
21A*:						
Lobdell	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, frost action.	Moderate: flooding.
Orrville	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Moderate: wetness, flooding.
22C	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: slope, large stones.	Severe: large stones.	Severe: large stones, droughty.
22E	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, droughty, slope.
23A	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Moderate: wetness, flooding.

See footnote at end of table.

Table 13.--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
24D, 24E---------- Pineville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
25*---------- Pits, quarries	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
26A---------- Pope	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
27D*, 27E*: Poplimento-------	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
Berks----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
28B---------- Shottower	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
28C---------- Shottower	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
28D---------- Shottower	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
29B---------- Timberville	Moderate: too clayey, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
29C---------- Timberville	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
30C---------- Tumbling	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.
30D---------- Tumbling	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
31C---------- Tumbling	Moderate: too clayey, large stones, slope.	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: small stones, large stones, slope.
31D, 31E---------- Tumbling	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
32*. Udorthents						

See footnote at end of table.

Table 13.--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
33*:						
Urban land	Variable	Variable	Variable	Variable	Variable	Variable.
Udorthents.						
34D*, 34E*:						
Wallen	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: too acid, slope.
Alticrest	Severe: depth to rock, cutbanks cave, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
35F*:						
Wallen	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: too acid, slope.
Rock outcrop	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
36C*:						
Watahala	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: slope.	Severe: small stones.
Frederick	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: slope, small stones.
36D*, 36E*:						
Watahala	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
Frederick	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 14.--Sanitary Facilities

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," 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
1A Allegheny	Moderate: flooding.	Moderate: seepage.	Moderate: flooding, too clayey.	Moderate: flooding.	Fair: too clayey, small stones.
1B Allegheny	Moderate: flooding.	Moderate: seepage, slope.	Moderate: flooding, too clayey.	Moderate: flooding.	Fair: too clayey, small stones.
2D*:					
Alticrest	Severe: depth to rock, poor filter, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, slope.
Gilpin	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: slope, area reclaim, thin layer.
3E*:					
Beech Grove	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Rock outcrop	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
4E*, 4F*:					
Berks	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, small stones, slope.
Poplimento	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
5D*, 5E*, 5F*:					
Berks	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, small stones, slope.
Weikert	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, slope.	Poor: depth to rock, seepage, small stones.
6E*:					
Bethesda	Severe: percs slowly, slope, unstable fill.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Poor: small stones, slope.

See footnote at end of table.

Table 14.--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
6E*:					
Fairpoint	Severe: percs slowly, slope, unstable fill.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Poor: small stones, slope.
Sewell	Severe: poor filter, slope, unstable fill.	Severe: seepage, slope, unstable fill.	Severe: seepage, slope, unstable fill.	Severe: seepage, slope, unstable fill.	Severe: seepage, slope, small stones.
7C	Severe:	Severe:	Severe:	Severe:	Poor:
Carbo	depth to rock, percs slowly.	depth to rock, slope.	depth to rock, too clayey.	depth to rock.	depth to rock, too clayey, hard to pack.
7D	Severe:	Severe:	Severe:	Severe:	Poor:
Carbo	depth to rock, percs slowly, slope.	depth to rock, slope.	depth to rock, slope, too clayey.	depth to rock, slope.	depth to rock, too clayey, hard to pack.
8C*:					
Carbo	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
Beech Grove	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
8D*, 8E*:					
Carbo	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: depth to rock, too clayey, hard to pack.
Beech Grove	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
9C*:					
Carbo	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
Rock outcrop	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
9D*, 9E*:					
Carbo	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: depth to rock, too clayey, hard to pack.
Rock outcrop	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.

See footnote at end of table.

Table 14.--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
10A*:					
Chagrin	Severe: flooding.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Fair: thin layer.
Lobdell	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Fair: wetness.
11B*:					
Escatawba	Severe: wetness, percs slowly.	Severe: wetness.	Severe: too clayey, too acid.	Moderate: wetness.	Poor: too clayey, hard to pack, small stones.
Jefferson	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too clayey, small stones.
11C*:					
Escatawba	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: too clayey, too acid.	Moderate: wetness, slope.	Poor: too clayey, hard to pack, small stones.
Jefferson	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: too clayey, small stones, slope.
12B Frederick	Moderate: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
12C Frederick	Moderate: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
12D, 12E, 12F Frederick	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
13B Frederick	Moderate: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
13C Frederick	Moderate: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
13D, 13E, 13F Frederick	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
14B Frederick	Moderate: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.

See footnote at end of table.

Table 14.--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
14C---------- Frederick	Moderate: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
14D, 14E---------- Frederick	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
15C*: Frederick----------	Moderate: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
Carbo----------	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
15D*, 15E*, 15F*: Frederick----------	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Carbo----------	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: depth to rock, too clayey, hard to pack.
16C---------- Gilpin	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, thin layer.
16D, 16E---------- Gilpin	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: slope, area reclaim, thin layer.
17D*, 17E*, 17F*: Gilpin----------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: slope, area reclaim, thin layer.
Berks----------	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, small stones, slope.
18A---------- Holly	Severe: flooding, wetness, percs slowly.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: wetness.
19E---------- Itmann	Severe: unstable fill, poor filter, slope.	Severe: seepage, slope, unstable fill.	Severe: seepage, slope, unstable fill.	Severe: seepage, slope, unstable fill.	Severe: small stones, slope.

See footnote at end of table.

Table 14.--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
20D---------- Jefferson	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
21A*:					
Lobdell----------	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Fair: wetness.
Orrville----------	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness.	Poor: wetness.
22C---------- Oriskany	Severe: large stones.	Severe: seepage, slope, large stones.	Severe: seepage, large stones.	Moderate: slope.	Poor: large stones.
22E---------- Oriskany	Severe: slope, large stones.	Severe: seepage, slope, large stones.	Severe: seepage, slope, large stones.	Severe: slope.	Poor: large stones, slope.
23A---------- Philo	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage.	Severe: flooding, wetness.	Fair: depth to rock, small stones, wetness.
24D, 24E---------- Pineville	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.
25*---------- Pits, quarries	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
26A---------- Pope	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Good.
27D*, 27E*:					
Poplimento---------	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Berks----------	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, small stones, slope.
28B---------- Shottower	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight----------	Poor: small stones.
28C---------- Shottower	Moderate: percs slowly, slope.	Severe: slope.	Moderate: too clayey, slope.	Moderate: slope.	Poor: small stones.

See footnote at end of table.

Table 14.--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
28D Shottower	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
29B Timberville	Severe: flooding.	Severe: flooding.	Severe: flooding, too clayey.	Severe: flooding.	Poor: too clayey, hard to pack, small stones.
29C Timberville	Moderate: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack, small stones.
30C Tumbling	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Poor: small stones.
30D Tumbling	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
31C Tumbling	Moderate: percs slowly, slope, large stones.	Severe: slope.	Severe: large stones.	Moderate: slope.	Poor: large stones.
31D, 31E Tumbling	Severe: slope.	Severe: slope.	Severe: slope, large stones.	Severe: slope.	Poor: large stones, slope.
32*. Udorthents					
33*: Urban land	Variable	Variable	Variable	Variable	Variable.
Udorthents.					
34D*, 34E*: Wallen	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, small stones, slope.
Alticrest	Severe: depth to rock, poor filter, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, small stones, slope.
35F*: Wallen	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, small stones, slope.
Rock outcrop	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.

See footnote at end of table.

Table 14.--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
36C*:					
Watahala	Severe: percs slowly.	Severe: seepage, slope.	Severe: too clayey.	Severe: seepage.	Poor: too clayey, hard to pack.
Frederick	Moderate: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
36D*, 36E*:					
Watahala	Severe: percs slowly, slope.	Severe: seepage, slope.	Severe: slope, too clayey.	Severe: seepage, slope.	Poor: too clayey, hard to pack, slope.
Frederick	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 15.--Construction Materials

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "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	Roadfill	Sand	Gravel	Topsoil
1A, 1B Allegheny	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
2D*:				
Alticrest	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Gilpin	Poor: thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
3E*:				
Beech Grove	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Rock outcrop	Poor: depth to rock, slope.	---	---	Poor: depth to rock, slope.
4E*, 4F*:				
Berks	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Poplimento	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, area reclaim.
5D*, 5E*, 5F*:				
Berks	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Weikert	Poor: depth to rock, slope.	Improbable: small stones.	Improbable: thin layer.	Poor: depth to rock, small stones, slope.
6E*:				
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.

