United States
Department of
Agriculture

Soil
Conservation
Service

In cooperation with
United States Department
of Agriculture, Forest
Service, and Virginia
Polytechnic Institute and
State University

Soil Survey of Botetourt County, Virginia

How To Use This Soil Survey

General Soil Map

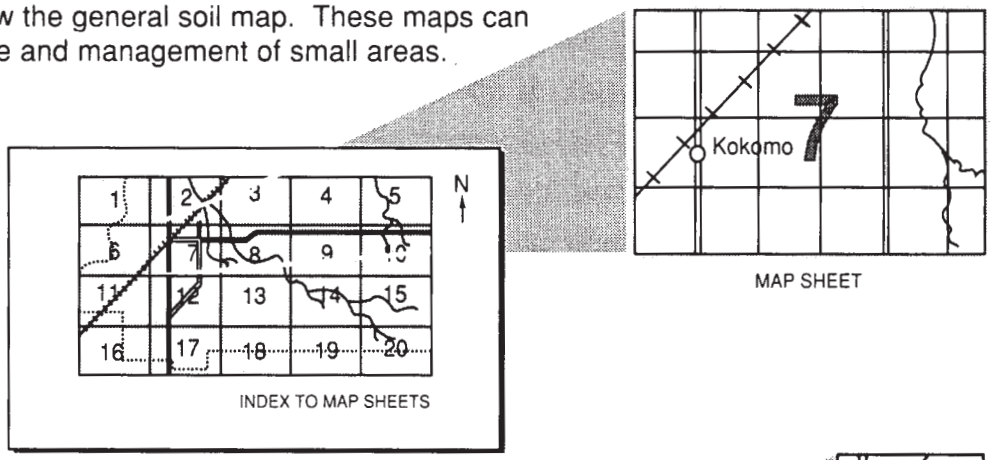
The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

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.

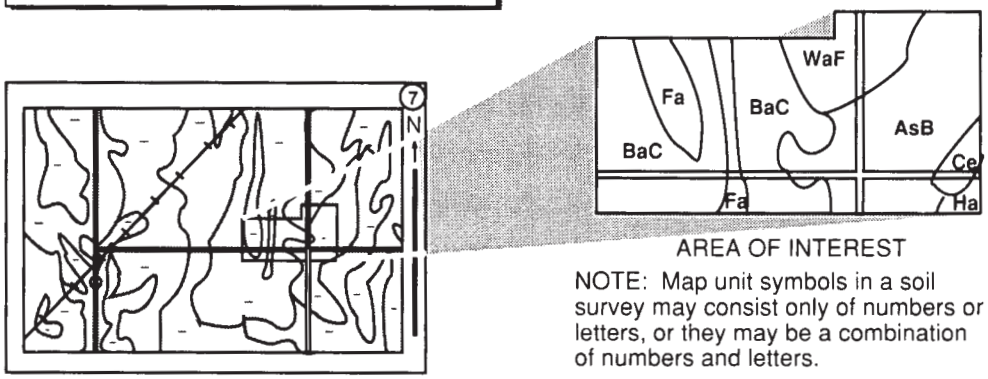
Detailed Soil Maps

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 **Index to Map Units** (see 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 **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **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 Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1988. Soil names and descriptions were approved in 1990. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1988. This survey was made cooperatively by the Soil Conservation Service, the Forest Service, and the Virginia Polytechnic Institute and State University. The Virginia Department of Conservation and Recreation and the Botetourt County Board of Supervisors provided financial support. The survey is part of the technical assistance furnished to the Mountain Castles Soil and Water Conservation District.

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

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Cover: Stripcropping of alfalfa and sudangrass in an area of Frederick loam, 7 to 15 percent slopes.

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Foreword

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

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to 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.

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

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

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Soil Survey of Botetourt County, Virginia

By Roy L. Vick, Jr., Soil Conservation Service

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

BOTETOURT COUNTY is in the southwestern part of Virginia (fig. 1). It has an area of 284,497 acres. In 1990, it had a population of 24,992. It is bordered on the north and northwest by Alleghany County, on the northeast by Rockbridge County, on the east and southeast by Bedford County, on the south by Roanoke County, and on the west and southwest by Craig County.

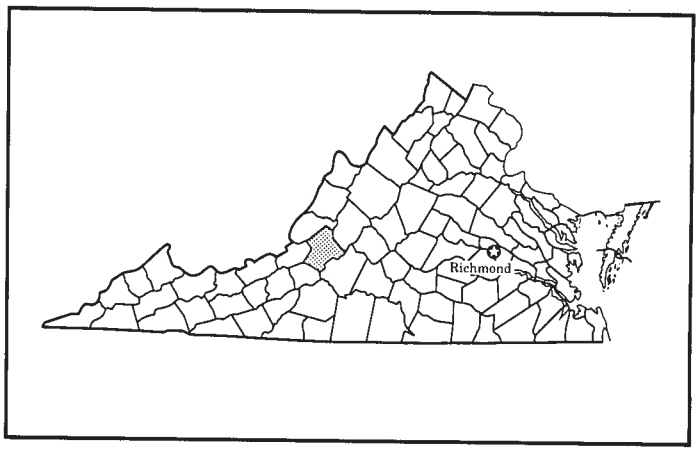

Figure 1.—Location of Botetourt County in Virginia.

General Nature of the County

This section gives general information about the county. It describes history and development, climate, transportation facilities, and geology and water resources.

History and Development

Botetourt County was formed from southern and western Augusta County, Virginia, in 1769. The original boundaries of the county differed from the current boundaries. On the eastern side, the boundary was the watershed of the Blue Ridge. The boundary to the south was the Virginia-North Carolina State line. It extended through what is now Kentucky and Tennessee all the way to the Mississippi River. The northern boundary was the Augusta County line. It extended northward through what is now southern Wisconsin to the Mississippi River. The western boundary was the Mississippi River.

The county was named for Norborne Berkeley, Lord Botetourt (1717-1770). Lord Botetourt served as a member of the English Parliament from 1741-1763. He was appointed by King George III of England to be Colonial Governor of Virginia in 1768 and served in that capacity until his death in October 1770.

The town of Fincastle is the county seat and has been the site of four court houses, including a newly restored one. The first court house was small and constructed of logs. The second was designed by Thomas Jefferson and built somewhere between 1818 and 1820. The third was completed around 1848 and

remained until it was destroyed by a fire in December 1970. The fourth and present-day court house is on the site of original one and was dedicated on June 14, 1975.

Botetourt County has been known as an agrarian area. It recently has begun to change, however, because of urbanization in the southern part. The major agricultural enterprises are dairying and beef farming. Apples and peaches are grown on a substantial acreage in orchards.

Woodland makes up a large acreage of the county. Parts of the George Washington National Forest and the Jefferson National Forest are in the county.

Mining is as a major industry in the county. The primary minerals that are mined are limestone and dolomite. In the past other minerals, such as iron ore, lead, and magnesium, were mined, but these currently are not actively mined on a large scale.

Climate

Table 1 gives data on temperature and precipitation for the survey area as recorded at Buchanan, Virginia, in the period 1930 to 1989. 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 37.9 degrees F and the average daily minimum temperature is 26.9 degrees. The lowest temperature on record, which occurred on January 21, 1985, is -11 degrees. In summer, the average temperature is 74.1 degrees and the average daily maximum temperature is 86.7 degrees. The highest recorded temperature, which occurred on July 28, 1930, is 107 degrees.

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

The total annual precipitation is 43.5 inches. Of this, 23 inches, or nearly 53 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 18 inches. The heaviest 1-day rainfall during the period of record was 8.0 inches on October 23, 1950.

The average seasonal snowfall is 20 inches. The greatest snow depth at any one time during the period of record was 20 inches. On the average, 1 day of the year has at least 1 inch of snow on the ground.

Transportation Facilities

Interstate Highway 81 and U.S. Highway 11 extend through Botetourt County from the northeast to the southwest, connecting the Roanoke area with the Shenandoah Valley. U.S. Highway 220 runs the length of the county in a north-south direction, connecting the Roanoke area with Fincastle, Eagle Rock, and Iron Gate. It intersects with Interstate 64 in Alleghany County. U.S. Highways 221 and 460 extend through the southern part of the county, connecting the Roanoke area with the Lynchburg and Richmond areas.

The county is served by two railroads. It has no commercial airport.

Geology and Water Resources

The age of the bedrock in Botetourt County ranges from Mississippian in the southwestern part to Precambrian in the eastern part. It is mainly Cambrian, Ordovician, and Devonian. The bedrock consists of four major groups of rocks. These are igneous rocks, such as granite, granodiorite, diorite, and unakite, along the Blue Ridge; metamorphic rocks, such as quartzite and phyllite, along the Blue Ridge; sedimentary shale, limestone, and dolomite, which are dominant in the valleys; and sedimentary sandstone and shale, which are dominant in the Appalachian Mountains.

The areas of limestone are sources of water in the form of large, free-flowing springs. Because of fractures and the cavernous nature of the limestone, however, pollution is a hazard in wells and springs. The areas of Cambrian and Ordovician limestone and dolomite have fair or good potential for supplying ground water. Wells in these areas yield 15 to more than 500 gallons per minute. The water generally is of excellent quality and is moderately hard, but it has a high content of iron and sulfate in small, isolated areas and is extremely hard in some small areas.

The areas of Mississippian, Devonian, and Silurian sandstone and shale have poor potential for supplying ground water. Wells in these areas yield 2 to 50 gallons per minute. The areas of shale have small, reliable wells, but the ground water in the areas of sandstone is concentrated mainly in fractured zones, which cannot be easily located. The water is of poor or fair quality, especially in the areas of shale where much of the water has a high content of iron and sulfur.

The areas of Cambrian and Precambrian metamorphic and igneous rocks have fair potential for supplying ground water. Wells in these areas yield as much as 200 gallons per minute. The higher yields are obtained where the wells are accurately located along faults and fractures.

The major supplier of surface water in Botetourt

County is the James River, which extends through the northern part of the county. The most important tributaries of the James River are Craig Creek, Catawba Creek, and Looney Creek. Tinker Creek, Glade Creek, and Carvins Creek, in the southern part of the county, drain into the Roanoke River. The surface water in the county generally is quite hard because of a large spring inflow from limestone formations.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; 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 in the survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil 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, these observations, supplemented by an understanding of the soil-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 soil 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. 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 of the soils are field tested through observation of the soils in different uses 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 assure 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.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by two or three kinds of soil. A map unit is identified and named according to the taxonomic

classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. 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 soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

Most inclusions have properties and behavioral patterns 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 (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soil on the landscape.

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

General Soil Map Units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in 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.

Dominantly Gently Sloping to Steep Soils That Are Very Deep, Moderately Deep, and Shallow and Are Somewhat Excessively Drained to Moderately Well Drained; on Uplands in the Limestone Valley

1. Frederick-Groseclose

Soils that have a clayey subsoil and are gently sloping to moderately steep, very deep, and well drained; formed in material weathered from dolomite and limestone

This map unit is extensive in the limestone valley. It makes up about 15 percent of the county. It is about 48 percent Frederick soils, 14 percent Groseclose soils, and 38 percent soils of minor extent.

The Frederick soils are on broad ridges in the uplands. They have a surface layer of dark yellowish brown loam and a subsoil of yellowish red clay. In some areas the surface layer is gravelly or very gravelly loam. In other areas limestone outcrops cover 2 to 10 percent of the surface.

The Groseclose soils are on narrow to broad ridges in the uplands. They have a surface layer of dark yellowish brown silt loam and a subsoil of yellowish brown and strong brown clay. In some areas they are severely eroded and have a surface layer of silty clay loam.

Of minor extent in this map unit are the very deep, well drained Shottower, moderately deep, well drained Carbo and Litz, and shallow, well drained Opequon soils on uplands; the very deep, well drained Timberville soils on foot slopes and along upland drainageways; and the very deep, well drained Wolfgap and very deep, moderately well drained Lindside and Massanetta soils on flood plains.

A large acreage of this map unit has been cleared of trees and is used for cultivated crops, pasture, hay, or orchards. Some of the gently sloping and strongly sloping areas are used for corn, corn silage, or small grain. Many of the strongly sloping and moderately steep areas are used for pasture or hay (fig. 2). Most of the pastures consist of tall fescue or a mixture of tall fescue and clover. Alfalfa, orchardgrass, red clover, and tall fescue are the major hay crops. Apples and peaches are the most common fruit crops grown in orchards. The slope, the erosion potential, the rock outcrops, and low natural fertility are the major limitations in the areas used for cultivated crops, hay, or pasture.

A small acreage of this map unit, generally consisting of the steeper, rocky areas, is used as woodland. The productivity of the soils for trees is moderately high. Oaks, yellow-poplar, hickory, white pine, and Virginia pine are the dominant tree species. The slope, the erosion potential, and the clayey subsoil are the major concerns in managing the soils for woodland.

A few scattered areas of this map unit are used for community development, especially near Daleville. The major limitations are the slope, the clayey subsoil, and the scattered outcrops of bedrock.

2. Frederick-Carbo-Rock Outcrop

Rock outcrop and soils that have a clayey subsoil and are gently sloping to steep, very deep or moderately deep, and well drained; formed in material weathered from dolomite and limestone

This map unit is generally near Catawba Creek and Timber Ridge and south of Eagle Rock in the limestone

Figure 2.—Pasture and hay in an area of the Frederick-Groseclose general soil map unit.

valley. It makes up about 14 percent of the county. It is about 43 percent Frederick soils, 20 percent Carbo soils, 11 percent Rock outcrop, and 26 percent soils of minor extent.

The Frederick soils are on narrow to broad ridges in the uplands. They are very deep. They have a surface layer of dark yellowish brown loam and a subsoil of yellowish red clay. In most areas the surface layer is gravelly or very gravelly loam. In many areas limestone outcrops cover 2 to 10 percent of the surface. Areas of sinkholes are common.

The Carbo soils are on narrow ridges in the uplands. They are moderately deep. They have a surface layer of dark brown silty clay loam and a subsoil of dark yellowish brown and yellowish brown clay. They are underlain by limestone bedrock.

The Rock outcrop, which consists mainly of limestone, covers 2 to 50 percent of the surface.

Of minor extent in this map unit are the moderately deep, well drained Chilhowie and shallow, well drained Opequon soils on uplands; the very deep, well drained Timberville soils on foot slopes and along upland drainageways; and the very deep, moderately well drained Massanetta soils on flood plains.

A small acreage of this map unit has been cleared of trees and is used for cultivated crops, pasture, or hay. Scattered areas are used for corn, corn silage, or small grain. Some of the strongly sloping and moderately steep areas are used for pasture or hay (fig. 3). Most of the pastures consist of tall fescue or a mixture of tall fescue and clover. Alfalfa, orchardgrass, red clover, and tall fescue are the major hay crops. The Rock outcrop, the gravel in the surface layer, the slope, the erosion

potential, and droughtiness are the major limitations in the areas used for cultivated crops, hay, or pasture.

Most of the acreage in this map unit is used as woodland. The productivity of the soils for trees is moderately high. Oaks, yellow-poplar, hickory, white pine, Virginia pine, and redcedar are the dominant tree species. The slope, the erosion potential, the Rock outcrop, and the clayey subsoil are the major concerns in managing the soils for woodland.

Very few areas of this map unit are used for community development. The major limitations are the depth to bedrock, the slope, the clayey subsoil, and the scattered outcrops of bedrock.

3. Groseclose-Chilhowie-Carbo

Soils that have a clayey subsoil and are gently sloping to steep, very deep or moderately deep, and well drained; formed in material weathered from limestone or interbedded limestone and shale

This map unit is in the limestone valley, generally in the area between Daleville and Fincastle and in the vicinity of Springwood. It makes up about 5 percent of the county. It is about 30 percent Groseclose soils, 29 percent Chilhowie soils, 22 percent Carbo soils, and 19 percent soils of minor extent.