See footnote at end of table.

Table 15.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
6E*:				
Sewell	Poor: large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.
7C	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
7D	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
8C*:				
Carbo	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Beech Grove	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones.
8D*:				
Carbo	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
Beech Grove	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
8E*:				
Carbo	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
Beech Grove	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
9C*:				
Carbo	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Rock outcrop	Poor: depth to rock.	---	---	Poor: depth to rock.

See footnote at end of table.

Table 15.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
9D*:				
Carbo	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
Rock outcrop	Poor: depth to rock.	---	---	Poor: depth to rock, slope.
9E*:				
Carbo	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
Rock outcrop	Poor: depth to rock, slope.	---	---	Poor: depth to rock, slope.
10A*:				
Chagrin	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Lobdell	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
11B*, 11C*:				
Escatawba	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, too acid.
Jefferson	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
12B, 12C Frederick	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.
12D Frederick	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
12E, 12F Frederick	Poor: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
13B, 13C Frederick	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
13D Frederick	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.

See footnote at end of table.

Table 15.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
13E, 13F Frederick	Poor: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
14B, 14C Frederick	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
14D Frederick	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
14E Frederick	Poor: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
15C*: Frederick	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Carbo	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
15D*: Frederick	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
Carbo	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
15E*, 15F*: Frederick	Poor: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
Carbo	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
16C Gilpin	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
16D, 16E Gilpin	Poor: thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
17D*, 17E*, 17F*: Gilpin	Poor: thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.

See footnote at end of table.

Table 15.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
17D*, 17E*, 17F*:				
Berks	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
18A	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Holly				
19E	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Itmann				
20D	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Jefferson				
21A*:				
Lobdell	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Orrville	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
22C	Poor: large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim.
Oriskany				
22E	Poor: large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.
Oriskany				
23A	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Philo				
24D, 24E	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Severe: small stones, slope.
Pineville				
25*	Poor: depth to rock, slope.	---	---	Poor: depth to rock, slope.
Pits, quarries				
26A	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
Pope				
27D*, 27E*:				
Poplimento	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, area reclaim.
Berks	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.

See footnote at end of table.

Table 15.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
28B, 28C---------- Shottower	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, area reclaim.
28D---------- Shottower	Fair: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, area reclaim.
29B, 29C---------- Timberville	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
30C---------- Tumbling	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, area reclaim.
30D---------- Tumbling	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, area reclaim.
31C---------- Tumbling	Fair: low strength, large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, large stones, area reclaim.
31D---------- Tumbling	Fair: low strength, large stones, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, large stones, area reclaim.
31E---------- Tumbling	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, large stones, area reclaim.
32*. Udorthents				
33*: Urban land----------	Variable----------	Variable----------	Variable----------	Variable.
Udorthents.				
34D*, 34E*: Wallen----------	Poor: depth to rock, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: small stones, too acid, slope.
Alticrest----------	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.

See footnote at end of table.

Table 15.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
35F*:				
Wallen	Poor: depth to rock, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: small stones, too acid, slope.
Rock outcrop	Poor: depth to rock, slope.	---	---	Poor: depth to rock, slope.
36C*:				
Watahala	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Frederick	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.
36D*, 36E*:				
Watahala	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Frederick	Poor: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 16.--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-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
1A Allegheny	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Favorable.
1B Allegheny	Moderate: seepage, slope.	Severe: piping.	Deep to water	Favorable	Favorable.
2D*:					
Alticrest	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, depth to rock.	Slope, depth to rock.
Gilpin	Severe: slope.	Severe: thin layer.	Deep to water	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
3E*:					
Beech Grove	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Slope, depth to rock.	Slope, depth to rock.
Rock outcrop	Severe: depth to rock, slope.	---	Deep to water	Slope, depth to rock.	Slope, depth to rock.
4E*, 4F*:					
Berks	Severe: seepage, slope.	Severe: thin layer.	Deep to water	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Poplimento	Severe: slope.	Severe: hard to pack.	Deep to water	Slope	Slope.
5D*, 5E*, 5F*:					
Berks	Severe: seepage, slope.	Severe: thin layer.	Deep to water	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Weikert	Severe: depth to rock, slope.	Severe: seepage.	Deep to water	Slope, depth to rock.	Slope, depth to rock.
6E*:					
Bethesda	Severe: slope.	Severe: seepage, piping.	Deep to water	Slope, large stones, slippage.	Large stones, slope, droughty.
Fairpoint	Severe: slope.	Severe: piping.	Deep to water	Slope, large stones, slippage.	Large stones, slope, droughty.
Sewell	Severe: seepage, slope.	Severe: seepage, large stones.	Deep to water	Slope, large stones.	Large stones, slope, droughty.

See footnote at end of table.

Table 16.--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
7C, 7D---------- Carbo	Severe: slope.	Severe: hard to pack.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
8C*, 8D*, 8E*:					
Carbo----------	Severe: slope.	Severe: hard to pack.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Beech Grove------	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Slope, depth to rock.	Slope, depth to rock.
9C*, 9D*, 9E*:					
Carbo----------	Severe: slope.	Severe: hard to pack.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Rock outcrop-----	Severe: depth to rock, slope.	---	Deep to water	Slope, depth to rock.	Slope, depth to rock.
10A*:					
Chagrin----------	Moderate: seepage.	Severe: piping.	Deep to water	Favorable--------	Favorable.
Lobdell----------	Severe: seepage.	Severe: piping.	Flooding, frost action.	Erodes easily, wetness.	Erodes easily.
11B*:					
Escatawba--------	Moderate: seepage, slope.	Severe: hard to pack.	Slope, too acid.	Wetness----------	Favorable.
Jefferson--------	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing-----	Favorable.
11C*:					
Escatawba--------	Severe: slope.	Severe: hard to pack.	Slope, too acid.	Slope, wetness.	Slope.
Jefferson--------	Severe: seepage.	Severe: piping.	Deep to water	Slope, soil blowing.	Slope.
12B---------- Frederick	Moderate: seepage, slope.	Severe: hard to pack.	Deep to water	Favorable--------	Favorable.
12C, 12D, 12E, 12F---------- Frederick	Severe: slope.	Severe: hard to pack.	Deep to water	Slope----------	Slope.
13B---------- Frederick	Moderate: seepage, slope.	Severe: hard to pack.	Deep to water	Favorable--------	Favorable.
13C, 13D, 13E, 13F---------- Frederick	Severe: slope.	Severe: hard to pack.	Deep to water	Slope----------	Slope.

See footnote at end of table.

Table 16.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
14B Frederick	Moderate: seepage, slope.	Severe: hard to pack.	Deep to water	Favorable	Favorable.
14C, 14D, 14E Frederick	Severe: slope.	Severe: hard to pack.	Deep to water	Slope	Slope.
15C*, 15D*, 15E*, 15F*: Frederick	Severe: slope.	Severe: hard to pack.	Deep to water	Slope	Slope.
Carbo	Severe: slope.	Severe: hard to pack.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
16C, 16D, 16E Gilpin	Severe: slope.	Severe: thin layer.	Deep to water	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
17D*, 17E*, 17F*: Gilpin	Severe: slope.	Severe: thin layer.	Deep to water	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Berks	Severe: seepage, slope.	Severe: thin layer.	Deep to water	Slope, large stones, depth to rock.	Large stones, slope, droughty.
18A Holly	Severe: seepage.	Severe: piping, wetness.	Flooding, frost action.	Wetness	Wetness.
19E Itmann	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope	Slope, droughty.
20D Jefferson	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, large stones.	Large stones, slope.
21A*: Lobdell	Severe: seepage.	Severe: piping.	Flooding, frost action.	Erodes easily, wetness.	Erodes easily.
Orrville	Moderate: seepage.	Severe: piping, wetness.	Flooding, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
22C, 22E Oriskany	Severe: seepage, slope.	Severe: piping, large stones.	Deep to water	Slope, large stones.	Large stones, slope, droughty.
23A Philo	Severe: seepage.	Severe: piping, wetness.	Flooding	Wetness	Favorable.
24D, 24E Pineville	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope	Slope.

See footnote at end of table.

Table 16.--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
25*-- Pits, quarries	Severe: depth to rock, slope.	---	Deep to water	Slope, depth to rock.	Slope, depth to rock.
26A-- Pope	Severe: seepage.	Severe: piping.	Deep to water	Favorable	Favorable.
27D*, 27E*:					
Poplimento	Severe: slope.	Severe: hard to pack.	Deep to water	Slope	Slope.
Berks	Severe: seepage, slope.	Severe: thin layer.	Deep to water	Slope, large stones, depth to rock.	Large stones, slope, droughty.
28B-- Shottower	Moderate: seepage, slope.	Moderate: hard to pack.	Deep to water	Favorable	Favorable.
28C, 28D-- Shottower	Severe: slope.	Moderate: hard to pack.	Deep to water	Slope	Slope.
29B-- Timberville	Moderate: seepage, slope.	Moderate: piping, hard to pack.	Deep to water	Favorable	Favorable.
29C-- Timberville	Severe: slope.	Moderate: piping, hard to pack.	Deep to water	Slope	Slope.
30C, 30D-- Tumbling	Severe: slope.	Moderate: large stones.	Deep to water	Slope, large stones.	Large stones, slope.
31C, 31D, 31E----- Tumbling	Severe: slope.	Severe: large stones.	Deep to water	Slope, large stones.	Large stones, slope, droughty.
32*. Udorthents					
33*:					
Urban land	Variable	Variable	Variable	Variable	Variable.
Udorthents.					
34D*, 34E*:					
Wallen	Severe: seepage, slope.	Severe: seepage, large stones.	Deep to water	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Alticrest	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, depth to rock, soil blowing.	Slope, depth to rock.
35F*:					
Wallen	Severe: seepage, slope.	Severe: seepage, large stones.	Deep to water	Slope, large stones, depth to rock.	Large stones, slope, droughty.

See footnote at end of table.

Table 16.--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
35F*:					
Rock outcrop	Severe: depth to rock, slope.	---	Deep to water	Slope, depth to rock.	Slope, depth to rock.
36C*, 36D*, 36E*:					
Watahala	Severe: seepage, slope.	Severe: hard to pack.	Deep to water	Slope, erodes easily.	Slope, erodes easily, droughty.
Frederick	Severe: slope.	Severe: hard to pack.	Deep to water	Slope	Slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 17.--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		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
1A, 1B----------	0-5	Loam----------	ML, CL	A-4	0	90-100	80-100	65-100	55-95	<35	NP-10
Allegheny	5-30	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
	30-62	Clay loam, 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
2D*:											
Alticrest-------	0-3	Fine sandy loam--	ML, CL-ML, SM, SC-SM	A-4, A-2	0-2	80-100	75-100	55-80	34-65	<20	NP-6
	3-27	Sandy loam, loam, fine sandy loam.	ML, CL-ML, SM, SC-SM	A-4, A-2	0-2	80-100	75-100	55-85	34-70	<23	NP-6
	27-30	Sand, loamy sand, sandy loam.	SM, SC-SM	A-2, A-4, A-1	0-5	80-100	75-100	45-75	13-36	<20	NP-5
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Gilpin----------	0-5	Silt loam--------	CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	5-29	Channery loam, shaly silt loam, silty clay loam.	GC, SC, CL, CL-ML	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
3E*:											
Beech Grove-----	0-3	Silt loam--------	ML, CL-ML, CL	A-4, A-6	0-15	80-100	75-90	65-90	45-80	20-30	5-10
	3	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop----	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
4E*, 4F*:											
Berks----------	0-5	Silt loam--------	CL, ML, CL-ML	A-4	0-10	80-100	75-100	65-85	50-75	25-36	5-10
	5-16	Very channery silty clay loam, very channery loam, very 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
	16-29	Extremely channery loam, very channery loam, extremely channery silt loam.	GM	A-1, A-2	0-40	25-50	20-40	15-35	15-35	24-38	2-10
	29	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
4E*, 4F*:											
Poplimento	0-8	Silt loam	CL, CL-ML	A-4, A-6	0-5	80-100	75-100	65-100	50-90	25-40	5-15
	8-15	Silty clay loam, silty clay, clay.	CL, CH	A-7	0-5	80-100	75-100	65-95	60-90	35-65	15-50
	15-55	Channery silty clay loam, very channery silty clay, clay.	CL, CH, GC, SC	A-6, A-7, A-2-6	0-10	45-90	40-100	35-80	30-75	35-60	15-35
	55-62	Silty clay, very channery silty clay loam, clay.	CL, CH, GC, SC	A-2, A-6, A-7	0-15	45-90	40-100	35-80	30-75	35-55	15-30
5D*, 5E*, 5F*:											
Berks	0-5	Silt loam	CL, ML, CL-ML	A-4	0-10	80-100	75-100	65-85	50-75	25-36	5-10
	5-16	Very channery loam, very channery silty clay loam, very 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
	16-29	Extremely channery loam, very channery loam, extremely channery silt loam.	GM	A-1, A-2	0-40	25-50	20-40	15-35	15-35	24-38	2-10
	29	Weathered bedrock	---	---	---	---	---	---	---	---	---
Weikert	0-3	Silt loam	CL-ML, CL	A-4, A-6	0-5	85-95	85-95	75-95	60-85	20-30	5-11
	3-15	Very channery loam, very channery silt loam.	GM, GP-GM	A-1, A-2	0-20	15-60	10-55	5-45	5-35	28-36	3-9
	15	Weathered bedrock	---	---	---	---	---	---	---	---	---
6E*:											
Bethesda	0-7	Gravelly 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
	7-62	Very channery silt loam, extremely channery silty clay loam.	GM, GC, ML, CL	A-4, A-6, A-7, A-2	10-30	40-80	25-65	22-65	18-62	24-50	3-23
Fairpoint	0-5	Shaly silt loam	CL, CL-ML, SC, GC	A-4, A-6, A-2	5-15	55-90	45-80	40-80	30-75	25-40	4-14
	5-62	Very channery loam, very channery silty clay loam, very channery silt loam.	GC, CL, CL-ML, SC	A-4, A-6, A-7, A-2	15-30	55-75	25-65	22-65	15-60	18-62	4-24

See footnote at end of table.

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
6E*:											
Sewell	0-10	Very stony sandy loam.	SM, SC-SM, GM-GC, GM	A-1, A-2	15-30	55-70	50-65	35-50	10-25	15-25	NP-7
	10-62	Very channery sandy loam, very stony sandy loam, extremely channery sandy loam.	GM, GP-GM, GM-GC	A-1, A-2	5-30	30-50	25-45	15-35	10-20	15-25	NP-7
7C, 7D	0-8	Silt loam	CL	A-6, A-7	0-2	95-100	90-100	85-95	75-85	30-50	10-25
Carbo	8-28	Clay	CH	A-7	0-5	95-100	85-100	80-95	70-90	60-80	35-55
	28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
8C*, 8D*, 8E*:											
Carbo	0-8	Silt loam	CL	A-6, A-7	0-2	95-100	90-100	85-95	75-85	30-50	10-25
	8-28	Clay	CH	A-7	0-5	95-100	85-100	80-95	70-90	60-80	35-55
	28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Beech Grove	0-3	Silt loam	ML, CL-ML, CL	A-4, A-6	0-15	80-100	75-90	65-90	45-80	20-30	5-10
	3	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
9C*, 9D*, 9E*:											
Carbo	0-8	Silt loam	CL	A-6, A-7	0-2	95-100	90-100	85-95	75-85	30-50	10-25
	8-28	Clay	CH	A-7	0-5	95-100	85-100	80-95	70-90	60-80	35-55
	28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
10A*:											
Chagrin	0-6	Loam	ML, CL, CL-ML	A-4	0	95-100	85-100	80-100	70-90	20-35	2-10
	6-42	Silt loam, loam, sandy clay loam, sandy loam.	ML, SM	A-4, A-2, A-6	0	90-100	75-100	55-90	30-80	20-40	NP-14
	42-62	Stratified silt loam to gravelly fine sand.	ML, SM, SP-SM	A-4, A-2	0	75-100	65-100	40-85	10-80	20-40	NP-10
Lobdell	0-8	Silt loam	ML, CL-ML, CL	A-4	0	95-100	90-100	80-100	65-90	20-30	NP-8
	8-48	Loam, silt loam	ML	A-4	0	90-100	80-100	70-95	55-85	20-35	NP-10
	48-62	Stratified sandy loam to silt loam.	ML, SM, CL-ML, CL	A-4	0	90-100	80-100	65-85	40-80	15-35	NP-10

See footnote at end of table.