The Groseclose soils are on narrow to broad ridges in the uplands. They are very deep. They have a surface layer of dark yellowish brown silt loam and a subsoil of strong brown clay. In some areas they are severely eroded and have a surface layer of silty clay loam.

The Chilhowie soils are on strongly sloping to steep, narrow ridges. They are moderately deep. They have a surface layer of dark brown silty clay loam and a subsoil

Figure 3.—A pastured area of the Frederick-Carbo-Rock outcrop general soil map unit.

of yellowish brown clay. They are underlain by shale and limestone bedrock. Rock outcrops, which consist mainly of limestone, cover 0.1 to 2.0 percent of the surface.

The Carbo soils are on narrow ridges. They are moderately deep. They have a surface layer of dark brown silty clay loam and a subsoil of yellowish brown clay. They are underlain by limestone bedrock. Rock outcrops, which consist mainly of limestone, cover 2 to 10 percent of the surface.

Of minor extent in this map unit are the moderately deep, well drained Litz and shallow, well drained Opequon soils on uplands; the very deep, well drained Timberville soils on foot slopes and along upland drainageways; and the very deep, moderately well drained Lindside and Massanetta soils on flood plains.

About half of the acreage in this map unit has been cleared of trees and is used for cultivated crops, pasture, hay, or orchards. Scattered areas are used for corn, corn silage, or small grain. Most of the strongly sloping and moderately steep areas are used for pasture or hay. Most of the pastures consist of tall fescue or a mixture of tall fescue and clover. Alfalfa, orchardgrass, red clover, and tall fescue are the major hay crops. Apples and peaches are the most common fruit crops grown in orchards. The rock outcrops, the slope, the erosion potential, and droughtiness are the major limitations in the areas used for cultivated crops, hay, or pasture.

A large acreage of this map unit is used as woodland. The productivity of the soils for trees is moderate. Oaks, yellow-poplar, hickory, white pine, Virginia pine, and redcedar are the dominant tree species. The slope, the erosion potential, the rock outcrops, and the clayey subsoil are the major concerns in managing the soils for woodland.

A few areas of this map unit are used for community development. The major limitations are the depth to bedrock, the slope, the clayey subsoil, and the scattered outcrops of bedrock.

4. Flatwoods-Berks-Weikert

Soils that have a clayey or loamy subsoil and are gently sloping to steep, moderately deep or shallow, and somewhat excessively drained to moderately well drained; formed in material weathered from shale

This map unit is in the Fincastle Valley, in the area northwest of Fincastle. It makes up about 3 percent of the county. It is about 44 percent Flatwoods soils, 18 percent Berks soils, 15 percent Weikert soils, and 23 percent soils of minor extent.

The Flatwoods soils are on gently sloping and strongly sloping, broad ridges in the uplands. They are moderately deep and moderately well drained. They have a surface layer of brown and brownish yellow silt loam and a subsoil of dominantly yellowish brown clay. They are underlain by shale bedrock.

The Berks soils are on strongly sloping to steep, narrow ridges in the uplands. They are moderately deep and well drained. They have a surface layer of very dark grayish brown and light yellowish brown channery silt loam and a subsoil of dominantly yellowish brown very channery silty clay loam. They are underlain by shale bedrock.

The Weikert soils are on strongly sloping to steep, narrow ridges in the uplands. They are shallow and somewhat excessively drained. They have a surface layer of yellowish brown channery silt loam and a subsoil of dominantly brownish yellow very channery silt loam. They are underlain by shale bedrock.

Of minor extent in this map unit are the very deep, moderately well drained Ernest soils on foot slopes and along upland drainageways and the very deep, moderately well drained Lindside soils on flood plains.

Most of the acreage in this map unit has been cleared of trees and is used for cultivated crops, pasture, or hay. A few areas are used for corn, corn silage, or small grain. Most of the cleared areas are used for pasture or hay. Most of the pastures consist of tall fescue or a mixture of tall fescue and clover. Orchardgrass, red clover, and tall fescue are the major hay crops. Seasonal wetness, the slope, the erosion potential, low natural fertility, and droughtiness are the major limitations in the areas used for cultivated crops, hay, or pasture.

A minor acreage of this map unit, generally consisting of the steeper areas, is used as woodland. The productivity of the soils for trees is moderate. Oaks, white pine, and Virginia pine are the dominant tree species. The slope, the erosion potential, wetness, and the clayey subsoil are the major concerns in managing the soils for woodland.

A few areas of this map unit are used for community development. The major limitations are the depth to bedrock, wetness, the slope, and the clayey subsoil.

5. Groseclose-Litz-Chiswell

Soils that have a loamy or clayey subsoil and are strongly sloping to steep, are very deep, moderately deep, or shallow, and are well drained; formed in material weathered from interbedded limestone and shale

This map unit is in the limestone valley, generally in the area southeast of Interstate 81 and southeast of

U.S. Highway 460. It makes up about 6 percent of the county. It is about 22 percent Groseclose soils, 15 percent Litz soils, 14 percent Chiswell soils, and 49 percent soils of minor extent.

The Groseclose soils are on narrow to broad ridges in the uplands. They are very deep. They have a surface layer of dark yellowish brown silt loam and a subsoil of strong brown clay.

The Litz soils are on narrow to broad ridges in the uplands. They are moderately deep. They have a surface layer of dark brown and yellowish brown channery silt loam and a subsoil of dominantly yellowish brown extremely channery silt loam. They are underlain by shale and limestone bedrock.

The Chiswell soils are on narrow ridges. They are shallow. They have a surface layer of dark yellowish brown and light brown channery silt loam and a subsoil of yellowish brown very channery silt loam. They are underlain by shale bedrock.

Of minor extent in this map unit are the moderately deep, well drained Carbo and Chilhowie and shallow, well drained Opequon soils on uplands; the very deep, well drained Timberville and very deep, moderately well drained Ernest soils on foot slopes and along upland drainageways; and the very deep, well drained Derroc and Wolfgap soils on flood plains.

About half of the acreage in this map unit has been cleared of trees and is used for cultivated crops, pasture, or hay. Scattered areas are used for corn, corn silage, or small grain. Most of the strongly sloping and moderately steep cleared areas are used for pasture or hay. Most of the pastures consist of tall fescue or a mixture of tall fescue and clover. Alfalfa, orchardgrass, red clover, and tall fescue are the major hay crops. The slope, the erosion potential, and droughtiness are the major limitations in the areas used for cultivated crops, hay, or pasture.

A large acreage of this map unit is used as woodland. The productivity of the soils for trees is moderate. Oaks, hickory, and Virginia pine are the dominant tree species. The slope, the erosion potential, seedling mortality, and the clayey subsoil in some areas are the major concerns in managing the soils for woodland.

A few areas of this map unit are used for community development, mainly in the vicinity of Webster and Bonsack. The major limitations are the depth to bedrock, the slope, and the clayey subsoil in some areas.

6. Tumbling-Groseclose-Laidig

Soils that have a loamy or clayey subsoil and are gently sloping to moderately steep, very deep, and well drained; formed in old colluvial deposits or in material weathered from limestone and shale

This map unit is on foothills and on colluvial fans at the base of the Blue Ridge. It makes up about 6 percent of the county. It is about 37 percent Tumbling soils, 25 percent Groseclose soils, 20 percent Laidig soils, and 18 percent soils of minor extent.

The Tumbling soils are on narrow to broad colluvial fans. They have a surface layer of very dark grayish brown and yellowish brown cobbly loam and a subsoil of dominantly red clay. In some areas the surface layer has no cobbles. In other areas the surface is very stony.

The Groseclose soils are on narrow to broad ridges and side slopes in the uplands. They have a surface layer of dark yellowish brown silt loam and a subsoil of strong brown clay.

The Laidig soils are on narrow to broad foot slopes and colluvial fans. They have a surface layer of very dark grayish brown and light yellowish brown cobbly fine sandy loam. The upper part of the subsoil is yellowish brown clay loam. The lower part is a yellowish brown, firm, brittle fragipan. In some areas the surface layer has no cobbles. In other areas the surface is very stony.

Of minor extent in this map unit are the very deep, well drained Frederick, moderately deep, well drained Litz and Carbo, and shallow, well drained Chiswell soils on uplands and the very deep, well drained Derroc soils on flood plains.

About half of the acreage in this map unit has been cleared of trees and is used for cultivated crops, pasture, or hay. Scattered areas, consisting mainly of the more gently sloping soils that do not have cobbles or stones in the surface layer, are used for corn, corn silage, or small grain. Many of the strongly sloping and moderately steep cleared areas are used for pasture or hay. Most of the pastures consist of tall fescue or a mixture of tall fescue and clover. Alfalfa, orchardgrass, red clover, and tall fescue are the major hay crops. The stones and cobbles in the surface layer, the slope, low natural fertility, and the erosion potential are the major limitations in the areas used for cultivated crops, hay, or pasture.

A large acreage of this map unit is used as woodland. The productivity of the soils for trees is moderate. Oaks, hickory, and Virginia pine are the dominant tree species. The slope, the erosion potential, and the clayey subsoil in some areas are the major concerns in managing the soils for woodland.

A few areas of this map unit, mainly in the vicinity of Blue Ridge and Troutville, are used for community development. The major limitations are wetness in

some areas, the slope, and the clayey subsoil in some areas.

Dominantly Gently Sloping to Very Steep Soils That Are Very Deep, Moderately Deep, and Shallow and Are Somewhat Excessively Drained and Well Drained; on Uplands in the Appalachian Mountains

7. Dekalb-Berks-Weikert

Soils that have a loamy subsoil and are gently sloping to very steep, moderately deep or shallow, and somewhat excessively drained or well drained; formed in material weathered from sandstone and shale

This map unit is on the summits, shoulders, and side slopes of ridges in the Appalachian Mountains. It makes up about 29 percent of the county. It is about 25 percent Dekalb soils, 15 percent Berks soils, 12 percent Weikert soils, and 48 percent soils of minor extent.

The Dekalb soils are on gently sloping to very steep, narrow ridges. They are moderately deep and well drained. They have a surface layer of dark brown and yellowish brown channery fine sandy loam and a subsoil of dominantly brownish yellow very channery fine sandy loam. They are underlain by sandstone bedrock. They are very stony or extremely stony. In some areas sandstone outcrops cover 10 to 50 percent of the surface.

The Berks soils are on moderately steep to very steep, narrow ridges. They are moderately deep and well drained. They have a surface layer of very dark grayish brown and light yellowish brown channery silt loam and a subsoil of dominantly yellowish brown very channery silty clay loam. They are underlain by shale bedrock.

The Weikert soils are on moderately steep to very steep, narrow ridges. They are shallow and somewhat excessively drained. They have a surface layer of yellowish brown channery silt loam and a subsoil of dominantly brownish yellow very channery silt loam. They are underlain by shale bedrock. In some areas sandstone or shale outcrops cover 10 to 50 percent of the surface.

Of minor extent in this map unit are the very deep, well drained Laidig, Oriskany, Rushtown, Shelocta, and Tumbling soils on foot slopes and colluvial fans; the very deep, moderately well drained Ernest soils on foot slopes; the deep, well drained Bailegap, moderately deep, well drained Chilhowie, Gilpin, Lily, and Sequoia, and moderately deep, well drained to excessively drained Lehew soils on uplands; the very deep, moderately well drained Moomaw soils on stream terraces; and the very deep, well drained Derroc soils on flood plains.

Very little of the acreage in this map unit has been cleared. The cleared areas are used for pasture or hay. Most of the pastures consist of tall fescue or a mixture of tall fescue and clover. Orchardgrass, red clover, and tall fescue are the major hay crops. The rock fragments on and below the surface, the slope, the erosion potential, low natural fertility, and droughtiness are the major limitations in the areas used for hay or pasture.

Nearly all of the acreage in this map unit is used as woodland. The productivity of the soils for trees is moderate. Oaks, hickory, pitch pine, Table Mountain pine, white pine, and Virginia pine are the dominant tree species. The slope, droughtiness, the erosion potential, seedling mortality, and the content of rock fragments are the major concerns in managing the soils for woodland.

Very few areas of this map unit are used for community development. The major limitations are the depth to bedrock, the slope, and the content of rock fragments.

8. Laidig-Berks-Weikert

Soils that have a loamy subsoil and are gently sloping to very steep, are very deep, moderately deep, or shallow, and are somewhat excessively drained or well drained; formed in old colluvial deposits or in material weathered from shale

This map unit is on foothills and on colluvial fans at the base of the Appalachian Mountains. It makes up about 6 percent of the county. It is about 52 percent Laidig soils, 18 percent Berks soils, 16 percent Weikert soils, and 14 percent soils of minor extent.

The Laidig soils are on narrow to broad foot slopes and colluvial fans. They are very deep and well drained. They have a surface layer of very dark grayish brown and light yellowish brown cobbly fine sandy loam. The upper part of the subsoil is yellowish brown clay loam. The lower part is a yellowish brown, firm, brittle fragipan. In some areas the surface layer has no cobbles. In other areas the surface is very stony.

The Berks soils are on moderately steep to very steep, narrow ridges. They are moderately deep and well drained. They have a surface layer of very dark grayish brown and light yellowish brown channery silt loam and a subsoil of dominantly yellowish brown very channery silty clay loam. They are underlain by shale bedrock.

The Weikert soils are on moderately steep to very steep, narrow ridges. They are shallow and somewhat excessively drained. They have a surface layer of yellowish brown channery silt loam and a subsoil of dominantly brownish yellow very channery silt loam. They are underlain by shale bedrock. In some areas

sandstone or shale outcrops cover 10 to 50 percent of the surface.

Of minor extent in this map unit are the moderately deep, well drained Gilpin soils on uplands; the very deep, well drained Oriskany soils on colluvial fans; the very deep, moderately well drained Ernest soils on foot slopes; and the very deep, well drained Derroc soils on flood plains.

A small acreage of this map unit has been cleared of trees and is used for cultivated crops, pasture, or hay. Scattered areas, consisting mainly of the more gently sloping soils that do not have cobbles or stones in the surface layer, are used for corn, corn silage, or small grain. Many of the strongly sloping and moderately steep cleared areas are used for pasture or hay. Most of the pastures consist of tall fescue or a mixture of tall fescue and clover. Orchardgrass, red clover, and tall fescue are the major hay crops. The stones and cobbles in the surface layer, the slope, droughtiness, low natural fertility, and the erosion potential are the major limitations in the areas used for cultivated crops, hay, or pasture.

Most of the acreage in this map unit is used as woodland. The productivity of the soils for trees is moderate. Oaks, hickory, white pine, and Virginia pine are the dominant tree species. The slope, the erosion potential, droughtiness, and seedling mortality are the major concerns in managing the soils for woodland.

A few areas of this map unit are used for community development. The major limitations are seasonal wetness in some soils, the slope, and the depth to bedrock.

Dominantly Gently Sloping to Very Steep Soils That Are Very Deep and Moderately Deep and Are Well Drained and Somewhat Excessively Drained; on Uplands in the Blue Ridge

9. Dekalb

Soils that have a loamy subsoil and are gently sloping to very steep, moderately deep, and well drained; formed in material weathered from sandstone and quartzite

This map unit is on the Blue Ridge. It makes up about 1 percent of the county. It is about 64 percent Dekalb soils and 36 percent soils of minor extent.

The Dekalb soils are on gently sloping to very steep, narrow ridges in the mountains. They have a surface layer of dark brown and yellowish brown channery fine sandy loam and a subsoil of dominantly brownish yellow very channery fine sandy loam. They are underlain by sandstone bedrock. They are very stony.