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
11B*, 11C*:											
Escatawba	0-5	Loam	CL-ML, ML	A-4	0-5	85-100	80-100	60-95	40-80	5-26	2-12
	5-17	Loam, silt loam, fine sandy loam.	CL-ML, ML	A-4	0-5	85-100	80-100	60-95	40-80	5-26	2-12
	17-38	Loam, silt loam, gravelly loam.	CL-ML, ML	A-4	0-5	65-100	55-100	50-95	35-80	5-29	2-12
	38-62	Gravelly clay, gravelly clay loam, clay loam.	CL, CH, MH	A-7-5, A-7-6	5-20	65-85	55-80	50-80	40-65	49-60	19-30
Jefferson	0-11	Loam	SM, SC, ML, CL	A-2, A-4	0-5	85-95	80-90	40-80	25-65	20-35	2-10
	11-42	Gravelly loam, clay loam, gravelly sandy clay loam.	SM, SC, ML, CL	A-4, A-2, A-6	0-5	75-90	50-90	50-80	30-70	15-35	2-15
	42-62	Gravelly clay loam, very gravelly clay loam, very gravelly sandy clay loam.	GM, SM, ML, GM-GC	A-2, A-4, A-1	0-5	55-75	25-75	20-70	10-60	20-35	2-10
12B, 12C, 12D, 12E, 12F, Frederick	0-8	Gravelly loam	GM, GC, ML, CL	A-4, A-6	0-10	60-80	50-75	40-70	35-65	0-35	NP-15
	8-62	Clay, silty clay, gravelly clay.	CH	A-7	0-5	75-100	60-100	55-100	50-85	60-85	30-50
13B, 13C, 13D, 13E, 13F, 14B, 14C, 14D, 14E, Frederick	0-9	Silt loam	ML, CL, CL-ML	A-4, A-6	0-5	80-100	75-100	75-95	75-90	<35	NP-15
	9-62	Clay, silty clay, gravelly clay.	CH	A-7	0-5	75-100	60-100	55-100	50-95	60-85	30-55
15C*, 15D*, 15E*, 15F*:											
Frederick	0-9	Silt loam	ML, CL, CL-ML	A-4, A-6	0-5	80-100	75-100	75-95	75-90	<35	NP-15
	9-62	Clay, silty clay, gravelly clay.	CH	A-7	0-5	75-100	60-100	55-100	50-95	60-85	30-55
Carbo	0-8	Silt loam	CL	A-6, A-7	0-2	95-100	90-100	85-95	75-85	30-50	10-25
	8-28	Clay	CH	A-7	0-5	95-100	85-100	80-95	70-90	60-80	35-55
	28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
16C, 16D, 16E, Gilpin	0-8	Silt loam	CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	8-30	Channery loam, silt loam, silty clay loam.	GC, SC, CL, CL-ML	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
17D*, 17E*, 17F*:											
Gilpin	0-5	Silt loam	CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	5-29	Channery loam, shaly silt loam, silty clay loam.	GC, SC, CL, CL-ML	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Berks	0-5	Silt loam	CL, ML, CL-ML	A-4	0-10	80-100	75-100	65-85	50-75	25-36	5-10
	5-27	Very channery loam, very channery silty clay loam, very 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
	27-31	Extremely channery loam, very channery silt loam, extremely channery silt loam.	GM, SM	A-1, A-2	0-40	25-50	20-40	15-35	15-35	24-38	2-10
	31	Weathered bedrock	---	---	---	---	---	---	---	---	---
18A Holly	0-4	Loam	ML	A-4	0	90-100	85-100	80-100	70-90	25-35	3-10
	4-10	Silt loam, loam, sandy loam.	ML, SM	A-4, A-6	0	85-100	75-100	70-95	45-85	20-40	NP-14
	10-34	Silt loam, loam, sandy loam.	ML, SM	A-4, A-2	0	85-100	75-100	50-95	25-80	20-40	NP-10
	34-62	Stratified silt loam to gravelly sand.	ML, SM, SP-SM	A-4, A-2, A-1	0-5	70-100	65-100	40-90	10-70	20-40	NP-10
19E Itmann	0-37	Extremely channery sandy loam.	GM, GM-GC	A-1, A-2	0-10	40-55	35-50	25-45	15-35	15-25	NP-7
	37-62	Very channery sandy loam, very channery loam, extremely channery sandy loam.	GM, GM-GC	A-1, A-2	0-15	30-55	25-50	20-45	10-35	15-25	NP-7
20D Jefferson	0-11	Very stony loam	SM, GM, ML, CL	A-4	5-20	65-90	60-90	50-80	40-60	25-35	2-10
	11-42	Channery loam, clay loam, gravelly sandy clay loam.	SM, SC, ML, CL	A-2, A-4, A-6	5-20	75-90	70-90	50-80	30-70	15-35	2-15
	42-62	Very gravelly clay loam, gravelly clay loam, very gravelly sandy clay loam.	GM, SM, ML, GM-GC	A-1, A-2, A-4	5-25	55-75	50-75	35-70	20-60	20-35	2-10

See footnote at end of table.

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
21A*:											
Lobdell	0-8	Silt loam	ML, CL-ML, CL	A-4	0	95-100	90-100	80-100	65-90	20-30	NP-8
	8-48	Loam, silt loam	ML	A-4	0	90-100	80-100	70-95	55-85	20-35	NP-10
	48-62	Stratified sandy loam to silt loam.	ML, SM, CL-ML, CL	A-4	0	90-100	80-100	65-85	40-80	15-35	NP-10
Orrville	0-6	Loam	ML, CL-ML, CL	A-4	0	100	90-100	85-100	60-80	20-35	3-10
	6-47	Silt loam, loam, silty clay loam.	CL, CL-ML, ML	A-4, A-6	0-2	95-100	75-100	70-95	50-90	20-40	2-16
	47-62	Stratified gravelly loamy sand to silt loam.	ML, CL, SM, SC	A-4, A-2, A-1	0-2	95-100	65-100	40-85	15-75	15-35	NP-10
22C, 22E Oriskany	0-12	Extremely stony loam.	SM, GM, ML, CL	A-2, A-4	15-60	75-95	70-90	40-85	20-70	0-30	NP-10
	12-35	Very cobbly loam, very cobbly clay loam, extremely cobbly clay loam.	CL, SC, CL-ML, GC	A-2, A-4, A-6	30-60	70-80	65-75	50-75	25-60	20-40	5-20
	35-62	Extremely cobbly sandy loam, very cobbly loam, very cobbly sandy clay loam.	GM, SM, GM-GC, GC	A-2, A-4, A-6	30-60	70-80	65-75	40-70	20-55	20-40	2-15
23A Philo	0-8	Fine sandy loam	ML, SM, CL-ML	A-4	0-5	95-100	75-100	60-70	30-40	20-35	1-10
	8-62	Fine sandy loam, loam, sandy loam.	ML, SM, CL-ML	A-4	0-5	95-100	75-100	45-90	22-75	20-35	1-10
24D, 24E Pineville	0-9	Very stony loam	ML, CL-ML, SM, SC-SM	A-2, A-4	3-15	55-90	50-85	45-80	30-75	25-35	4-10
	9-62	Channery loam, channery clay loam, very channery loam.	CL, CL-ML, SC, SC-SM	A-2, A-4, A-6	0-10	55-85	50-80	45-75	30-65	25-40	6-15
25* Pits, quarries	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
26A Pope	0-8	Fine sandy loam	SM, ML, CL-ML, SC-SM	A-2, A-4	0	85-100	75-100	51-85	25-55	<20	NP-5
	8-62	Fine sandy loam, sandy loam, loam.	SM, SC-SM, ML, CL-ML	A-2, A-4	0	95-100	80-100	51-95	25-75	<30	NP-7

See footnote at end of table.