Of minor extent in this map unit are the very deep, well drained Laidig, Oriskany, and Tumbling soils on foot slopes and colluvial fans and the deep, well drained Bailegap soils on uplands.

Very little of the acreage in this map unit has been cleared. The cleared areas are used for pasture or hay. Most of the pastures consist of tall fescue or a mixture of tall fescue and clover. Orchardgrass, red clover, and tall fescue are the major hay crops. The rock fragments on and below the surface, the slope, the erosion potential, low natural fertility, and droughtiness are the major limitations in the areas used for hay or pasture.

Nearly all of the acreage in this map unit is used as woodland. The productivity of the soils for trees is moderate. Oaks, hickory, pitch pine, Table Mountain pine, white pine, and Virginia pine are the dominant tree species. The slope, droughtiness, the erosion potential, seedling mortality, and the content of rock fragments are the major concerns in managing the soils for woodland.

Very few areas of this map unit are used for community development. The major limitations are the depth to bedrock, the slope, and the content of rock fragments.

10. Edneytown-Peaks-Thurmont

Soils that have a loamy subsoil and are gently sloping to very steep, very deep or moderately deep, and well drained or somewhat excessively drained; formed in old colluvial deposits or in material weathered from granite and granite gneiss

This map unit is on ridges in the mountains and on colluvial fans on the Blue Ridge. It makes up about 2 percent of the county. It is about 53 percent Edneytown soils, 18 percent Peaks soils, 16 percent Thurmont soils, and 13 percent soils of minor extent.

The Edneytown soils are on moderately steep and steep, broad ridges. They are very deep and well drained. They have a surface layer of dark brown loam and a subsoil of dominantly strong brown clay loam. They are very stony.

The Peaks soils are on steep and very steep, narrow ridges. They are moderately deep and somewhat excessively drained. They have a surface layer of very dark grayish brown gravelly sandy loam and a subsoil of dark yellowish brown very gravelly sandy loam. They are underlain by granite and granite gneiss bedrock. They are very stony.

The Thurmont soils are on gently sloping to steep, narrow to broad colluvial fans. They are very deep and well drained. They have a surface layer of dark brown and yellowish brown loam and a subsoil of dominantly strong brown clay loam. They are very stony.

Of minor extent in this map unit are the very deep, well drained Hayesville soils on uplands and the very

deep, well drained Derroc soils on flood plains.

Very little of the acreage in this map unit has been cleared. The cleared areas are used for pasture or hay. Most of the pastures consist of tall fescue or a mixture of tall fescue and clover. Orchardgrass, red clover, and tall fescue are the major hay crops. The stones in the surface layer, the slope, droughtiness, low natural fertility, and the erosion potential are the major limitations in the areas used for hay or pasture.

Most of the acreage in this map unit is used as woodland. The productivity of the soils for trees is moderately high to very high. Oaks, yellow-poplar, white pine, and Virginia pine are the dominant tree species. The slope, the erosion potential, droughtiness, and seedling mortality are the major concerns in managing the soils for woodland.

A few areas of this map unit are used for community development. The major limitations are the slope and the depth to bedrock.

Dominantly Nearly Level to Strongly Sloping Soils That Are Very Deep and Are Well Drained and Moderately Well Drained; on Terraces and Flood Plains

11. Moomaw-Gladehill-Wolfgap

Soils that have a loamy subsoil and are nearly level to strongly sloping, very deep, and well drained or moderately well drained; formed in alluvial deposits

This map unit is on flood plains and terraces along Craig Creek, Catawba Creek, and the upper reaches of the James River. It makes up about 9 percent of the county. It is about 22 percent Moomaw soils, 7 percent Gladehill soils, 7 percent Wolfgap soils, and 64 percent soils of minor extent.

The Moomaw soils are on gently sloping and strongly sloping, narrow to broad stream terraces. They are moderately well drained. They have a surface layer of grayish brown and pale brown loam. The upper part of the subsoil is light yellowish brown loam. The lower part is a brownish yellow, firm, brittle fragipan.

The Gladehill soils are on nearly level flood plains. They are well drained. They have a surface layer of very dark grayish brown fine sandy loam and a subsoil of dominantly dark yellowish brown fine sandy loam. They are underlain by dark brown fine sandy loam.

The Wolfgap soils are on nearly level flood plains and on nearly level and gently sloping second bottoms and low terraces. They are well drained. They have a surface layer of dark brown loam and a subsoil of dominantly dark yellowish brown loam. They are underlain by dark yellowish brown gravelly sandy loam.

Of minor extent in this map unit are the moderately deep, well drained Berks and shallow, somewhat excessively drained Weikert soils on uplands; the very deep, well drained Alonzville and Shottower, very deep, moderately well drained Botetourt and Zoar, very deep, somewhat poorly drained Toms and Tygart, and very deep, poorly drained Purdy soils on terraces; and the very deep, well drained Derroc and very deep, moderately well drained Irongate soils on flood plains.

Most of the acreage in this map unit has been cleared of trees and is used for cultivated crops, pasture, or hay. Much of the cleared acreage is used for corn, corn silage, or small grain. The rest is used for pasture or hay. Most of the pastures consist of tall fescue or a mixture of tall fescue and clover. Orchardgrass, red clover, and tall fescue are the major hay crops. Seasonal wetness, flooding, the slope, and the erosion potential are the major limitations in the areas used for cultivated crops, hay, or pasture.

A small acreage of this map unit is used as woodland. The productivity of the soils for trees is moderate to high. Oaks, hickory, and Virginia pine are the dominant tree species. Seasonal wetness in some of the soils is the main concern in managing the soils for woodland.

A few areas of this map unit are used for community development, mainly in the vicinity of Oriskany and Iron Gate. The major limitations are seasonal wetness in some of the soils and flooding in some areas.

12. Shottower-Wolfgap-Gladehill

Soils that have a loamy or clayey subsoil and are nearly level to strongly sloping, very deep, and well drained; formed in alluvial deposits

This map unit is on flood plains and terraces along the lower reaches of the James River. It makes up about 4 percent of the county. It is about 35 percent Shottower soils, 14 percent Wolfgap soils, 8 percent Gladehill soils, and 43 percent soils of minor extent.

The Shottower soils are on narrow to broad, high terraces. They have a surface layer of brown loam and a subsoil of dominantly red clay. In some areas the surface layer is cobbly loam.

The Wolfgap soils are on nearly level flood plains and on nearly level and gently sloping second bottoms and low terraces. They have a surface layer of dark brown loam and a subsoil of dominantly dark yellowish brown loam. They are underlain by dark yellowish brown gravelly sandy loam.

The Gladehill soils are on nearly level flood plains. They have a surface layer of very dark grayish brown fine sandy loam and a subsoil of dominantly dark yellowish brown fine sandy loam. They are underlain by dark brown fine sandy loam.

Of minor extent in this map unit are the very deep, well drained Frederick and Groseclose, moderately deep, well drained Carbo and Litz, and shallow, well drained Chiswell and Opequon soils on uplands; the very deep, well drained Alonzville, very deep, moderately well drained Botetourt and Moomaw, and very deep, somewhat poorly drained Toms soils on terraces; and the very deep, well drained Derroc soils on flood plains.

Most of the acreage in this map unit has been cleared of trees and is used for cultivated crops, pasture, or hay. Much of the cleared acreage is used for corn, corn silage, or small grain. Many of the strongly sloping and moderately steep cleared areas are used for pasture or hay. Most of the pastures consist of tall fescue or a mixture of tall fescue and clover. Alfalfa, orchardgrass, red clover, and tall fescue are the major hay crops. Flooding, the slope, the erosion potential, and the cobbles in the surface layer are the major limitations in the areas used for cultivated crops, hay, or pasture.

A small acreage of this map unit is used as woodland. The productivity of the soils for trees is moderate to high. Yellow-poplar, oaks, hickory, white pine, and Virginia pine are the dominant tree species. The slope, the erosion potential, and the clayey subsoil are the major concerns in managing the soils for woodland.

A few areas of this map unit are used for community development, mainly in the vicinity of Buchanan and Springwood. The major limitations are the slope, the clayey subsoil, and flooding in some areas.

Detailed Soil Map Units

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

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

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

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

Soils of one series can differ in texture of the surface layer or of the substratum. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Frederick gravelly loam, 7 to 15 percent slopes, is a phase of the Frederick series.

Some map units are made up of two or more major soils. These map units are called soil complexes. A *soil complex* consists of two or more soils, or one or more soils and a miscellaneous area, in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Groseclose-Litz complex, 7 to 15 percent slopes, is an example.

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

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

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

Soil Descriptions

1B—Alonzville loam, 2 to 7 percent slopes. This very deep, gently sloping, well drained soil is on terraces along the major streams and the James River. Areas are long and narrow and range from 4 to 40 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 10 inches, brown loam

Subsoil:
10 to 36 inches, strong brown clay loam
36 to 65 inches, strong brown loam that has yellowish brown mottles

Included with this soil in mapping are the very deep, moderately well drained Botetourt and Moomaw soils. These soils are in depressions and near the adjacent uplands. Also included are some areas of soils that have a surface layer of fine sandy loam or gravelly loam. Included soils make up about 15 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: More than 60 inches
Shrink-swell potential: Low
Organic matter content: Moderate
Natural fertility: Low
Surface runoff: Medium
Erosion potential: Medium
Tilth: Good
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used for cultivated crops or pasture. This soil is classified as prime farmland.

This soil is well suited to cultivated crops. The medium potential for erosion is a management concern. In cultivated areas conservation tillage, cover crops, and a crop rotation that includes grasses and legumes increase the content of organic matter, maintain tilth, and help to control runoff and erosion.

This soil is well suited to hay and pasture. Establishing and maintaining a mixture of grasses and legumes, preventing overgrazing, deferring grazing as needed, and applying lime and fertilizer to offset the acidity and low natural fertility of the soil can increase the production of feed and forage and help to control erosion. If the pasture is overgrazed, the runoff rate is increased and erosion is likely to be excessive.

The potential productivity for eastern white pine is very high. The estimated annual production of wood is 939 board feet per acre. Wooded areas of this soil are managed for eastern white pine and mixed hardwoods. Seeds and seedlings survive and grow well if competing vegetation is controlled.

This soil has slight limitations as a site for dwellings.

The moderate permeability limits the use of this soil as a site for septic tank absorption fields. Excavating longer field lines and installing the lines on the contour and at the proper grade can improve the lateral and downward flow of effluent.

The potential for frost action limits the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material helps to prevent the damage to pavement caused by frost action.

The capability subclass is IIe.

1C—Alonzville loam, 7 to 15 percent slopes. This very deep, strongly sloping, well drained soil is on terraces along the major streams and the James River. Areas are typically long and narrow. They range from 4 to 20 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 10 inches, brown loam

Subsoil:
10 to 36 inches, strong brown clay loam
36 to 65 inches, strong brown loam that has yellowish brown mottles

Included with this soil in mapping are the moderately deep, well drained Berks soils and the very deep, moderately well drained Botetourt and Moomaw soils. Berks soils are near the boundaries of the unit. Botetourt and Moomaw soils are in shallow depressions and near the adjacent uplands. Also included are a few areas of soils that have a surface layer of gravelly loam or fine sandy loam. Included soils make up about 15 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: More than 60 inches
Shrink-swell potential: Low
Organic matter content: Moderate
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Good
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used for cultivated crops or pasture. A few areas are wooded.

This soil is moderately well suited to cultivated crops. The high potential for erosion is a management concern. In cultivated areas conservation tillage, cover crops, and a crop rotation that includes grasses and legumes increase the content of organic matter, maintain tilth, and help to control runoff and erosion.

This soil is moderately well suited to hay and pasture. Establishing and maintaining a mixture of grasses and legumes, preventing overgrazing, deferring grazing as needed, and applying lime and fertilizer to offset the acidity and low natural fertility of the soil increase the production of feed and forage and help to control erosion. If the pasture is overgrazed, the runoff rate is increased and erosion is likely to be excessive.

The potential productivity for eastern white pine is very high. The estimated annual production of wood is 909 board feet per acre. Wooded areas of this soil are managed for eastern white pine and mixed hardwoods.

Seeds and seedlings survive and grow well if competing vegetation is controlled.

The slope limits the use of this soil as a site for dwellings. Land shaping and grading and designing the dwelling so that it conforms to the natural slope of the land help to overcome this limitation.

The slope and the moderate permeability limit the use of this soil as a site for septic tank absorption fields. Installing the field lines on the contour and at the proper grade helps to overcome the slope. Excavating longer field lines increases the absorption area and thus helps to overcome the moderate permeability.

The slope and the potential for frost action limit the use of this soil as a site for local roads and streets. Constructing the roads on the contour helps to overcome the slope. Providing suitable subgrade or base material minimizes the damage caused by frost action.

The capability subclass is IIIe.

2C—Bailegap fine sandy loam, 7 to 15 percent slopes. This moderately steep soil is deep and well drained. It is on narrow to broad, convex summits, shoulders, and side slopes in the Appalachian Mountains. Areas are oval or rectangular and range from about 4 to 10 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 2 inches, dark brown fine sandy loam

Subsurface layer:
2 to 10 inches, yellowish brown fine sandy loam

Subsoil:
10 to 17 inches, strong brown fine sandy loam
17 to 28 inches, strong brown sandy clay loam
28 to 42 inches, yellowish red clay loam
42 to 51 inches, mottled yellowish red, red, and yellowish brown channery clay loam

Bedrock:
51 inches, fractured sandstone that has beds of siltstone

Included with this soil in mapping are the moderately deep, well drained Berks, Dekalb, Lily, and Sequoia soils and the very deep, well drained Laidig soils. Berks, Dekalb, Lily, and Sequoia soils are on the same landscape as the Bailegap soil. Laidig soils are in saddles and depressions and at the concave head of drainageways. Also included are some areas of rock outcrop. Included areas make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Low
Depth to bedrock: 40 to 60 inches
Root zone: 40 to 60 inches
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Good
Depth to the water table: More than 72 inches
Potential for frost action: Low

Most areas are used as woodland. A few areas have been cleared of trees and are used as pasture or hayland.

This soil is moderately well suited to cultivated crops. The high potential for erosion is a management concern. In cultivated areas conservation tillage, cover crops, and a crop rotation that includes grasses and legumes can help to control runoff and erosion and conserve moisture.

This soil is moderately well suited to pasture and hay. The low available water capacity, acidity, and the low natural fertility restrict the establishment of grasses and legumes. Applying lime and fertilizer, deferring grazing as needed, and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for northern red oak is moderately high. The estimated annual production of wood is 285 board feet per acre. Wooded areas of this soil are managed for eastern white pine and mixed hardwoods. Seeds and seedlings survive and grow well if competing vegetation is controlled. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion.

The slope limits the use of this soil as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. The depth to bedrock is an additional limitation on sites for dwellings with basements. Building above the bedrock and landscaping with fill material help to overcome this limitation. The deeper included soils are better sites.

The slope, the depth to bedrock, and the moderate permeability limit the use of this soil as a site for septic tank absorption fields. Maintaining a correct grade in the absorption fields and installing the fields on the contour help to overcome the slope. Areas where bedrock is within a depth of 40 inches should not be selected as sites for the absorption fields. Excavating longer field lines increases the absorption area and thus helps to overcome the moderate permeability.

The slope limits the use of this soil as a site for local roads and streets. The roads should be constructed on the contour or designed so that they conform to the natural slope of the land.

The capability subclass is IIIe.