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
27D*, 27E*:											
Poplimento	0-8	Silt loam	CL, CL-ML	A-4, A-6	0-5	80-100	75-100	65-100	50-90	25-40	5-15
	8-15	Silty clay loam, silty clay, clay.	CL, CH	A-7	0-5	80-100	75-100	65-95	60-90	35-65	15-50
	15-55	Channery silty clay loam, very channery silty clay, clay.	CL, CH, GC, SC	A-6, A-7, A-2-6	0-10	45-90	40-100	35-80	30-75	35-60	15-35
	55-62	Silty clay, very channery silty clay loam, clay.	CL, CH, GC, SC	A-2, A-6, A-7	0-15	45-90	40-100	35-80	30-75	35-55	15-30
Berks	0-5	Silt loam	CL, ML, CL-ML	A-4	0-10	80-100	75-100	65-85	50-75	25-36	5-10
	5-16	Very channery loam, very channery silty clay loam, very 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
	16-29	Extremely channery loam, very channery loam, extremely channery silt loam.	GM	A-1, A-2	0-40	25-50	20-40	15-35	15-35	24-38	2-10
	29	Weathered bedrock	---	---	---	---	---	---	---	---	---
28B, 28C, 28D----Shottower	0-10	Silt loam	CL	A-4, A-6	0-2	90-100	75-100	60-95	50-85	20-35	5-15
	10-18	Silty clay loam, clay loam, gravelly silty clay.	CL, CH	A-6, A-7	0-10	70-100	60-100	55-95	50-90	35-55	10-35
	18-62	Silty clay loam, clay, gravelly silty clay.	CH, CL, GC	A-7	0-10	65-100	55-100	50-85	45-80	35-65	15-40
29B, 29C----------Timberville	0-9	Silt loam	ML, CL-ML, SC-SM, SM	A-4	0-3	85-100	75-100	55-95	35-85	<25	NP-7
	9-28	Silt loam, silty clay loam, gravelly loam.	CL, CL-ML, GC, GM-GC	A-4, A-6	0-5	55-100	50-100	40-90	35-85	15-40	5-20
	28-62	Clay, silty clay loam, clay loam.	CL, CH, SC, GC	A-6, A-7	0-10	55-95	50-95	45-90	40-85	35-60	14-32
30C, 30D----------Tumbling	0-8	Loam	CL-ML, CL	A-4, A-6	0-2	80-100	75-100	65-95	50-80	15-30	4-15
	8-14	Clay loam, sandy clay loam, gravelly clay loam.	CL, SC	A-2, A-4, A-6	0-20	75-100	60-95	50-90	30-70	30-45	8-20
	14-61	Cobbly clay loam, clay loam, gravelly clay.	CL, CH, SC, GC	A-2, A-7	0-20	60-95	50-95	45-85	30-75	40-55	15-30

See footnote at end of table.

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
31C, 31D, 31E----Tumbling	0-8	Very stony loam--	CL-ML, SC-SM, SC	A-4, A-6	2-10	80-100	60-95	60-90	40-80	15-30	4-15
	8-14	Clay loam, cobbly sandy clay loam, gravelly clay loam.	CL, SC	A-2, A-4, A-6	5-45	75-100	60-95	50-90	30-70	30-45	8-20
	14-61	Clay loam, gravelly clay, cobbly clay loam.	CL, CH, SC, GC	A-7, A-2	10-45	60-95	50-95	45-85	30-75	40-55	15-30
32*. Udorthents											
33*: Urban land------	0-6	Variable---------	---	---	---	---	---	---	---	---	---
Udorthents.											
34D*, 34E*: Wallen----------	0-7	Very stony loam--	SM, GM, ML, SC-SM	A-2, A-4	5-20	50-90	50-80	45-75	25-55	<35	NP-10
	7-26	Very channery sandy loam, very cobbly loam, very gravelly loam.	SM, GM, GM-GC, SC-SM	A-2, A-4, A-1	20-55	35-65	30-60	20-50	10-40	<35	NP-10
	26	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Alticrest-------	0-9	Fine sandy loam--	ML, CL-ML, SM, SC-SM	A-4	0-2	80-100	75-100	55-80	40-65	15-20	NP-6
	9-29	Sandy loam, loam, fine sandy loam.	ML, CL-ML, SM, SC-SM	A-4	0-2	80-100	50-75	45-70	40-65	15-20	NP-6
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
35F*: Wallen----------	0-7	Very stony loam--	SM, GM, ML, SC-SM	A-2, A-4	5-20	50-90	50-80	45-75	25-55	<35	NP-10
	7-26	Very channery sandy loam, very cobbly loam, very gravelly loam.	SM, GM, GM-GC, SC-SM	A-2, A-4, A-1	20-55	35-65	30-60	20-50	10-40	<35	NP-10
	26	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop----	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
36C*, 36D*, 36E*:											
Watahala	0-2	Gravelly loam	GM, GM-GC, GC, ML	A-4	0-10	55-85	50-70	40-60	30-45	20-30	2-8
	2-22	Gravelly loam, gravelly silt loam.	GM, GM-GC, GC	A-4, A-2-4	0-10	55-85	50-70	40-60	30-45	20-30	2-8
	22-35	Gravelly loam, gravelly silt loam, gravelly silty clay loam.	GM, GM-GC, GC, ML	A-4	0-10	55-70	50-65	45-60	40-55	25-40	10-20
	35-72	Clay, silty clay-	CH	A-7	0-5	90-100	85-100	75-100	65-95	50-75	24-45
Frederick	0-8	Gravelly loam	GM, GC, ML, CL	A-4, A-6	0-10	60-80	50-75	40-70	35-65	0-35	NP-15
	8-62	Clay, silty clay-	CH	A-7	0-5	90-100	85-100	70-100	60-85	60-85	30-50

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 18.--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/cc	In/hr	In/in	pH				Pct
1A, 1B	0-5	15-27	1.20-1.40	0.6-2.0	0.14-0.17	3.6-5.5	Low	0.32	5	1-4
Allegheny	5-30	18-35	1.20-1.50	0.6-2.0	0.13-0.20	3.6-5.5	Low	0.28		
	30-62	10-35	1.20-1.40	0.6-2.0	0.10-0.19	3.6-5.5	Low	0.28		
2D*:										
Alticrest	0-3	8-18	1.40-1.55	2.0-6.0	0.10-0.15	4.5-5.5	Low	0.24	2	1-3
	3-27	8-18	1.40-1.55	2.0-6.0	0.08-0.17	4.5-5.5	Low	0.20		
	27-30	3-10	1.40-1.60	6.0-20	0.04-0.12	4.5-5.5	Low	0.20		
	30	---	---	0.00-0.2	---	---	---	---		
Gilpin	0-5	15-27	1.20-1.40	0.6-2.0	0.17-0.20	3.6-5.5	Low	0.32	3	.5-4
	5-29	18-35	1.20-1.50	0.6-2.0	0.14-0.20	3.6-5.5	Low	0.24		
	29	---	---	0.2-2.0	---	---	---	---		
3E*:										
Beech Grove	0-3	10-27	1.20-1.50	0.6-2.0	0.17-0.20	6.1-8.4	Moderate	0.24	1	2-5
	3	---	---	0.0-0.2	---	---	---	---		
Rock outcrop	0-60	---	---	0.06-6.0	---	---	---	---	---	---
4E*, 4F*:										
Berks	0-5	5-23	1.20-1.50	0.6-6.0	0.17-0.20	3.6-6.5	Low	0.24	2	2-4
	5-16	5-32	1.20-1.60	0.6-6.0	0.14-0.20	3.6-6.5	Low	0.17		
	16-29	5-20	1.20-1.60	2.0-6.0	0.14-0.20	3.6-6.5	Low	0.17		
	29	---	---	0.2-20	---	---	---	---		
Poplimento	0-8	17-27	1.20-1.35	0.6-2.0	0.17-0.20	4.5-6.5	Low	0.32	5	.5-2
	8-15	35-60	1.30-1.60	0.2-0.6	0.10-0.20	4.5-6.5	High	0.24		
	15-55	35-55	1.30-1.55	0.2-0.6	0.10-0.19	4.5-6.5	High	0.24		
	55-62	27-50	1.25-1.50	0.2-0.6	0.10-0.19	4.5-6.5	Moderate	0.24		
5D*, 5E*, 5F*:										
Berks	0-5	5-23	1.20-1.50	0.6-6.0	0.17-0.20	3.6-6.5	Low	0.24	2	2-4
	5-16	5-32	1.20-1.60	0.6-6.0	0.14-0.20	3.6-6.5	Low	0.17		
	16-29	5-20	1.20-1.60	2.0-6.0	0.14-0.20	3.6-6.5	Low	0.17		
	29	---	---	0.2-20	---	---	---	---		
Weikert	0-3	5-25	1.20-1.40	2.0-6.0	0.17-0.20	4.5-6.0	Low	0.37	1	1-4
	3-15	5-27	1.20-1.40	2.0-6.0	0.14-0.20	4.5-6.0	Low	0.28		
	15	---	---	0.6-20	---	---	---	---		
6E*:										
Bethesda	0-7	18-27	1.40-1.55	0.6-2.0	0.17-0.20	3.6-5.5	Low	0.28	5	0-.5
	7-62	18-35	1.60-1.90	0.2-0.6	0.14-0.20	3.6-5.5	Low	0.32		
Fairpoint	0-5	18-27	1.40-1.55	0.6-2.0	0.17-0.20	5.6-7.3	Low	0.28	5	0-.5
	5-62	18-35	1.60-1.80	0.2-0.6	0.14-0.20	5.6-7.3	Moderate	0.28		
Sewell	0-10	5-18	1.35-1.65	2.0-20	0.08-0.12	3.6-5.5	Low	0.32	5	0-.5
	10-62	5-18	1.35-1.65	2.0-20	0.08-0.17	3.6-5.5	Low	0.32		
7C, 7D	0-8	20-27	1.20-1.40	0.6-2.0	0.17-0.20	4.5-7.3	Moderate	0.37	2	.5-3
Carbo	8-28	60-80	1.30-1.45	0.06-0.2	0.10-0.14	5.6-7.8	High	0.24		
	28	---	---	2.0-20	---	---	---	---		

See footnote at end of table.

Table 18.--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/cc	In/hr	In/in	pH				Pct
8C*, 8D*, 8E*:										
Carbo	0-8	20-27	1.20-1.40	0.6-2.0	0.17-0.20	4.5-7.3	Moderate	0.37	2	.5-3
	8-28	60-80	1.30-1.45	0.06-0.2	0.10-0.14	5.6-7.8	High	0.24		
	28	---	---	2.0-20	---	---				
Beech Grove	0-3	10-27	1.20-1.50	0.6-2.0	0.17-0.20	6.1-8.4	Moderate	0.24	1	2-5
	3	---	---	0.0-0.2	---	---				
9C*, 9D*, 9E*:										
Carbo	0-8	20-27	1.20-1.40	0.6-2.0	0.17-0.20	4.5-7.3	Moderate	0.37	2	.5-3
	8-28	60-80	1.30-1.45	0.06-0.2	0.10-0.14	5.6-7.8	High	0.24		
	28	---	---	2.0-20	---	---				
Rock outcrop	0-60	---	---	0.06-6.0	---	---				---
10A*:										
Chagrin	0-6	10-27	1.20-1.40	0.6-2.0	0.14-0.17	5.6-7.3	Low	0.32	5	2-4
	6-42	18-30	1.20-1.50	0.6-2.0	0.13-0.20	5.6-7.3	Low	0.32		
	42-62	5-25	1.20-1.40	0.6-2.0	0.04-0.20	5.6-7.3	Low	0.32		
Lobdell	0-8	15-27	1.20-1.40	0.6-2.0	0.17-0.20	5.1-7.3	Low	0.37	5	1-3
	8-48	18-30	1.25-1.60	0.6-2.0	0.14-0.20	5.1-7.3	Low	0.37		
	48-62	15-30	1.20-1.60	0.6-6.0	0.08-0.20	5.6-7.3	Low	0.37		
11B*, 11C*:										
Escatawba	0-5	8-20	1.30-1.50	0.6-2.0	0.14-0.17	3.5-5.5	Low	0.32	5	.5-2
	5-17	8-20	1.30-1.50	0.6-2.0	0.10-0.20	3.5-5.5	Low	0.32		
	17-38	18-27	1.35-1.55	0.6-2.0	0.14-0.20	4.5-5.5	Low	0.32		
	38-62	35-50	1.45-1.60	0.2-0.6	0.10-0.19	4.5-5.5	Low	0.28		
Jefferson	0-11	10-20	1.30-1.50	2.0-6.0	0.14-0.17	4.5-6.5	Low	0.24	5	.5-5
	11-42	18-34	1.30-1.65	2.0-6.0	0.08-0.19	4.5-5.5	Low	0.28		
	42-62	15-30	1.30-1.65	2.0-6.0	0.08-0.19	4.5-5.5	Low	0.17		
12B, 12C, 12D, 12E, 12F	0-8	13-27	1.25-1.50	2.0-6.0	0.14-0.17	4.5-6.0	Low	0.28	5	1-2
Frederick	8-62	40-80	1.20-1.50	0.6-2.0	0.10-0.19	4.5-6.0	High	0.24		
13B, 13C, 13D, 13E, 13F, 14B, 14C, 14D, 14E	0-9	13-27	1.25-1.50	2.0-6.0	0.17-0.20	4.5-6.0	Low	0.32	5	1-2
Frederick	9-62	40-80	1.20-1.50	0.6-2.0	0.10-0.19	4.5-6.0	High	0.24		
15C*, 15D*, 15E*, 15F*:										
Frederick	0-9	13-27	1.25-1.50	2.0-6.0	0.17-0.20	4.5-6.0	Low	0.32	5	1-2
	9-62	40-80	1.20-1.50	0.6-2.0	0.10-0.19	4.5-6.0	High	0.24		
Carbo	0-8	20-27	1.20-1.40	0.6-2.0	0.17-0.20	4.5-7.3	Moderate	0.37	2	.5-3
	8-28	60-80	1.30-1.45	0.06-0.2	0.10-0.14	5.6-7.8	High	0.24		
	28	---	---	2.0-20	---	---				
16C, 16D, 16E	0-8	15-27	1.20-1.40	0.6-2.0	0.17-0.20	3.6-5.5	Low	0.32	3	.5-4
Gilpin	8-30	18-35	1.20-1.50	0.6-2.0	0.14-0.20	3.6-5.5	Low	0.24		
	30	---	---	0.2-2.0	---	---				
17D*, 17E*, 17F*:										
Gilpin	0-5	15-27	1.20-1.40	0.6-2.0	0.17-0.20	3.6-5.5	Low	0.32	3	.5-4
	5-29	18-35	1.20-1.50	0.6-2.0	0.14-0.20	3.6-5.5	Low	0.24		
	29	---	---	0.2-2.0	---	---				

See footnote at end of table.