3C—Bailegap cobbly fine sandy loam, 7 to 15 percent slopes. This strongly sloping soil is deep and well drained. It is on narrow to broad, convex summits and shoulders in the Appalachian Mountains. Areas are oval or rectangular and range from about 4 to 30 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 2 inches, dark brown cobbly fine sandy loam

Subsurface layer:
2 to 10 inches, yellowish brown cobbly fine sandy loam

Subsoil:
10 to 17 inches, strong brown fine sandy loam
17 to 28 inches, strong brown sandy clay loam
28 to 42 inches, yellowish red clay loam
42 to 51 inches, mottled yellowish red, red, and yellowish brown channery clay loam

Bedrock:
51 inches, fractured sandstone that has beds of siltstone

Included with this soil in mapping are the moderately deep, somewhat excessively drained Lehew soils; the moderately deep, well drained Dekalb and Lily soils; and the very deep, well drained Laidig soils. Dekalb, Lily, and Lehew soils are on the same landscape as the Bailegap soil. Laidig soils are in saddles and depressions and at the concave head of drainageways. Also included are some areas of rock outcrop. Included areas make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Low
Depth to bedrock: 40 to 60 inches
Root zone: 40 to 60 inches
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Good, but cobbles interfere with tillage.
Depth to the water table: More than 72 inches
Potential for frost action: Low

Most areas are used as woodland. A few areas have been cleared of trees and are used as pasture.

This soil is poorly suited to cultivated crops because of the slope, the low available water capacity, the high potential for erosion, and the cobbles in the surface layer. The cobbles damage tillage equipment and interfere with planting.

This soil is moderately well suited to pasture and hay. The low available water capacity, acidity, and the low natural fertility restrict the establishment of grasses and legumes. Applying lime and fertilizer, deferring grazing as needed, and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for northern red oak is moderately high. The estimated annual production of wood is 285 board feet per acre. Wooded areas of this soil are managed for eastern white pine and mixed hardwoods. Seeds and seedlings survive and grow well if competing vegetation is controlled. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion.

Large stones and the slope limit the use of this soil as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. The depth to bedrock is an additional limitation on sites for dwellings with basements. Building above the bedrock and landscaping with fill material help to overcome this limitation. The deeper included soils are better sites.

Large stones, the slope, the depth to bedrock, and the moderate permeability limit the use of this soil as a site for septic tank absorption fields. Maintaining a correct grade in the absorption fields and installing the fields on the contour help to overcome the slope. Areas where bedrock is within a depth of 40 inches should not be selected as sites for the absorption fields. Excavating longer field lines increases the absorption area and thus helps to overcome the moderate permeability.

The slope and the potential for frost action limit the use of this soil as a site for local roads and streets. The roads should be constructed on the contour or designed so that they conform to the natural slope of the land. Providing suitable subgrade or base material helps to prevent the damage to pavement caused by frost action.

The capability subclass is IVs.

3D—Bailegap cobbly fine sandy loam, 15 to 30 percent slopes. This moderately steep soil is deep and well drained. It is on narrow to broad, convex summits, shoulders, and side slopes in the Appalachian Mountains. Areas are oval or rectangular and range from about 5 to 30 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 2 inches, dark brown cobbly fine sandy loam

Subsurface layer:
2 to 10 inches, yellowish brown cobbly fine sandy loam

Subsoil:
10 to 17 inches, strong brown fine sandy loam
17 to 28 inches, strong brown sandy clay loam
28 to 42 inches, yellowish red clay loam
42 to 51 inches, mottled yellowish red, red, and yellowish brown channery clay loam

Bedrock:
51 inches, fractured sandstone that has beds of siltstone

Included with this soil in mapping are the moderately deep, somewhat excessively drained Lehew soils; the moderately deep, well drained Dekalb and Lily soils; and the very deep, well drained Laidig and Tumbling soils. Lily, Dekalb, and Lehew soils are on the same landscape as the Bailegap soil. Laidig and Tumbling soils are in saddles and depressions and at the concave head of drainageways. Also included are some areas of rock outcrop. Included areas make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Low
Depth to bedrock: 40 to 60 inches
Root zone: 40 to 60 inches
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Good, but cobbles interfere with tillage.
Depth to the water table: More than 72 inches
Potential for frost action: Low

Most areas are used as woodland. A few areas have been cleared of trees and are used as pasture.

This soil is generally not suited to cultivated crops because of the slope, the low available water capacity, the high potential for erosion, and the cobbles in the surface layer. The cobbles damage tillage equipment and interfere with planting.

This soil is moderately well suited to pasture and hay. The low available water capacity, acidity, and the low natural fertility restrict the establishment of grasses and legumes. Applying lime and fertilizer, deferring grazing as needed, and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for northern red oak is moderately high on north aspects and moderate on south aspects. The estimated annual production of wood is 285 board feet per acre on north aspects and 257 board feet per acre on south aspects. Wooded areas of this soil are managed for eastern white pine and mixed hardwoods. Seeds and seedlings survive and grow well if competing vegetation is controlled. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion. The slope hinders the safe operation of heavy timber equipment.

The slope and large stones limit the use of this soil as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. The depth to bedrock is an additional limitation on sites for dwellings with basements. Building above the bedrock and landscaping with fill material help to overcome this limitation. The deeper included soils are better sites.

The slope and large stones limit the use of this soil as a site for septic tank absorption fields. Installing the field lines at the correct grade and on the contour helps to overcome the slope. The less sloping included soils are better sites.

The slope and the potential for frost action limit the use of this soil as a site for local roads and streets. The roads should be constructed on the contour or designed so that they conform to the natural slope of the land. Providing suitable subgrade or base material helps to prevent the damage to pavement caused by frost action.

The capability subclass is VIs.

3E—Bailegap cobbly fine sandy loam, 30 to 60 percent slopes. This steep and very steep soil is deep and well drained. It is on the sides of ridges in the Appalachian Mountains. Areas are long and winding and range from about 5 to 50 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 2 inches, dark brown cobbly fine sandy loam

Subsurface layer:
2 to 10 inches, yellowish brown cobbly fine sandy loam

Subsoil:
10 to 17 inches, strong brown fine sandy loam
17 to 28 inches, strong brown sandy clay loam
28 to 42 inches, yellowish red clay loam

42 to 51 inches, mottled yellowish red, red, and yellowish brown channery clay loam

Bedrock:

51 inches, fractured sandstone that has beds of siltstone

Included with this soil in mapping are the moderately deep, somewhat excessively drained Lehew soils; the moderately deep, well drained Dekalb and Lily soils; and the very deep, well drained Laidig and Tumbling soils. Lily, Dekalb, and Lehew soils are on the same landscape as the Bailegap soil. Laidig and Tumbling soils are on foot slopes and at the concave head of drainageways. Also included are some areas of rock outcrop and soils that have stones on the surface. Included areas make up about 25 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Low
Depth to bedrock: 40 to 60 inches
Root zone: 40 to 60 inches
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low
Surface runoff: Very rapid
Erosion potential: High
Tilth: Good, but cobbles interfere with tillage.
Depth to the water table: More than 72 inches
Potential for frost action: Low

Most areas are used as woodland. A few areas are used as native pasture.

This soil is not suited to cultivated crops because of the slope, the low available water capacity, the high potential for erosion, and the cobbles in the surface layer. The cobbles damage tillage equipment and interfere with planting.

This soil is poorly suited to pasture and hay. The slope hinders the safe operation of equipment. The low available water capacity, acidity, and the low natural fertility restrict the establishment of grasses and legumes. Applying lime and fertilizer, deferring grazing as needed, and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for northern red oak is moderately high on north aspects and moderate on south aspects. The estimated annual production of wood is 285 board feet per acre on north aspects and 257 board feet per acre on south aspects. Wooded areas of this soil are managed for shortleaf pine and mixed hardwoods. Seeds and seedlings survive and grow well if competing vegetation is controlled. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion. The slope hinders the safe operation of heavy timber equipment. As a result, a cable system or other alternatives are needed for harvesting.

The slope and large stones limit the use of this soil as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. The depth to bedrock is an additional limitation on sites for dwellings with basements. Building above the bedrock and landscaping with fill material help to overcome this limitation. The deeper included soils are better sites.

The slope and large stones limit the use of this soil as a site for septic tank absorption fields. Installing the field lines at the correct grade and on the contour helps to overcome the slope. The less sloping included soils are better sites.

The slope and the potential for frost action limit the use of this soil as a site for local roads and streets. The roads should be constructed on the contour or designed so that they conform to the natural slope of the land. Providing suitable subgrade or base material helps to prevent the damage to pavement caused by frost action.

The capability subclass is VIIe.

4C—Berks-Weikert complex, 7 to 15 percent slopes. These strongly sloping soils are on narrow, convex summits, shoulders, and side slopes in the uplands. They occur as areas so intermingled that mapping them separately is not practical. This map unit is about 45 percent moderately deep, well drained Berks soil, 40 percent shallow, somewhat excessively drained Weikert soil, and 15 percent other soils. Areas are long and winding and range from about 4 to 50 acres in size.

The typical sequence, depth, and composition of the layers in the Berks soil are as follows—

Surface layer:

0 to 1 inch, very dark grayish brown channery silt loam

Subsurface layer:

1 to 6 inches, light yellowish brown channery silt loam

Subsoil:

6 to 13 inches, yellowish brown channery silt loam
13 to 24 inches, yellowish brown very channery silty clay loam

Substratum:

24 to 31 inches, reddish yellow extremely channery silt loam

Bedrock:
31 inches, shale

The typical sequence, depth, and composition of the layers in the Weikert soil are as follows—

Surface layer:
0 to 4 inches, yellowish brown channery silt loam

Subsoil:
4 to 10 inches, brownish yellow very channery silt loam

Substratum:
10 to 16 inches, light yellowish brown extremely channery silt loam

Bedrock:
16 inches, shale

Included with these soils in mapping are the moderately deep, well drained Gilpin and Sequoia soils and the very deep, moderately well drained Ernest soils. Gilpin and Sequoia soils are on the same landscape as the Berks and Weikert soils. Ernest soils are on concave foot slopes and toe slopes and at the head of drainageways. Also included are areas of soils that have stones on the surface and areas of rock outcrop on summits and nose slopes.

Soil properties—

Permeability: Moderate or moderately rapid in the Berks soil and moderately rapid in the Weikert soil
Available water capacity: Low in the Berks soil and very low in the Weikert soil
Depth to bedrock: 20 to 40 inches in the Berks soil and 10 to 20 inches in the Weikert soil
Root zone: Same as the depth to bedrock
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low
Surface runoff: Medium
Erosion potential: High
Tilth: Fair; shale channers interfere with tillage.
Depth to the water table: More than 72 inches
Potential for frost action: Low in the Berks soil and moderate in the Weikert soil

Most areas are used as woodland. A few areas are used as pasture.

This map unit is poorly suited to cultivated crops because of the high potential for erosion, the slope, a high content of coarse fragments, a shallow or moderate rooting depth, the low or very low available water capacity, and the low natural fertility.

This map unit is moderately well suited to pasture and hay. The low or very low available water capacity, the moderate or shallow rooting depth, and the low natural fertility restrict the establishment of grasses and legumes. Applying lime and fertilizer, deferring grazing as needed, and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for northern red oak is moderately high on the Berks soil and moderate on the Weikert soil. The estimated annual production of wood is 280 board feet per acre on the Berks soil and 268 board feet per acre on the Weikert soil. Wooded areas of this map unit are managed for eastern white pine, Virginia pine, and mixed hardwoods. The survival of seeds and seedlings is affected by droughtiness during the growing season. Windthrow is a hazard on the Weikert soil. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion.

The slope and the depth to bedrock limit the use of this map unit as site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. Ripping the bedrock or building above it and landscaping with fill material help to overcome the depth to bedrock.

The depth to bedrock limits the use of this map unit as a site for septic tank absorption fields. The deeper included soils are better sites.

The slope, the potential for frost action, and the depth to bedrock in the Weikert soil limit the use of this map unit as a site for local roads and streets. The roads should be built on the contour or designed so that they conform to the natural slope of the land. Providing suitable subgrade or base material helps to prevent the damage to pavement caused by frost action. Planning grades so that rock removal is not needed and ripping the bedrock help to overcome the depth to bedrock.

The capability subclass is IVe.

4D—Berks-Weikert complex, 15 to 30 percent slopes. These moderately steep soils are on narrow, convex summits, shoulders, and side slopes in the uplands. They occur as areas so intermingled that mapping them separately is not practical. This map unit is about 45 percent moderately deep, well drained Berks soil, 40 percent shallow, somewhat excessively drained Weikert soil, and 15 percent other soils. Areas are long and winding and range from about 5 to 90 acres in size.

The typical sequence, depth, and composition of the layers in the Berks soil are as follows—

Surface layer:
0 to 1 inch, very dark grayish brown channery silt loam

Subsurface layer:
1 to 6 inches, light yellowish brown channery silt loam

Subsoil:
6 to 13 inches, yellowish brown channery silt loam
13 to 24 inches, yellowish brown very channery silty clay loam

Substratum:
24 to 31 inches, reddish yellow extremely channery silt loam

Bedrock:
31 inches, shale

The typical sequence, depth, and composition of the layers in the Weikert soil are as follows—

Surface layer:
0 to 4 inches, yellowish brown channery silt loam

Subsoil:
4 to 10 inches, brownish yellow very channery silt loam

Substratum:
10 to 16 inches, light yellowish brown extremely channery silt loam

Bedrock:
16 inches, shale

Included with these soils in mapping are the moderately deep, well drained Gilpin and Sequoia soils; the very deep, moderately well drained Ernest soils; and the very deep, well drained Shelocta soils. Gilpin and Sequoia soils are on the same landscape as the Berks and Weikert soils. Ernest and Shelocta soils are on concave foot slopes and toe slopes and at the head of drainageways. Also included are areas of soils that have stones on the surface and areas of rock outcrop on summits and nose slopes.

Soil properties—

Permeability: Moderate or moderately rapid in the Berks soil and moderately rapid in the Weikert soil
Available water capacity: Low in the Berks soil and very low in the Weikert soil
Depth to bedrock: 20 to 40 inches in the Berks soil and 10 to 20 inches in the Weikert soil
Root zone: Same as the depth to bedrock
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low
Surface runoff: Medium
Erosion potential: High
Tilth: Fair; shale channers interfere with tillage.
Depth to the water table: More than 72 inches
Potential for frost action: Low in the Berks soil and moderate in the Weikert soil

Most areas are used as woodland. A few areas are used as pasture.

This map unit is not suited to cultivated crops because of the high potential for erosion, the slope, a high content of coarse fragments, a shallow or moderate rooting depth, the low or very low available water capacity, and the low natural fertility.

This map unit is poorly suited to pasture and hay. The low or very low available water capacity, the moderate or shallow rooting depth, and the low natural fertility restrict the establishment of grasses and legumes. Applying lime and fertilizer, deferring grazing as needed, and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for northern red oak on north aspects is moderately high on the Berks soil and moderate on the Weikert soil. The potential productivity for northern red oak on south aspects is moderate on both soils. The estimated annual production of wood on north aspects is 280 board feet per acre on the Berks soil and 268 board feet per acre on the Weikert soil. The estimated annual production of wood on south aspects is 260 board feet per acre on the Berks soil and 244 board feet per acre the Weikert soil. Wooded areas of this map unit are managed for eastern white pine, Virginia pine, and mixed hardwoods. The survival of seeds and seedlings is affected by droughtiness during the growing season. Windthrow is a hazard on the Weikert soil. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion. The slope hinders the safe operation of heavy timber equipment.

The slope and the depth to bedrock limit the use of this map unit as site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. Ripping the bedrock or building above it and landscaping with fill material help to overcome the depth to bedrock.

The slope and the depth to bedrock limit the use of this map unit as a site for septic tank absorption fields. The deeper, less steep included soils are better sites.