Table 18.--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 K	Erosion factors T	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH				Pct
17D*, 17E*, 17F*:										
Berks	0-5	5-23	1.20-1.50	0.6-6.0	0.17-0.20	3.6-6.5	Low	0.24	2	2-4
	5-27	5-32	1.20-1.60	0.6-6.0	0.14-0.20	3.6-6.5	Low	0.17		
	27-31	5-20	1.20-1.60	2.0-6.0	0.14-0.20	3.6-6.5	Low	0.17		
	31	---	---	0.2-20	---	---				
18A	0-4	15-27	1.20-1.40	0.6-2.0	0.14-0.17	5.6-7.3	Low	0.28	5	2-5
Holly	4-10	18-30	1.20-1.50	0.2-2.0	0.08-0.20	5.1-7.3	Low	0.28		
	10-34	18-30	1.20-1.45	0.2-2.0	0.08-0.20	5.1-7.3	Low	0.28		
	34-62	10-27	1.20-1.40	0.6-6.0	0.08-0.20	5.6-7.8	Low	0.28		
19E	0-37	4-15	1.00-1.30	2.0-20	0.06-0.17	3.6-5.5	Low	0.32	5	0-.5
Itmann	37-62	4-15	1.00-1.30	2.0-20	0.06-0.17	3.6-5.5	Low	0.32		
20D	0-11	10-25	1.30-1.50	2.0-6.0	0.14-0.17	4.5-6.5	Low	0.10	5	.5-5
Jefferson	11-42	18-34	1.30-1.65	2.0-6.0	0.08-0.19	4.5-5.5	Low	0.28		
	42-62	15-30	1.30-1.65	2.0-6.0	0.08-0.19	4.5-5.5	Low	0.17		
21A*:										
Lobdell	0-8	15-27	1.20-1.40	0.6-2.0	0.17-0.20	5.1-7.3	Low	0.37	5	1-3
	8-48	18-30	1.25-1.60	0.6-2.0	0.14-0.20	5.1-7.3	Low	0.37		
	48-62	15-30	1.20-1.60	0.6-6.0	0.08-0.20	5.6-7.3	Low	0.37		
Orrville	0-6	12-27	1.25-1.45	0.6-2.0	0.14-0.17	5.1-6.5	Low	0.37	5	2-4
	6-47	18-30	1.30-1.50	0.6-2.0	0.13-0.19	5.1-6.5	Low	0.37		
	47-62	10-25	1.20-1.40	0.6-6.0	0.08-0.20	5.1-7.3	Low	0.37		
22C, 22E	0-12	7-15	1.20-1.40	2.0-6.0	0.14-0.17	4.5-5.5	Low	0.10	5	.5-2
Oriskany	12-35	20-35	1.30-1.65	0.6-2.0	0.13-0.19	4.5-5.5	Low	0.10		
	35-62	10-30	1.25-1.60	0.6-6.0	0.13-0.19	4.5-5.5	Low	0.10		
23A	0-8	10-18	1.20-1.40	2.0-6.0	0.10-0.15	4.5-6.0	Low	0.28	5	2-4
Philo	8-62	10-18	1.20-1.40	0.6-2.0	0.08-0.17	4.5-6.0	Low	0.32		
24D, 24E	0-9	15-25	1.00-1.30	0.6-2.0	0.14-0.17	3.6-7.3	Low	0.20	5	.5-5
Pineville	9-62	18-30	1.30-1.60	0.6-2.0	0.08-0.19	3.6-5.5	Low	0.15		
25*	0-60	---	---	---	---	---				---
Pits, quarries										
26A	0-8	5-15	1.20-1.40	2.0-6.0	0.10-0.15	3.6-5.5	Low	0.28	5	1-4
Pope	8-62	5-18	1.30-1.60	0.6-6.0	0.08-0.20	3.6-5.5	Low	0.28		
27D*, 27E*:										
Poplimento	0-8	17-27	1.20-1.35	0.6-2.0	0.17-0.20	4.5-6.5	Low	0.32	5	.5-2
	8-15	35-60	1.30-1.60	0.2-0.6	0.10-0.20	4.5-6.5	High	0.24		
	15-55	35-55	1.30-1.55	0.2-0.6	0.10-0.19	4.5-6.5	High	0.24		
	55-62	27-50	1.25-1.50	0.2-0.6	0.10-0.19	4.5-6.5	Moderate	0.24		
Berks	0-5	5-23	1.20-1.50	0.6-6.0	0.17-0.20	3.6-6.5	Low	0.24	2	2-4
	5-16	5-32	1.20-1.60	0.6-6.0	0.14-0.20	3.6-6.5	Low	0.17		
	16-29	5-20	1.20-1.60	2.0-6.0	0.04-0.20	3.6-6.5	Low	0.17		
	29	---	---	0.2-20	---	---				
28B, 28C, 28D	0-10	15-27	1.30-1.45	0.6-6.0	0.17-0.20	3.6-6.0	Low	0.32	5	.5-2
Shottower	10-18	30-50	1.45-1.60	0.6-2.0	0.10-0.19	3.6-6.0	Moderate	0.24		
	18-62	40-70	1.45-1.60	0.6-2.0	0.10-0.19	3.6-6.0	Moderate	0.20		
29B, 29C	0-9	6-25	1.30-1.50	2.0-6.0	0.17-0.20	3.6-6.5	Low	0.32	5	1-3
Timberville	9-28	13-35	1.30-1.50	0.6-2.0	0.14-0.20	3.6-6.5	Low	0.24		
	28-62	35-60	1.40-1.55	0.6-2.0	0.10-0.19	3.6-6.5	Moderate	0.24		

See footnote at end of table.

Table 18.--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/cc	In/hr	In/in	pH				Pct
30C, 30D---	0-8	10-27	1.20-1.40	0.6-2.0	0.14-0.17	4.5-5.5	Low	0.32	5	.5-2
Tumbling	8-14	27-40	1.20-1.45	0.6-2.0	0.10-0.19	4.5-5.5	Low	0.20		
	14-61	35-55	1.20-1.45	0.6-2.0	0.10-0.19	4.5-5.5	Low	0.20		
31C, 31D, 31E---	0-8	10-27	1.20-1.45	0.6-6.0	0.14-0.17	4.5-5.5	Low	0.24	5	.5-2
Tumbling	8-14	27-40	1.20-1.45	0.6-2.0	0.10-0.19	4.5-5.5	Low	0.17		
	14-61	35-55	1.20-1.45	0.6-2.0	0.10-0.19	4.5-5.5	Low	0.17		
32*.										
Udorthents	---	---	---	0.06-20	---	3.6-6.5	---	---	---	---
33*:										
Urban land---	0-6	---	---	---	---	---	---	---	---	---
Udorthents.										
34D*, 34E*:										
Wallen---	0-7	8-20	1.40-1.55	2.0-6.0	0.14-0.17	3.5-6.0	Low	0.17	2	1-2
	7-26	8-20	1.40-1.55	2.0-6.0	0.08-0.20	3.5-6.0	Low	0.17		
	26	---	---	0.00-0.2	---	---	---	---		
Alticrest---	0-9	8-18	1.40-1.55	2.0-6.0	0.10-0.15	4.5-5.5	Low	0.24	2	1-3
	9-29	8-18	1.40-1.55	2.0-6.0	0.04-0.17	4.5-5.5	Low	0.20		
	29	---	---	0.00-0.2	---	---	---	---		
35F*:										
Wallen---	0-7	8-20	1.40-1.55	2.0-6.0	0.14-0.17	3.5-6.0	Low	0.17	2	1-2
	7-26	8-20	1.40-1.55	2.0-6.0	0.08-0.20	3.5-6.0	Low	0.17		
	26	---	---	0.00-0.2	---	---	---	---		
Rock outcrop---	0-60	---	---	0.06-6.0	---	---	---	---	---	---
36C*, 36D*, 36E*:										
Watahala---	0-2	10-22	1.25-1.50	2.0-6.0	0.14-0.17	3.6-5.5	Low	0.23	4	.5-2
	2-22	10-22	1.20-1.50	2.0-6.0	0.14-0.20	3.6-5.5	Low	0.20		
	22-35	20-35	1.20-1.50	0.6-2.0	0.14-0.20	3.6-5.5	Low	0.17		
	35-62	43-80	1.20-1.40	0.2-2.0	0.10-0.15	4.5-6.0	Moderate	0.24		
Frederick---	0-8	13-27	1.25-1.50	2.0-6.0	0.14-0.17	4.5-6.0	Low	0.28	5	1-2
	8-62	40-80	1.20-1.50	0.6-2.0	0.10-0.19	4.5-6.0	High	0.24		