The slope, the potential for frost action, and the depth to bedrock in the Weikert soil limit the use of this map unit as a site for local roads and streets. The roads should be built on the contour or designed so that they conform to the natural slope of the land. Providing suitable subgrade or base material helps to prevent the damage to pavement caused by frost action. Planning grades so that rock removal is not needed and ripping

the bedrock help to overcome the depth to bedrock.

The capability subclass is VIe.

4E—Berks-Weikert complex, 30 to 60 percent slopes. These steep and very steep soils are on narrow, convex summits, shoulders, and side slopes in the uplands. They occur as areas so intermingled that mapping them separately is not practical. This map unit is about 45 percent moderately deep, well drained Berks soil, 40 percent shallow, somewhat excessively drained Weikert soil, and 15 percent other soils. Areas are long and winding and range from about 5 to 90 acres in size.

The typical sequence, depth, and composition of the layers in the Berks soil are as follows—

Surface layer:
0 to 1 inch, very dark grayish brown channery silt loam

Subsurface layer:
1 to 6 inches, light yellowish brown channery silt loam

Subsoil:
6 to 13 inches, yellowish brown channery silt loam
13 to 24 inches, yellowish brown very channery silty clay loam

Substratum:
24 to 31 inches, reddish yellow extremely channery silt loam

Bedrock:
31 inches, shale

The typical sequence, depth, and composition of the layers in the Weikert soil are as follows—

Surface layer:
0 to 4 inches, yellowish brown channery silt loam

Subsoil:
4 to 10 inches, brownish yellow very channery silt loam

Substratum:
10 to 16 inches, light yellowish brown extremely channery silt loam

Bedrock:
16 inches, shale

Included with these soils in mapping are the moderately deep, well drained Gilpin and Sequoia soils; the very deep, moderately well drained Ernest soils; the very deep, excessively drained Rushtown soils; and the very deep, well drained Shelocta soils. Gilpin and Sequoia soils are on the same landscape as the Berks and Weikert soils. Ernest, Rushtown, and Shelocta soils are on concave foot slopes and toe slopes and at the head of drainageways. Also included are areas of soils that have stones on the surface, areas of rock outcrop, and areas of soils that have slopes of more than 60 percent.

Soil properties—

Permeability: Moderate or moderately rapid in the Berks soil and moderately rapid in the Weikert soil
Available water capacity: Low in the Berks soil and very low in the Weikert soil
Depth to bedrock: 20 to 40 inches in the Berks soil and 10 to 20 inches in the Weikert soil
Root zone: Same as the depth to bedrock
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid or very rapid
Erosion potential: High
Tilth: Fair; shale channers interfere with tillage.
Depth to the water table: More than 72 inches
Potential for frost action: Low in the Berks soil and moderate in the Weikert soil

Most areas are used as woodland. A few areas are used as pasture.

This map unit is not suited to cultivated crops. Crop production is limited by the slope, a high content of coarse fragments, the low or very low available water capacity, a moderate or shallow rooting depth, and the low natural fertility. The slope limits the use of equipment. The high potential for erosion is another management concern.

This map unit is poorly suited to pasture and hay. The low or very low available water capacity, the moderate or shallow rooting depth, and the low natural fertility restrict the establishment of grasses and legumes. Applying lime and fertilizer, deferring grazing as needed, and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for northern red oak on north aspects is moderately high on the Berks soil and moderate on the Weikert soil. The potential productivity for northern red oak on south aspects is moderate on both soils. The estimated annual production of wood on north aspects is 280 board feet per acre the Berks soil and 268 board feet per acre the Weikert soil. The estimated annual production of wood on south aspects is 260 board feet per acre on the Berks soil and 244 board feet per acre on the Weikert soil. Wooded areas of this map unit are managed for eastern white pine, Virginia pine, and mixed hardwoods. The survival of seeds and seedlings is affected by droughtiness during

the growing season. Windthrow is a hazard on the Weikert soil. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion. The slope hinders the safe operation of heavy timber equipment. As a result, a cable system or other alternatives are needed for harvesting.

The slope and the depth to bedrock limit the use of this map unit as site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. Less sloping soils are better sites. Ripping the bedrock or building above it and landscaping with fill material help to overcome the depth to bedrock.

The slope and the depth to bedrock limit the use of this soil as a site for septic tank absorption fields. The deeper, less steep included soils are better sites.

The slope, the potential for frost action, and the depth to bedrock in the Weikert soil limit the use of this map unit as a site for local roads and streets. The roads should be built on the contour or designed so that they conform to the natural slope of the land. Planning grades so that rock removal is not needed and ripping the bedrock help to overcome the depth to bedrock.

The capability subclass is VIIe.

5B—Botetourt loam, 2 to 7 percent slopes, rarely flooded. This gently sloping soil is very deep and moderately well drained. It is on low stream terraces and foot slopes throughout the survey area. Areas are long and winding or irregularly shaped and range from about 4 to 30 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 7 inches, brown loam

Subsoil:
7 to 14 inches, brownish yellow clay loam that has strong brown mottles
14 to 24 inches, yellowish brown clay loam that has pale brown and strong brown mottles
24 to 44 inches, brownish yellow clay loam that has light gray mottles
44 to 53 inches, mottled reddish yellow and light gray loam

Substratum:
53 to 65 inches, mottled yellowish brown, gray, and light gray gravelly sandy clay loam

Included with this soil in mapping are the very deep, well drained Alonzville and Wolfgap soils; the moderately deep, well drained Berks soils; the very deep, somewhat poorly drained Toms soils; and the very deep, moderately well drained Irongate soils. Alonzville and Wolfgap soils are in the slightly higher, more convex areas. Berks soils are on the adjacent uplands. Toms soils are in slight depressions. Irongate soils are on the adjacent flood plains. Also included are some areas of soils that have a cobbly or gravelly surface layer. Included soils make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: Restricted by the water table
Shrink-swell potential: Low
Organic matter content: Moderate
Natural fertility: Medium
Surface runoff: Medium
Erosion potential: Medium
Tilth: Good
Depth to the water table: 18 to 30 inches in winter and early spring
Potential for frost action: High
Flooding: Rare, during periods of abnormally high rainfall

Most areas are used as pasture or hayland. Some areas are used for cultivated crops or woodland.

This soil is well suited to cultivated crops. Alfalfa commonly is short lived because of seasonal wetness and restricted root growth. The medium potential for erosion is a management concern. In cultivated areas contour farming, conservation tillage, and a crop rotation that includes grasses and legumes help to control runoff and erosion and conserve moisture.

This soil is well suited to pasture. Establishing and maintaining a mixture of grasses and legumes, deferring grazing as needed, controlling weeds, using proper stocking rates, and applying lime and fertilizer increase the production of feed and forage and help to control erosion.

The potential productivity for northern red oak is moderately high. The estimated annual production of wood is 284 board feet per acre. Wooded areas of this soil are managed for eastern white pine, Virginia pine, and mixed hardwoods. Seeds and seedlings survive and grow well if competing vegetation is controlled.

The rare flooding and the seasonal high water table limit the use of this soil as a site for dwellings. Installing foundation drains and sealing foundations help to overcome the wetness. The well drained included soils that are not subject to flooding are better sites.

The seasonal high water table and the rare flooding limit the use of this soil as a site for septic tank absorption fields. The well drained included soils that are not subject to flooding are better sites.

The potential for frost action, the seasonal high water table, and the flooding are the main limitations affecting the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material and installing a drainage system help to prevent the damage caused by the seasonal high water table and frost action. Routing the roads away from the areas that are subject to flooding and protecting the roadbanks with riprap can minimize the damage caused by flooding.

The capability subclass is IIe.

6C—Botetourt loam, 7 to 15 percent slopes. This strongly sloping soil is very deep and is moderately well drained or somewhat poorly drained. It is on stream terraces, foot slopes, and benches throughout the survey area. Areas are long and winding or irregularly shaped and range from about 4 to 20 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 7 inches, brown loam

Subsoil:
7 to 14 inches, brownish yellow clay loam that has strong brown mottles
14 to 24 inches, yellowish brown clay loam that has pale brown and strong brown mottles
24 to 44 inches, brownish yellow clay loam that has light gray mottles
44 to 53 inches, mottled reddish yellow and light gray loam

Substratum:
53 to 65 inches, mottled yellowish brown, gray, and light gray gravelly sandy clay loam

Included with this soil in mapping are the very deep, well drained Alonzville and Wolfgap soils; the moderately deep, well drained Berks soils; the very deep, somewhat poorly drained Toms soils; and the very deep, moderately well drained Irongate soils. Alonzville and Wolfgap soils are in the slightly higher, more convex areas. Berks soils are on the adjacent uplands. Toms soils are in slight depressions. Irongate soils are on the adjacent flood plains. Also included are some areas of soils that have a cobbly or gravelly surface layer. Included soils make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: Restricted by the water table
Shrink-swell potential: Low
Organic matter content: Moderate
Natural fertility: Medium
Surface runoff: High
Erosion potential: High
Tilth: Good
Depth to the water table: 18 to 30 inches in winter and early spring
Potential for frost action: High

Most areas are used as woodland. Some areas are used for cultivated crops or pasture.

This soil is moderately well suited to cultivated crops. Alfalfa commonly is short lived because of seasonal wetness and restricted root growth. The high potential for erosion is a management concern. In cultivated areas contour farming, conservation tillage, and a crop rotation that includes grasses and legumes help to control runoff and erosion and conserve moisture.

This soil is moderately well suited to pasture. Establishing and maintaining a mixture of grasses and legumes, deferring grazing as needed, controlling weeds, using proper stocking rates, and applying lime and fertilizer increase the production of feed and forage and help to control erosion.

The potential productivity for northern red oak is moderately high. The estimated annual production of wood is 284 board feet per acre. Wooded areas of this soil are managed for eastern white pine, Virginia pine, and mixed hardwoods. Seeds and seedlings survive and grow well if competing vegetation is controlled.

The seasonal high water table and the slope limit the use of this soil as a site for dwellings. Installing foundation drains and sealing foundations help to overcome the seasonal wetness. The well drained included soils are better sites. The dwelling should be designed so that it conforms to the natural slope of the land. Land shaping may be needed.

The seasonal high water table limits the use of this soil as a site for septic tank absorption fields. The well drained included soils are better sites.

The potential for frost action, the seasonal high water table, and the slope are the main limitations affecting the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material and installing a drainage system help to prevent the damage caused by the seasonal high water table and frost action. Building the roads on the contour helps to overcome the slope.

The capability subclass is IIIe.

7C—Carbo silty clay loam, 7 to 15 percent slopes, very rocky. This strongly sloping soil is moderately deep and well drained. It is on side slopes, summits, and shoulders in a limestone valley. Rock outcrops cover 2 to 10 percent of the surface. Sinkholes are

common in some areas. Areas are roughly rectangular or long and winding and range from 4 to 30 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 5 inches, dark brown silty clay loam

Subsoil:
5 to 9 inches, dark yellowish brown clay
9 to 21 inches, yellowish brown clay
21 to 27 inches, yellowish brown clay that has yellowish red mottles

Bedrock:
27 inches, limestone

Included with this soil in mapping are the moderately deep, well drained Chilhowie soils and the very deep, well drained Frederick, Groseclose, and Timberville soils. Chilhowie, Frederick, and Groseclose soils are on the same landscape as the Carbo soil. Timberville soils are in depressions and along intermittent drainageways. Also included are some areas of soils that have a surface layer of gravelly silt loam, severely eroded soils that have a surface layer of silty clay or clay, and soils that have slopes of less than 7 percent. Included soils make up about 15 percent of this map unit.

Soil properties—

Permeability: Slow
Available water capacity: Low
Depth to bedrock: 20 to 40 inches
Root zone: 20 to 40 inches
Shrink-swell potential: High
Organic matter content: Moderate
Natural fertility: High
Surface runoff: Rapid
Erosion potential: High
Tilth: Fair at optimum soil moisture content; the rock outcrops interfere with tillage.
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as pasture. A few areas are used for hay or woodland.

This soil is unsuited to cultivated crops. The rock outcrops interfere with tillage. The rooting depth is restricted by the very firm clay in the subsoil and the moderate depth to bedrock. In cultivated areas the surface layer often has a thin crust after heavy rains. The high potential for erosion is a management concern.

This soil is moderately well suited to hay and pasture. The very firm clay in the subsoil and the depth to bedrock restrict the growth of some legumes and grasses. Grazing when the soil is wet compacts the surface layer. Overgrazing reduces the quantity and quality of forage and increases the runoff rate and the hazard of erosion. Timely deferment of grazing and weed and brush control increase the production of feed and forage and help to control erosion.

The potential productivity for Virginia pine is high. The estimated annual production of wood is 526 board feet per acre. Wooded areas of this soil are managed for Virginia pine, eastern white pine, yellow-poplar, and mixed hardwoods. Plant competition, surface crusting, and a restricted rooting depth are the major limitations. Seeds and seedlings survive and grow fairly well if competing vegetation is controlled. The soil is soft and slippery when wet. As a result, the use of heavy harvesting equipment is restricted to dry periods. The rooting depth is restricted by the very firm clay in the subsoil and the moderate depth to bedrock. Some trees are uprooted during windy periods. Thinning that does not leave the remaining trees widely spaced helps to prevent uprooting.

The depth to bedrock, the rock outcrops, the shrink-swell potential, and the slope limit the use of this soil as a site for dwellings. Filling can raise the site above the bedrock. The deeper included soils are better sites. Providing extra reinforcement in the footings and foundations and backfilling with sandy material help to prevent the damage caused by shrinking and swelling. Land shaping and grading help to overcome the slope.

The slow permeability and the depth to bedrock limit the use of this soil as a site for septic tank absorption fields. Included areas of better suited soils should be considered. Blasting of the limestone bedrock and the rock outcrops may be needed.

Low strength and the shrink-swell potential limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material and otherwise improving the traffic-supporting capacity of the roads help to overcome these limitations.

The capability subclass is VIs.

7D—Carbo silty clay loam, 15 to 30 percent slopes, very rocky. This moderately steep soil is moderately deep, well drained. It is on side slopes in a limestone valley. Rock outcrops cover 2 to 10 percent of the surface. Sinkholes are common in some areas. Areas are roughly rectangular or long and winding and range from 4 to 50 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 5 inches, dark brown silty clay loam

Subsoil:
5 to 9 inches, dark yellowish brown clay
9 to 21 inches, yellowish brown clay
21 to 27 inches, yellowish brown clay that has yellowish red mottles

Bedrock:
27 inches, limestone

Included with this soil in mapping are the moderately deep, well drained Chilhowie soils and the very deep, well drained Frederick, Groseclose, and Timberville soils. Chilhowie, Frederick, and Groseclose soils are on the same landscape as the Carbo soil. Timberville soils are in depressions and along intermittent drainageways. Also included are some areas of soils that have a surface layer of gravelly silt loam, severely eroded soils that have a surface layer of silty clay or clay, and soils that have slopes of less than 7 percent. Included soils make up about 25 percent of this map unit.

Soil properties—

Permeability: Slow
Available water capacity: Low
Depth to bedrock: 20 to 40 inches
Root zone: 20 to 40 inches
Shrink-swell potential: High
Organic matter content: Moderate
Natural fertility: High
Surface runoff: Rapid
Erosion potential: High
Tilth: Fair at optimum soil moisture content; the rock outcrops interfere with tillage.
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as pasture. A few areas are wooded.

This soil is unsuited to cultivated crops. The rock outcrops interfere with tillage. The rooting depth is restricted by the very firm clay in the subsoil and the moderate depth to bedrock.