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 19.--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 less than; > 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		Potential frost action	Risk of corrosion	
		Frequency	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
			Ft			In				
1A, 1B---------- Allegheny	B	Rare----------	>6.0	---	---	>60	---	Moderate-	Low------	High.
2D*:										
Alticrest--------	B	None----------	>6.0	---	---	20-40	Hard	Moderate-	Low------	High.
Gilpin----------	C	None----------	>6.0	---	---	20-40	Soft	Moderate-	Low------	High.
3E*:										
Beech Grove------	C	None----------	>6.0	---	---	1-10	Hard	Moderate-	Moderate-	Low.
Rock outcrop-----	D	None----------	>6.0	---	---	0	Hard	---	---	---
4E*, 4F*:										
Berks----------	C	None----------	>6.0	---	---	20-40	Hard	Low------	Low------	High.
Poplimento-------	C	None----------	>6.0	---	---	>60	---	Moderate-	High-----	Moderate.
5D*, 5E*, 5F*:										
Berks----------	C	None----------	>6.0	---	---	20-40	Hard	Low------	Low------	High.
Weikert----------	C	None----------	>6.0	---	---	10-20	Hard	Moderate-	Moderate-	Moderate.
6E*:										
Bethesda---------	C	None----------	>6.0	---	---	>60	---	Moderate-	Moderate-	High.
Fairpoint--------	C	None----------	>6.0	---	---	>60	---	Moderate-	High-----	Moderate.
Sewell----------	C	None----------	>6.0	---	---	>60	---	Moderate-	Moderate-	High.
7C, 7D---------- Carbo	C	None----------	>6.0	---	---	20-40	Hard	Moderate-	High-----	Low.
8C*, 8D*, 8E*:										
Carbo----------	C	None----------	>6.0	---	---	20-40	Hard	Moderate-	High-----	Low.
Beech Grove------	C	None----------	>6.0	---	---	1-10	Hard	Moderate-	Moderate-	Low.
9C*, 9D*, 9E*:										
Carbo----------	C	None----------	>6.0	---	---	20-40	Hard	Moderate-	High-----	Low.
Rock outcrop-----	D	None----------	>6.0	---	---	0	Hard	---	---	---
10A*:										
Chagrin----------	B	Occasional------	4.0-6.0	Apparent	Feb-Mar	>60	---	Moderate-	Low------	Moderate.
Lobdell----------	B	Occasional------	2.0-3.5	Apparent	Dec-Apr	>60	---	High-----	Low------	Moderate.
11B*, 11C*:										
Escatawba--------	B	None----------	2.5-4.0	Perched	Dec-May	>60	---	Moderate-	High-----	Moderate.
Jefferson--------	B	None----------	>6.0	---	---	>60	---	Moderate-	Moderate-	High.

* See footnote at end of table.

Table 19.--Soil and Water Features—Continued

Soil name and map symbol	Hydrologic group	Flooding	High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
			Ft			In				
12B, 12C, 12D, 12E, 12F, 13B, 13C, 13D, 13E, 13F, 14B, 14C, 14D, 14E--------- Frederick	B	None----------	>6.0	---	---	>72	---	Moderate-	Moderate-	High.
15C*, 15D*, 15E*, 15F*:										
Frederick------- Carbo-----------	B C	None---------- None----------	>6.0 >6.0	--- ---	--- ---	>72 20-40	--- Hard	Moderate- Moderate-	Moderate- High-----	High. Low.
16C, 16D, 16E----- Gilpin	C	None----------	>6.0	---	---	20-40	Soft	Moderate-	Low------	High.
17D*, 17E*, 17F*:										
Gilpin---------- Berks----------	C C	None---------- None----------	>6.0 >6.0	--- ---	--- ---	20-40 20-40	Soft Hard	Moderate- Low------	Low------ Low------	High. High.
18A--------------- Holly	D	Frequent--------	0-1.0	Apparent	Dec-May	>60	---	High-----	High-----	Moderate.
19E--------------- Itmann	C	None----------	>6.0	---	---	>60	---	Moderate-	High-----	High.
20D--------------- Jefferson	B	None----------	>6.0	---	---	>60	---	Moderate-	Moderate-	High.
21A*:										
Lobdell---------- Orrville---------	B C	Occasional------ Occasional------	2.0-3.5 1.0-2.5	Apparent Apparent	Dec-Apr Nov-Jun	>60 >60	--- ---	High----- High-----	Low------ High-----	Moderate. Moderate.
22C, 22E---------- Oriskany	B	None----------	>6.0	---	---	>60	---	Moderate-	High-----	Moderate.
23A--------------- Philo	B	Occasional------	1.5-3.0	Apparent	Dec-Apr	>60	---	Moderate-	Low------	High.
24D, 24E---------- Pineville	B	None----------	>6.0	---	---	>60	---	Moderate-	Low------	High.
25*--------------- Pits, quarries	-	None----------	>6.0	---	---	0	Hard	---	---	---
26A--------------- Pope	B	Occasional------	>6.0	---	---	>60	---	Moderate-	Low------	High.
27D*, 27E*:										
Poplimento------- Berks----------	C C	None---------- None----------	>6.0 >6.0	--- ---	--- ---	>60 20-40	--- Hard	Moderate- Low------	High----- Low------	Moderate. High.
28B, 28C, 28D----- Shottower	B	None----------	>6.0	---	---	>60	---	Moderate-	High-----	Moderate.
29B--------------- Timberville	B	Frequent--------	>6.0	---	---	>60	---	Moderate-	Low------	High.

* See footnote at end of table.

Table 19.--Soil and Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding	High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
			Ft			In				
29C---------- Timberville	B	None----------	>6.0	---	---	>60	---	Moderate-	Low------	High.
30C, 30D, 31C, 31D, 31E--------- Tumbling	B	None----------	>6.0	---	---	>60	---	Moderate-	Moderate-	Moderate.
32*. Udorthents										
33*: Urban land-------	-	None----------	>2.0	---	---	>10	Hard	---	---	---
Udorthents.										
34D*, 34E*: Wallen----------	B	None----------	>6.0	---	---	20-40	Hard	Low------	Low------	High.
Alticrest--------	B	None----------	>6.0	---	---	20-40	Hard	Moderate-	Low------	High.
35F*: Wallen----------	B	None----------	>6.0	---	---	20-40	Hard	Low------	Low------	High.
Rock outcrop-----	D	None----------	>6.0	---	---	0	Hard	---	---	---
36C*, 36D*, 36E*: Watahala---------	B	None----------	>6.0	---	---	>60	---	Low------	High-----	High.
Frederick--------	B	None----------	>6.0	---	---	>72	---	Moderate-	Moderate-	High.

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 20.--Classification of the Soils

Soil name	Family or higher taxonomic class
Allegheny	Fine-loamy, mixed, mesic Typic Hapludults
Alticrest	Coarse-loamy, siliceous, mesic Typic Dystrochrepts
Beech Grove	Loamy, mixed, nonacid, mesic Lithic Udorthents
Berks	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
Bethesda	Loamy-skeletal, mixed, acid, mesic Typic Udorthents
Carbo	Very-fine, mixed, mesic Typic Hapludalfs
Chagrin	Fine-loamy, mixed, mesic Dystric Fluventic Eutrochrepts
Escatawba	Fine-loamy, siliceous, mesic Typic Paleudults
Fairpoint	Loamy-skeletal, mixed, nonacid, mesic Typic Udorthents
Frederick	Clayey, mixed, mesic Typic Paleudults
Gilpin	Fine-loamy, mixed, mesic Typic Hapludults
Holly	Fine-loamy, mixed, nonacid, mesic Typic Fluvaquents
Itmann	Loamy-skeletal, mixed, acid, mesic Typic Udorthents
Jefferson	Fine-loamy, siliceous, mesic Typic Hapludults
Lobdell	Fine-loamy, mixed, mesic Fluvaquentic Eutrochrepts
Oriskany	Loamy-skeletal, siliceous, mesic Typic Hapludults
Orrville	Fine-loamy, mixed, nonacid, mesic Aeric Fluvaquents
Philo	Coarse-loamy, mixed, mesic Fluvaquentic Dystrochrepts
Pineville	Fine-loamy, mixed, mesic Typic Hapludults
Pope	Coarse-loamy, mixed, mesic Fluventic Dystrochrepts
Poplimento	Fine, mixed, mesic Ultic Hapludalfs
Sewell	Loamy-skeletal, mixed, acid, mesic Typic Udorthents
Shottower	Clayey, kaolinitic, mesic Typic Paleudults
Timberville	Clayey, mixed, mesic Typic Hapludults
Tumbling	Clayey, kaolinitic, mesic Typic Paleudults
Udorthents	Udorthents
Wallen	Loamy-skeletal, siliceous, mesic Typic Dystrochrepts
Watahala	Fine-loamy over clayey, siliceous, mesic Typic Paleudults
Weikert	Loamy-skeletal, mixed, mesic Lithic Dystrochrepts