This soil is moderately well suited to hay and pasture. The very firm clay in the subsoil and the depth to bedrock restrict the growth of some legumes and grasses. Grazing when the soil is wet compacts the surface layer. Overgrazing reduces the quantity and quality of forage and increases the runoff rate and the hazard of erosion. Timely deferment of grazing and weed and brush control increase the production of feed and forage and help to control erosion.

The potential productivity for Virginia pine is high. The estimated annual production of wood is 500 board feet per acre on north aspects and 437 board feet per acre on south aspects. Wooded areas of this soil are managed for Virginia pine, eastern white pine, and mixed hardwoods. Plant competition, surface crusting, and a restricted rooting depth are the major limitations. Seeds and seedlings survive and grow fairly well if competing vegetation is controlled. The slope and the surface layer, which is soft and slippery when wet, restrict the use of heavy harvesting equipment to dry periods. The rooting depth is restricted by the very firm clay in the subsoil and the moderate depth to bedrock. Some trees are uprooted during windy periods. Thinning that does not leave the remaining trees widely spaced helps to prevent uprooting. Building logging roads and skid trails on the contour helps to control runoff and erosion.

The slope, the depth to bedrock, the rock outcrops, and the shrink-swell potential limit the use of this soil as a site for dwellings. Land shaping and grading help to overcome the slope. Filling can raise the site above the bedrock. The deeper included soils are better sites. Providing extra reinforcement in the footings and foundations and backfilling with sandy material minimize the structural damage caused by shrinking and swelling.

The slope, low strength, and the high shrink-swell potential limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material and otherwise improving the traffic-supporting capacity of the roads help to overcome low strength and the shrink-swell potential. The roads should be constructed on the contour or designed so that they conform to the natural slope of the land. Limestone bedrock encountered during construction requires blasting.

The slope, the depth to bedrock, and the slow permeability limit the use of this soil as a site for septic tank absorption fields. The deeper, less steep included soils are better sites.

The capability subclass is VIs.

8C—Carbo-Opequon-Rock outcrop complex, 2 to 15 percent slopes. This map unit consists of gently sloping and strongly sloping, well drained soils intermingled with outcrops of limestone bedrock. It is on narrow to broad, convex summits, shoulders, and side slopes in a limestone valley. Sinkholes are common in some areas. The two soils and the Rock outcrop occur as areas so intermingled that mapping them separately is not practical. The unit is about 35 percent moderately deep Carbo soil, 30 percent Rock outcrop, 30 percent shallow Opequon soil, and 5 percent other soils. Areas are long and winding and range from 5 to 50 acres in size.

The typical sequence, depth, and composition of the layers in the Carbo soil are as follows—

Surface layer:
0 to 5 inches, dark brown silty clay loam

Subsoil:
5 to 9 inches, dark yellowish brown clay
9 to 21 inches, yellowish brown clay
21 to 27 inches, yellowish brown clay that has yellowish red mottles

Bedrock:
27 inches, limestone

The typical sequence, depth, and composition of the layers in the Opequon soil are as follows—

Surface layer:
0 to 6 inches, dark brown silty clay loam

Subsoil:
6 to 17 inches, yellowish red clay

Bedrock:
17 inches, limestone

Included in this map unit are the very deep, well drained Frederick, Groseclose, and Timberville soils and the very deep, moderately well drained Massanetta soils. Frederick and Groseclose soils are on the same landscape as the Carbo and Opequon soils. Massanetta soils are along drainageways below springs. Timberville soils are in depressions and along intermittent drainageways. Also included are some areas of soils that have a surface layer of flaggy silty clay or clay.

Properties of the Carbo and Opequon soils—

Permeability: Slow in the Carbo soil and moderately slow or moderate in the Opequon soil
Available water capacity: Low in the Carbo soil and very low in the Opequon soil
Depth to bedrock: 20 to 40 inches in the Carbo soil and 12 to 20 inches in the Opequon soil
Root zone: Same as the depth to bedrock
Shrink-swell potential: High
Organic matter content: Moderate
Natural fertility: High
Surface runoff: Medium or rapid
Erosion potential: Medium
Tilth: Severely limited by the Rock outcrop
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as woodland. Some areas have been cleared of trees and are used as pasture.

This map unit is unsuited to cultivated crops. The Rock outcrop severely limits the use of machinery for seedbed preparation, cultivation, spraying, and harvesting.

This map unit is moderately well suited to pasture. The very firm clay in the subsoil, the depth to bedrock, and droughtiness during the growing season restrict the growth of some grasses and legumes. Grazing when the soil is too wet compacts the surface layer. Timely deferment of grazing, applications of fertilizer, and weed and brush control increase the production of forage and help to control erosion.

The potential productivity for Virginia pine is high on the Carbo soil and moderate on the Opequon soil. The estimated annual production of wood is 526 board feet per acre on the Carbo soil and 271 board feet per acre on the Opequon soil. Wooded areas of this map unit are managed for Virginia pine and mixed hardwoods. The survival of seeds and seedlings is affected by droughtiness during the growing season. Windthrow is a hazard on the Opequon soil. The Rock outcrop limits the use of heavy harvesting equipment.

The slope, the depth to bedrock, the Rock outcrop, and the high shrink-swell potential limit the use of this map unit as a site for dwellings. Land shaping and grading help to overcome the slope. Building above the bedrock and landscaping with fill material help to overcome the depth to bedrock. The deeper included soils are better sites. Providing extra reinforcement in the footings and backfilling with coarse textured material help to prevent the damage caused by shrinking and swelling.

The depth to bedrock, the slope, and the slow permeability limit the use of this map unit as a site for septic tank absorption fields. The deeper, less steep included soils are better sites.

The depth to bedrock, the Rock outcrop, low strength, and the high shrink-swell potential limit the use of this map unit as a site for local roads and streets. Planning grades and routes so that rock removal is not needed and blasting help to overcome the depth to bedrock and the Rock outcrop. Providing suitable subgrade or base material helps to prevent the damage caused by low strength and by shrinking and swelling.

The capability subclass is VIIs.

8E—Carbo-Opequon-Rock outcrop complex, 15 to 45 percent slopes. This map unit consists of moderately steep to very steep, well drained soils intermingled with outcrops of limestone bedrock. It is on the narrow, convex side slopes of ridges in a limestone valley. Sinkholes are common in some areas. The two soils and the Rock outcrop occur as areas so intermingled that mapping them separately is not practical. The unit is about 35 percent moderately deep Carbo soil, 30 percent Rock outcrop, 30 percent shallow Opequon soil, and 5 percent other soils. Areas are long and winding and range from 5 to 250 acres in size.

The typical sequence, depth, and composition of the layers in the Carbo soil are as follows—

Surface layer:
0 to 5 inches, dark brown silty clay loam

Subsoil:
5 to 9 inches, dark yellowish brown clay
9 to 21 inches, yellowish brown clay
21 to 27 inches, yellowish brown clay that has yellowish red mottles

Bedrock:
27 inches, limestone

The typical sequence, depth, and composition of the layers in the Opequon soil are as follows—

Surface layer:
0 to 6 inches, dark brown silty clay loam

Subsoil:
6 to 17 inches, yellowish red clay

Bedrock:
17 inches, limestone

Included in this map unit are the very deep, well drained Frederick, Groseclose, and Timberville soils and the very deep, moderately well drained Massanetta soils. Frederick and Groseclose soils are on the same landscape as the Carbo and Opequon soils. Massanetta soils are along drainageways below springs. Timberville soils are in depressions and along intermittent drainageways. Also included are some areas of soils that have a surface layer of flaggy silty clay or clay.

Properties of the Carbo and Opequon soils—

Permeability: Slow in the Carbo soil and moderately slow or moderate in the Opequon soil
Available water capacity: Low in the Carbo soil and very low in the Opequon soil
Depth to bedrock: 20 to 40 inches in the Carbo soil and 12 to 20 inches in the Opequon soil
Root zone: Same as the depth to bedrock
Shrink-swell potential: High
Organic matter content: Moderate
Natural fertility: High
Surface runoff: Rapid or very rapid
Erosion potential: High
Tilth: Severely limited by the Rock outcrop
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as woodland. A few small areas have been cleared of trees and are used as pasture.

This map unit is unsuited to cultivated crops. The Rock outcrop severely limits the use of machinery for seedbed preparation, cultivation, spraying, and harvesting.

This map unit is poorly suited to pasture. The very firm clay in the subsoil, the depth to bedrock, and droughtiness during the growing season restrict the growth of some grasses and legumes. Grazing when the soil is too wet compacts the surface layer. Timely deferment of grazing, applications of fertilizer, and weed and brush control increase the production of forage and help to control erosion.

The potential productivity for Virginia pine is high on the Carbo soil. In areas of the Opequon soil, it is high on north aspects and moderately high on south aspects. The estimated annual production of wood on north aspects is 500 board feet on the Carbo soil and 437 board feet per acre on the Opequon soil. The estimated annual production of wood on south aspects is 482 board feet per acre on the Carbo soil and 406 board feet per acre on the Opequon soil. Wooded areas of this map unit are managed for Virginia pine, yellow-poplar, and mixed hardwoods. The survival of seeds and seedlings is affected by droughtiness during the growing season. Windthrow is a hazard on the Opequon soil. The Rock outcrop and the slope hinder the safe operation of heavy harvesting equipment.

The slope, the depth to bedrock, the Rock outcrop, and the high shrink-swell potential limit the use of this map unit as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. Building above the bedrock and landscaping with fill material help to overcome the depth to bedrock. The deeper included soils are better sites. Providing extra reinforcement in the footings and backfilling with coarse textured material help to prevent the damage caused by shrinking and swelling.

The depth to bedrock, the Rock outcrop, and the slow permeability limit the use of this map unit as a site for septic tank absorption fields. The deeper, less steep included soils are better sites.

The slope, the depth to bedrock, the Rock outcrop, low strength, and the high shrink-swell potential limit the use of this map unit as a site for local roads and streets. Planning grades and routes so that rock removal is not needed and blasting help to overcome the depth to bedrock and the Rock outcrop. The roads should be built on the contour or designed so that they conform to the natural slope of the land. Providing suitable subgrade or base material helps to prevent the damage caused by low strength and by shrinking and swelling.

The capability subclass is VIIs.

9C—Chilhowie silty clay loam, 7 to 15 percent slopes, rocky. This strongly sloping soil is moderately deep and well drained. It is on side slopes, summits, and shoulders in a limestone valley. Rock outcrops

cover 0.1 to 2.0 percent of the surface. Areas are roughly rectangular or long and winding and range from 4 to 25 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 6 inches, dark brown silty clay loam

Subsoil:
6 to 17 inches, yellowish brown clay

Substratum:
17 to 27 inches, yellowish brown extremely channery clay

Bedrock:
27 inches, limestone and calcareous shale

Included with this soil in mapping are the moderately deep, well drained Carbo and Litz and very deep, well drained Groseclose soils. These soils are on the same landscape as the Chilhowie soil. Also included are some areas of severely eroded soils that have a surface layer of silty clay or channery silty clay. Included soils make up about 15 percent of this map unit.

Soil properties—

Permeability: Slow
Available water capacity: Low
Depth to bedrock: 20 to 40 inches
Root zone: 10 to 34 inches
Shrink-swell potential: High
Organic matter content: Low
Natural fertility: High
Surface runoff: Medium or rapid
Erosion potential: High
Tilth: Fair at optimum soil moisture content
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as pasture. A few areas are wooded.

This soil is poorly suited to cultivated crops. The high potential for erosion is a management concern. The rooting depth is restricted by the very firm clay in the subsoil and the moderate depth to bedrock, and the soil is droughty during the growing season. In cultivated areas the surface layer often has a thin crust after heavy rains. Cover crops, a crop rotation that includes grasses and legumes, and conservation tillage minimize crusting, maintain or increase the content of organic matter in the surface layer, increase the rate of water infiltration, and help to control runoff and erosion.

This soil is moderately well suited to hay and pasture. The very firm clay in the subsoil and the depth to bedrock restrict the growth of some legumes and grasses. Grazing when the soil is wet compacts the surface layer. Overgrazing reduces the quantity and quality of forage and increases the runoff rate and the hazard of erosion. Timely deferment of grazing and weed and brush control increase the production of feed and forage and help to control erosion.

The potential productivity for Virginia pine is high. The estimated annual production of wood is 500 board feet per acre. Wooded areas of this soil is managed for Virginia pine, eastern white pine, and mixed hardwoods. Plant competition, surface crusting, and a restricted rooting depth are the main limitations. Seeds and seedlings survive and grow fairly well. The soil is soft and slippery when wet. As a result, the use of heavy harvesting equipment is restricted to dry periods. The rooting depth is restricted by the very firm clay in the subsoil and the moderate depth to bedrock. Some trees are uprooted during windy periods. Thinning that does not leave the remaining trees widely spaced helps to prevent uprooting.

The slope, the depth to bedrock, the rock outcrops, and the shrink-swell potential limit the use of this soil as a site for dwellings. Land shaping and grading help to overcome the slope. Filling can raise the site above the bedrock. The deeper included soils are better sites. Providing extra reinforcement in the footings and foundations and backfilling with sandy material help to prevent the damage caused by shrinking and swelling.

The slow permeability and the depth to bedrock limit the use of this soil as a site for septic tank absorption fields. The better suited included soils should be considered. Blasting of the limestone bedrock and the rock outcrops may be needed.

The shrink-swell potential limits the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material helps to overcome this limitation.

The capability subclass is IVe.

9D—Chilhowie silty clay loam, 15 to 30 percent slopes, rocky. This moderately steep soil is moderately deep and well drained. It is on the sides of ridges in a limestone valley. Rock outcrops cover 0.1 to 2.0 percent of the surface. Areas are roughly rectangular or long and winding and range from 4 to 75 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 6 inches, dark brown silty clay loam

Subsoil:
6 to 17 inches, yellowish brown clay

Substratum:
17 to 27 inches, yellowish brown extremely channery clay

Bedrock:
27 inches, limestone and calcareous shale

Included with this soil in mapping are the moderately deep, well drained Carbo and Litz soils and the very deep, well drained Groseclose and Timberville soils. Carbo, Litz, and Groseclose soils are on the same landscape as the Chilhowie soil. Timberville soils are on foot slopes and along intermittent drainageways. Also included are some areas of severely eroded soils that have a surface layer of silty clay or channery silty clay. Included soils make up about 15 percent of this map unit.

Soil properties—

Permeability: Slow
Available water capacity: Low
Depth to bedrock: 20 to 40 inches
Root zone: 10 to 34 inches
Shrink-swell potential: High
Organic matter content: Low
Natural fertility: High
Surface runoff: Medium or rapid
Erosion potential: High
Tilth: Fair at optimum soil moisture content
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as pasture. A few areas are wooded.

This soil is unsuited to cultivated crops. The rock outcrops interfere with tillage. The high potential for erosion is a management concern.

This soil is moderately well suited to hay and pasture. The very firm clay in the subsoil and the depth to bedrock restrict the growth of some legumes and grasses. Grazing when the soil is wet compacts the surface layer. Overgrazing reduces the quantity and quality of forage and increases the runoff rate and the hazard of erosion. Timely deferment of grazing and weed and brush control increase the production of feed and forage and help to control erosion.

The potential productivity for Virginia pine is high on north aspects and moderately high on south aspects. The estimated annual production of wood is 500 board feet per acre on north aspects and 349 board feet per acre on south aspects. Wooded areas of this soil is managed for Virginia pine, eastern white pine, and mixed hardwoods. Plant competition, surface crusting, and a restricted rooting depth are the major limitations. Seedling mortality is severe on south aspects. The slope and the surface layer, which is soft and slippery when wet, restrict the use of heavy harvesting equipment to dry periods. The rooting depth is restricted by the very firm clay in the subsoil and the moderate depth to bedrock. Some trees are uprooted during windy periods. Thinning that does not leave the remaining trees widely spaced helps to prevent uprooting. Building logging roads and skid trails on the contour helps to control runoff and erosion.

The slope, the depth to bedrock, the rock outcrops, and the shrink-swell potential limit the use of this soil as a site for dwellings. Land shaping and grading help to overcome the slope, although bedrock will be encountered in most areas. Filling can raise the site above the bedrock. The deeper included soils are better sites. Providing extra reinforcement in the footings and foundations and backfilling with sandy material minimize the structural damage caused by shrinking and swelling.

The slope, the slow permeability, and the depth to bedrock limit the use of this soil as a site for septic tank absorption fields. The deeper, less steep included soils are better sites.

The high shrink-swell potential and the slope limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material and otherwise improving the traffic-supporting capacity of the roads help to prevent the damage caused by low strength and by shrinking and swelling. The roads should be constructed on the contour or designed so that they conform to the natural slope of the land. Limestone bedrock encountered during construction requires blasting.

The capability subclass is VIe.

10E—Chilhowie channery silty clay loam, 30 to 60 percent slopes, rocky. This steep and very steep soil is moderately deep and well drained. It is on the sides of ridges in a limestone valley. Rock outcrops cover 0.1 to 2.0 percent of the surface. Areas are roughly rectangular or long and winding and range from 5 to 75 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 3 inches, dark brown channery silty clay loam

Subsoil:
3 to 14 inches, yellowish brown channery clay

Substratum:
14 to 24 inches, yellowish brown extremely channery clay

Bedrock:
24 inches, limestone and calcareous shale

Included with this soil in mapping are the moderately

deep, well drained Carbo and Litz and very deep, well drained Groseclose soils. These soils are on the same landscape as the Chilhowie soil. Also included are some areas of severely eroded soils, soils having deep gullies that extend to the bedrock, soils that have a flaggy surface layer, and areas that have more rock outcrops. Included areas make up about 25 percent of this map unit.

Soil properties—

Permeability: Slow
Available water capacity: Low
Depth to bedrock: 20 to 40 inches
Root zone: 10 to 34 inches
Shrink-swell potential: High
Organic matter content: Low or moderate
Natural fertility: High
Surface runoff: Very rapid
Erosion potential: High
Tilth: Fair at optimum soil moisture content
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as woodland. A few areas are used as pasture.

This soil is unsuited to cultivated crops. The slope hinders the safe operation of tillage equipment. The high potential for erosion is a management concern. The rock outcrops interfere with tillage.

This soil is poorly suited to hay and pasture. The very firm clay in the subsoil and the depth to bedrock restrict the growth of some legumes and grasses. Grazing when the soil is wet compacts the surface layer. Overgrazing reduces the quantity and quality of forage and increases the runoff rate and the hazard of erosion. Timely deferment of grazing and weed and brush control increase the production of feed and forage and help to control erosion.

The potential productivity for Virginia pine is high on north aspects and moderately high on south aspects. The estimated annual production of wood is 500 board feet per acre on north aspects and 349 board feet per acre on south aspects. Wooded areas of this soil are managed for Virginia pine, eastern white pine, and mixed hardwoods. Plant competition, surface crusting, and a restricted rooting depth are the major limitations. Seedling mortality is severe on south aspects. The rooting depth is restricted by the very firm clay in the subsoil and the moderate depth to bedrock. Some trees are uprooted during windy periods. Thinning that does not leave the remaining trees widely spaced helps to prevent uprooting. The slope hinders the safe operation of heavy equipment. As a result, a cable system or other alternatives are needed for harvesting.

The slope, the depth to bedrock, the rock outcrops, and the shrink-swell potential limit the use of this soil as a site for dwellings. Land shaping and grading help overcome the slope. Filling can raise the site above the bedrock. The deeper included soils are better sites. Providing extra reinforcement in the footings and foundations and backfilling with sandy material minimize the structural damage caused by shrinking and swelling.

The slope, the slow permeability, and the depth to bedrock limit the use of this soil as a site for septic tank absorption fields. The deeper, less steep included soils are better sites.

The slope and the high shrink-swell potential limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material helps to overcome the shrink-swell potential. The roads should be constructed on the contour or designed so that they conform to the natural slope of the land. Limestone bedrock encountered during construction requires blasting.

The capability subclass is VIIe.

11C—Chiswell-Groseclose complex, 7 to 15 percent slopes. These strongly sloping, well drained soils are on convex shoulders, summits, and side slopes in a limestone valley. They occur as areas so intermingled that mapping them separately is not practical. This map unit is about 45 percent shallow Chiswell soil, 25 percent very deep Groseclose soil, and 30 percent other soils. Areas are long and narrow and range from about 4 to 30 acres in size.

The typical sequence, depth, and composition of the layers in the Chiswell soil are as follows—

Surface layer:
0 to 4 inches, dark yellowish brown channery silt loam

Subsoil:
4 to 9 inches, light yellowish brown channery silt loam
9 to 13 inches, yellowish brown very channery silt loam

Bedrock:
13 inches, shale

The typical sequence, depth, and composition of the layers in the Groseclose soil are as follows—

Surface layer:
0 to 7 inches, dark yellowish brown gravelly silt loam

Subsoil:
7 to 13 inches, yellowish brown clay

13 to 26 inches, strong brown clay
26 to 37 inches, strong brown silty clay loam
37 to 50 inches, yellowish brown silty clay

Substratum:
50 to 65 inches, yellowish brown, light gray, and red silty clay loam

Included with these soils in mapping are the moderately deep, well drained Carbo, Chilhowie, and Litz soils; the very deep, well drained Timberville soils; and the very deep, moderately well drained Ernest soils. Carbo, Chilhowie, and Litz soils are on the same landscape as the Chiswell and Groseclose soils. Ernest and Timberville soils are in saddles and at the head of drainageways. Also included are some areas of limestone or shale outcrops.

Soil properties—

Permeability: Moderate in the Chiswell soil and slow in the Groseclose soil
Available water capacity: Very low in the Chiswell soil and moderate in the Groseclose soil
Depth to bedrock: 10 to 20 inches in the Chiswell soil and more than 60 inches in the Groseclose soil
Root zone: 10 to 20 inches in the Chiswell soil and more than 60 inches in the Groseclose soil
Shrink-swell potential: Low in the Chiswell soil and high in the Groseclose soil
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Fair; shale channers interfere with tillage.
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as pasture. Many areas are wooded.

This map unit is poorly suited to cultivated crops. The high potential for erosion is a management concern. Crop production is limited by the low natural fertility, the very low available water capacity, a high content of coarse fragments, and a shallow rooting depth in the Chiswell soil.

This map unit is poorly suited to pasture and hay. The Chiswell soil is droughty during the growing season. The very low available water capacity and shallow rooting depth in the Chiswell soil and the low natural fertility of both soils restrict the establishment of grasses and legumes. Applying lime and fertilizer, deferring grazing as needed, and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for northern red oak is moderately high. The estimated annual production of wood is 260 board feet per acre on the Chiswell soil and 305 board feet per acre on the Groseclose soil. Wooded areas of these soils are managed for Virginia pine, eastern white pine, and mixed hardwoods. The survival of seeds and seedlings is affected by droughtiness in the Chiswell soil during the growing season. Windthrow is a hazard on the Chiswell soil. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion.

The slope of both soils, the depth to bedrock in the Chiswell soil, and the shrink-swell potential in the Groseclose soil limit the use of this map unit as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. Ripping the bedrock or building above it and landscaping with fill material help to overcome the depth to bedrock. Backfilling with sandy material and providing extra reinforcement in foundations and footings help to prevent the damage caused by the shrinking and swelling of the Groseclose soil.

The slope of both soils, the depth to bedrock in the Chiswell soil, and the slow permeability in the Groseclose soil limit the use of this map unit as a site for septic tank absorption fields. Installing the field lines on the contour helps to overcome the slope. The less steep included soils are better sites.

The slope of both soils, the depth to bedrock in the Chiswell soils, and the shrink-swell potential, potential for frost action, and low strength in the Groseclose soil limit the use of this map unit as a site for local roads and streets. The roads should be built on the contour or designed so that they conform to the natural slope of the land. Planning grades so that rock removal is not needed and ripping the bedrock help to overcome the depth to bedrock. Providing suitable subgrade or base material helps to prevent the damage caused by frost action and by shrinking and swelling in the Groseclose soil.

The capability subclass is IVe.

11D—Chiswell-Groseclose complex, 15 to 30 percent slopes. These moderately steep, well drained soils are on upland side slopes and narrow summits and shoulders in a limestone valley. They occur as areas so intermingled that mapping them separately is not practical. This map unit is about 45 percent shallow Chiswell soil, 25 percent very deep Groseclose soil, and 30 percent other soils. Areas are long and narrow and range from about 4 to 50 acres in size.

The typical sequence, depth, and composition of the layers in the Chiswell soil are as follows—

Surface layer:
0 to 4 inches, dark yellowish brown channery silt loam

Subsoil:
4 to 9 inches, light yellowish brown channery silt loam
9 to 13 inches, yellowish brown very channery silt loam

Bedrock:
13 inches, shale

The typical sequence, depth, and composition of the layers in the Groseclose soil are as follows—

Surface layer:
0 to 7 inches, dark yellowish brown gravelly silt loam

Subsoil:
7 to 13 inches, yellowish brown clay
13 to 26 inches, strong brown clay
26 to 37 inches, strong brown silty clay loam
37 to 50 inches, yellowish brown silty clay

Substratum:
50 to 65 inches, yellowish brown, light gray, and red silty clay loam

Included with these soils in mapping are the moderately deep, well drained Carbo, Chilhowie, and Litz soils; the very deep, well drained Timberville soils; and the very deep, moderately well drained Ernest soils. Carbo, Chilhowie, and Litz soils are on the same landscape as the Chiswell and Groseclose soils. Ernest and Timberville soils are in saddles, on foot slopes, and along intermittent drainageways. Also included are some areas of limestone or shale outcrops.

Soil properties—

Permeability: Moderate in the Chiswell soil and slow in the Groseclose soil
Available water capacity: Very low in the Chiswell soil and moderate in the Groseclose soil
Depth to bedrock: 10 to 20 inches in the Chiswell soil and more than 60 inches in the Groseclose soil
Root zone: 10 to 20 inches in the Chiswell soil and more than 60 inches in the Groseclose soil
Shrink-swell potential: Low in the Chiswell soil and high in the Groseclose soil
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Fair; shale channers interfere with tillage.
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as pasture. Many areas are wooded.

This map unit is unsuited to cultivated crops. The high potential for erosion is a management concern. Crop production is limited by the low natural fertility, the very low available water capacity, a high content of coarse fragments, and a shallow rooting depth in the Chiswell soil.

This map unit is poorly suited to pasture and hay. The Chiswell soil is droughty during the growing season. The very low available water capacity and shallow rooting depth in the Chiswell soil and the low natural fertility of both soils restrict the establishment of grasses and legumes. Applying lime and fertilizer, deferring grazing as needed, and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for northern red oak is moderate on the Chiswell soil and moderately high on the Groseclose soil. The estimated annual production of wood on the Chiswell soil is 260 board feet per acre on north aspects and 220 board feet per acre on south aspects. The estimated annual production of wood on the Groseclose soil is 305 board feet per acre on north aspects and 290 board feet per acre on south aspects. Wooded areas of these soils are managed for Virginia pine, eastern white pine, and mixed hardwoods. The survival of seeds and seedlings is affected by droughtiness in the Chiswell soil during the growing season. Windthrow is a hazard on the Chiswell soil. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion. The slope hinders the safe operation of heavy harvesting equipment.

The slope of both soils, the depth to bedrock in the Chiswell soil, and the shrink-swell potential in the Groseclose soil limit the use of this map unit as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. Ripping the bedrock or building above it and landscaping with fill material help to overcome the depth to bedrock. Backfilling with sandy material and providing extra reinforcement in foundations and footings help to prevent the damage caused by the shrinking and swelling of the Groseclose soil.

The slope of both soils, the depth to bedrock in the Chiswell soil, and the slow permeability in the Groseclose soil limit the use of this map unit as a site for septic tank absorption fields. Installing the field lines on the contour helps to overcome the slope. The less steep included soils are better sites.

The slope of both soils and the depth to bedrock in the Chiswell soil limit the use of this map unit as a site for local roads and streets. The shrink-swell potential, the potential for frost action, and low strength are limitations in areas of the Groseclose soil. The roads should be built on the contour or designed so that they conform to the natural slope of the land. Planning grades so that rock removal is not needed and ripping the bedrock help to overcome the depth to bedrock. Providing suitable subgrade or base material helps to prevent the damage caused by frost action and by shrinking and swelling in the Groseclose soil.

The capability subclass is VIe.

11E—Chiswell-Groseclose complex, 30 to 60 percent slopes. These steep and very steep, well drained soils are on the sides of ridges in a limestone valley. They occur as areas so intermingled that mapping them separately is not practical. This map unit is about 45 percent shallow Chiswell soil, 25 percent very deep Groseclose soil, and 30 percent other soils. Areas are long and narrow and range from about 5 to 50 acres in size.

The typical sequence, depth, and composition of the layers in the Chiswell soil are as follows—

Surface layer:
0 to 4 inches, dark yellowish brown channery silt loam

Subsoil:
4 to 9 inches, light yellowish brown channery silt loam
9 to 13 inches, yellowish brown very channery silt loam

Bedrock:
13 inches, shale

The typical sequence, depth, and composition of the layers in the Groseclose soil are as follows—

Surface layer:
0 to 7 inches, dark yellowish brown gravelly silt loam

Subsoil:
7 to 13 inches, yellowish brown clay
13 to 26 inches, strong brown clay
26 to 37 inches, strong brown silty clay loam
37 to 50 inches, yellowish brown silty clay

Substratum:
50 to 65 inches, yellowish brown, light gray, and red silty clay loam

Included with these soils in mapping are the moderately deep, well drained Carbo, Chilhowie, and Litz soils; the very deep, well drained Timberville soils; and the very deep, moderately well drained Ernest soils. Carbo, Chilhowie, and Litz soils are on the same landscape as the Chiswell and Groseclose soils. Ernest and Timberville soils are in saddles, on foot slopes, and along intermittent drainageways. Also included are some areas of limestone or shale outcrops.

Soil properties—

Permeability: Moderate in the Chiswell soil and slow in the Groseclose soil
Available water capacity: Very low in the Chiswell soil and moderate in the Groseclose soil
Depth to bedrock: 10 to 20 inches in the Chiswell soil and more than 60 inches in the Groseclose soil
Root zone: 10 to 20 inches in the Chiswell soil and more than 60 inches in the Groseclose soil
Shrink-swell potential: Low in the Chiswell soil and high in the Groseclose soil
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Fair; shale channers interfere with tillage.
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as woodland. A few areas are used as pasture.

This map unit is unsuited to cultivated crops. The high potential for erosion is a management concern. Crop production is limited by the low natural fertility, the very low available water capacity, a high content of coarse fragments, and a shallow rooting depth in the Chiswell soil. The slope hinders the safe operation of farm machinery.

This map unit is poorly suited to pasture and hay. The Chiswell soil is droughty during the growing season. The very low available water capacity and shallow rooting depth in the Chiswell soil and the low natural fertility of both soils restrict the establishment of grasses and legumes. Applying lime and fertilizer, deferring grazing as needed, and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for northern red oak is moderate on the Chiswell soil and moderately high on the Groseclose soil. The estimated annual production of wood on the Chiswell soil is 260 board feet per acre on north aspects and 220 board feet per acre on south aspects. The estimated annual production of wood on the Groseclose soil is 305 board feet per acre on north

aspects and 290 board feet per acre on south aspects. Wooded areas of these soils are managed for Virginia pine, eastern white pine, and mixed hardwoods. The survival of seeds and seedlings is affected by droughtiness in the Chiswell soil during the growing season. Windthrow is a hazard on the Chiswell soil. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion. The slope hinders the safe operation of heavy harvesting equipment. As a result, a cable system or other alternatives are needed for harvesting.

The slope of both soils, the depth to bedrock in the Chiswell soil, and the shrink-swell potential in the Groseclose soil limit the use of this map unit as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. Ripping the bedrock or building above it and landscaping with fill material help to overcome the depth to bedrock. Backfilling with sandy material and providing extra reinforcement in foundations and footings help to prevent the damage caused by the shrinking and swelling of the Groseclose soil.

The slope of both soils, the depth to bedrock in the Chiswell soil, and the slow permeability in the Groseclose soil limit the use of this map unit as a site for septic tank absorption fields. Installing the field lines on the contour helps to overcome the slope. The less steep included soils are better sites.

The slope of both soils and the depth to bedrock in the Chiswell soil limit the use of this map unit as a site for local roads and streets. The shrink-swell potential, the potential for frost action, and low strength are limitations in areas of the Groseclose soil. The roads should be built on the contour or designed so that they conform to the natural slope of the land. Planning grades so that rock removal is not needed and ripping the bedrock help to overcome the depth to bedrock. Providing suitable subgrade or base material helps to prevent the damage caused by frost action and by shrinking and swelling in the Groseclose soil.

The capability subclass is VIIe.

12C—Dekalb channery fine sandy loam, 2 to 15 percent slopes, very stony. This gently sloping and strongly sloping soil is moderately deep and well drained. It is on narrow, convex shoulders, summits, and side slopes in the Blue Ridge and Appalachian Mountains. Stones more than 10 inches in diameter and about 5 to 30 feet apart cover 0.1 to 3.0 percent of the surface. Areas are long and winding and range from about 5 to 25 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 1 inch, very dark grayish brown channery fine sandy loam

Subsurface layer:
1 to 6 inches, yellowish brown channery fine sandy loam

Subsoil:
6 to 21 inches, brownish yellow very channery fine sandy loam
21 to 32 inches, yellowish brown very channery fine sandy loam

Substratum:
32 to 34 inches, yellowish brown extremely flaggy sandy loam

Bedrock:
34 inches, fractured sandstone

Included with this soil in mapping are the moderately deep, well drained to excessively drained Lehew soils; the moderately deep, well drained Lily soils; and the deep, well drained Bailegap soils. Bailegap, Lehew, and Lily soils are on the same landscape as the Dekalb soil. Also included are some areas of rock outcrop and soils that do not have stones on the surface. Included areas make up about 20 percent of this map unit.

Soil properties—

Permeability: Rapid
Available water capacity: Very low
Depth to bedrock: 20 to 40 inches
Root zone: 20 to 40 inches
Shrink-swell potential: Low
Organic matter content: Moderate
Natural fertility: Low
Surface runoff: Slow or medium
Erosion potential: Medium or high
Tilth: Restricted by the stones on the surface
Depth to the water table: More than 72 inches
Potential for frost action: Low

Nearly all areas are used as woodland.

This soil is unsuited to cultivated crops. Because of the stones on the surface, the use of machinery for seedbed preparation, cultivating, spraying, and harvesting is impractical.

This soil is poorly suited to pasture and hay. The stones on the surface, the very low available water capacity, acidity, and the low natural fertility restrict the establishment of grasses and legumes. Applying lime and fertilizer, deferring grazing as needed, and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for northern red oak is moderate. The estimated annual production of wood is 199 board feet per acre. Wooded areas of this soil are managed for mixed hardwoods and pine. The growth and survival of seeds and seedlings are limited by the very low available water capacity and the low natural fertility. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion.

The slope, large stones, and the depth to bedrock limit the use of this soil as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. Building above the bedrock and landscaping with fill material help to overcome the depth to bedrock and the large stones. The deeper included soils are better sites.

The depth to bedrock and the rapid permeability limit the use of this soil as a site for septic tank absorption fields. The rapid permeability results in a poor filtering capacity. The deeper soils are better sites.

The slope, large stones, and the depth to bedrock limit the use of this soil as a site for local roads and streets. Planning grades and routes so that rock removal is not needed and blasting help to overcome the depth to bedrock. The roads should be designed so that they conform to the natural slope of the land. Removal of the large stones during road construction is necessary before a suitable base is provided.

The capability subclass is VIIs.

12D—Dekalb channery fine sandy loam, 15 to 30 percent slopes, very stony. This moderately steep soil is moderately deep and well drained. It is on narrow, convex summits, shoulders, and side slopes in the Blue Ridge and Appalachian Mountains. Stones more than 10 inches in diameter and about 5 to 30 feet apart cover 0.1 to 3.0 percent of the surface. Areas are long and winding and range from about 10 to 75 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 1 inch, very dark grayish brown channery fine sandy loam

Subsurface layer:
1 to 6 inches, yellowish brown channery fine sandy loam

Subsoil:
6 to 21 inches, brownish yellow very channery fine sandy loam
21 to 32 inches, yellowish brown very channery fine sandy loam

Substratum:
32 to 34 inches, yellowish brown extremely flaggy sandy loam

Bedrock:
34 inches, fractured sandstone

Included with this soil in mapping are the moderately deep, well drained to excessively drained Lehew soils; the moderately deep, well drained Lily soils; the deep, well drained Bailegap soils; and the very deep, well drained Laidig soils. Bailegap, Lehew, and Lily soils are on the same landscape as the Dekalb soil. Laidig soils are in saddles, in depressions, and at the concave head of drainageways. Also included are some areas of rock outcrop and soils that do not have stones on the surface. Included areas make up about 20 percent of this map unit.

Soil properties—

Permeability: Rapid
Available water capacity: Very low
Depth to bedrock: 20 to 40 inches
Root zone: 20 to 40 inches
Shrink-swell potential: Low
Organic matter content: Moderate
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Restricted by the stones on the surface
Depth to the water table: More than 72 inches
Potential for frost action: Low

Nearly all areas are used as woodland.

This soil is unsuited to cultivated crops. Because of the stones on the surface, the use of machinery for seedbed preparation, cultivating, spraying, and harvesting is impractical.

This soil is poorly suited to pasture and hay. The stones on the surface, the very low available water capacity, acidity, and the low natural fertility restrict the establishment of grasses and legumes. Applying lime and fertilizer, deferring grazing as needed, and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for northern red oak is moderate. The estimated annual production of wood is 190 board feet per acre on north aspects and 177 board feet per acre on south aspects. Wooded areas of this soil are managed for mixed hardwoods and pine. The growth and survival of seeds and seedlings are limited by the very low available water capacity and the low natural fertility. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion. The slope hinders

the safe operation of heavy harvesting equipment.

The slope, large stones, and the depth to bedrock limit the use of this soil as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. Building above the bedrock and landscaping with fill material help to overcome the depth to bedrock and the large stones. The deeper included soils are better sites.

The slope, the depth to bedrock, and the rapid permeability limit the use of this soil as a site for septic tank absorption fields. The rapid permeability results in a poor filtering capacity. The deeper, less steep included soils are better sites.

The slope, large stones, and the depth to bedrock limit the use of this soil as a site for local roads and streets. Planning grades and routes so that rock removal is not needed and blasting help to overcome the depth to bedrock. The roads should be designed so that they conform to the natural slope of the land. Removal of the large stones during road construction is necessary before a suitable base is provided.

The capability subclass is VIIs.

12E—Dekalb channery fine sandy loam, 30 to 60 percent slopes, very stony. This steep soil is moderately deep and well drained. It is on the sides of ridges in the Blue Ridge and Appalachian Mountains. Stones more than 10 inches in diameter and about 5 to 30 feet apart cover 0.1 to 3.0 percent of the surface. Areas are long and winding and range from about 15 to 200 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 1 inch, very dark grayish brown channery fine sandy loam

Subsurface layer:
1 to 6 inches, yellowish brown channery fine sandy loam

Subsoil:
6 to 21 inches, brownish yellow very channery fine sandy loam
21 to 32 inches, yellowish brown very channery fine sandy loam

Substratum:
32 to 34 inches, yellowish brown extremely flaggy sandy loam

Bedrock:
34 inches, fractured sandstone

Included with this soil in mapping are the moderately deep, well drained to excessively drained Lehew soils; the moderately deep, well drained Lily soils; the deep, well drained Bailegap soils; and the very deep, well drained Laidig and Oriskany soils. Bailegap, Lehew, and Lily soils are on the same landscape as the Dekalb soil. Laidig and Oriskany soils are on foot slopes and toe slopes and along intermittent drainageways. Also included are some areas of rock outcrop and soils that do not have stones on the surface. Included areas make up about 20 percent of this map unit.

Soil properties—

Permeability: Rapid
Available water capacity: Very low
Depth to bedrock: 20 to 40 inches
Root zone: 20 to 40 inches
Shrink-swell potential: Low
Organic matter content: Moderate
Natural fertility: Low
Surface runoff: Rapid or very rapid
Erosion potential: High
Tilth: Restricted by the stones on the surface
Depth to the water table: More than 72 inches
Potential for frost action: Low

Nearly all areas are used as woodland.

This soil is unsuited to cultivated crops. Because of the stones on the surface, the use of machinery for seedbed preparation, cultivating, spraying, and harvesting is impractical.

This soil is poorly suited to pasture and hay. The stones on the surface, the slope, the very low available water capacity, acidity, and the low natural fertility restrict the establishment of grasses and legumes. Applying lime and fertilizer, deferring grazing as needed, and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for northern red oak is moderate. The estimated annual production of wood is 190 board feet per acre on north aspects and 177 board feet per acre on south aspects. Wooded areas of this soil are managed for mixed hardwoods and pine. The growth and survival of seeds and seedlings are limited by the very low available water capacity and the low natural fertility. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion. The slope hinders the safe operation of heavy timber equipment. As a result, a cable system or other alternatives are needed for harvesting.

The slope, large stones, and the depth to bedrock limit the use of this soil as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. Soils that are not so steep are better sites. Building above the bedrock and

landscaping with fill material help to overcome the depth to bedrock and the large stones. The deeper included soils are better sites.

The slope, the depth to bedrock, and the rapid permeability limit the use of this soil as a site for septic tank absorption fields. The rapid permeability results in a poor filtering capacity. The deeper, less steep included soils are better sites.

The slope, large stones, and the depth to bedrock limit the use of this soil as a site for local roads and streets. Planning grades and routes so that rock removal is not needed and blasting help to overcome the depth to bedrock. The roads should be designed so that they conform to the natural slope of the land. Removal of the large stones during road construction is necessary before a suitable base is provided.

The capability subclass is VIIe.

13E—Dekalb-Rock outcrop complex, 10 to 35 percent slopes. This map unit consists of a strongly sloping to steep, moderately deep, well drained Dekalb soil intermingled with outcrops of bedrock. It is on narrow, convex summits, shoulders, and side slopes in the Appalachian Mountains. Stones more than 10 inches in diameter and about 5 to 30 feet apart cover 0.1 to 3.0 percent of the surface. The Dekalb soil and Rock outcrop occur as areas so intermingled that mapping them separately is not practical. The unit is about 35 percent Rock outcrop, 40 percent Dekalb soil, and 25 percent other soils. Areas are long and winding and range from about 5 to 40 acres in size.

The typical sequence, depth, and composition of the layers in the Dekalb soil are as follows—

Surface layer:
0 to 1 inch, very dark grayish brown channery fine sandy loam

Subsurface layer:
1 to 6 inches, yellowish brown channery fine sandy loam

Subsoil:
6 to 21 inches, brownish yellow very channery fine sandy loam
21 to 32 inches, yellowish brown very channery fine sandy loam

Substratum:
32 to 34 inches, yellowish brown extremely flaggy sandy loam

Bedrock:
34 inches, fractured sandstone

Included in this map unit are the moderately deep, well drained to excessively drained Lehew soils; the moderately deep, well drained Lily soils; the deep, well drained Bailegap soils; and the very deep, well drained Laidig and Oriskany soils. Lehew and Lily soils are on the same landscape as the Dekalb soil. Bailegap soils are on the small, less steep side slopes. Laidig and Oriskany soils are on foot slopes and toe slopes along drainageways. Also included are some areas of extremely stony or bouldery soils and cliffs and escarpments.

Properties of the Dekalb soil—

Permeability: Rapid
Available water capacity: Very low
Depth to bedrock: 20 to 40 inches
Root zone: 20 to 40 inches
Shrink-swell potential: Low
Organic matter content: Moderate
Natural fertility: Low
Surface runoff: Rapid or very rapid
Erosion potential: High
Tilth: Restricted by the stones on the surface
Depth to the water table: More than 72 inches
Potential for frost action: Low

Nearly all areas are used as woodland.

This map unit is unsuited to cultivated crops. Because of the stones on the surface and the Rock outcrop, the use of machinery for seedbed preparation, cultivating, spraying, and harvesting is impractical.

This map unit is poorly to pasture and hay. The stones on the surface, the Rock outcrop, the very low available water capacity, acidity, and the low natural fertility restrict the establishment of grasses and legumes.

The potential productivity of the Dekalb soil for northern red oak is moderate. The estimated annual production of wood is 199 board feet per acre on north aspects and 177 board feet per acre on south aspects. The growth and survival of seeds and seedlings are limited by the very low available water capacity and the low natural fertility. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion. The Rock outcrop and the slope hinder the safe operation of heavy timber equipment.

The Rock outcrop, large stones, the slope, and the depth to bedrock limit the use of this map unit as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. Blasting or building above the bedrock and landscaping with fill material help to overcome the Rock outcrop, the depth to bedrock, and the large stones. The deeper included soils are better sites.

The Rock outcrop, the slope, the depth to bedrock, and the rapid permeability limit the use of this map unit

as a site for septic tank absorption fields. The rapid permeability results in a poor filtering capacity. The deeper, less steep included soils are better sites.

The Rock outcrop, the slope, large stones, and the depth to bedrock limit the use of this map unit as a site for local roads and streets. Planning grades and routes so that rock removal is not needed and blasting help to overcome the Rock outcrop and the depth to bedrock. The roads should be designed so that they conform to the natural slope of the land. Removal of the large stones during road construction is necessary before a suitable base is provided.

The capability subclass is VIIs.

13F—Dekalb-Rock outcrop complex, 35 to 80 percent slopes. This map unit consists of a very steep, moderately deep, well drained Dekalb soil intermingled with outcrops of bedrock. It is on the sides of ridges in the Appalachian Mountains. Stones more than 10 inches in diameter and about 5 to 30 feet apart cover 0.1 to 3.0 percent of the surface. The Dekalb soil and Rock outcrop occur as areas so intermingled that mapping them separately is not practical. The unit is about 35 percent Rock outcrop, 40 percent Dekalb soil, and 25 percent other soils. Areas are long and winding and range from about 15 to 300 acres in size.

The typical sequence, depth, and composition of the layers in the Dekalb soil are as follows—

Surface layer:
0 to 1 inch, very dark grayish brown channery fine sandy loam

Subsurface layer:
1 to 6 inches, yellowish brown channery fine sandy loam

Subsoil:
6 to 21 inches, brownish yellow very channery fine sandy loam
21 to 32 inches, yellowish brown very channery fine sandy loam

Substratum:
32 to 34 inches, yellowish brown extremely flaggy sandy loam

Bedrock:
34 inches, fractured sandstone

Included in this map unit are the moderately deep, well drained to excessively drained Lehew soils; the moderately deep, well drained Lily soils; the deep, well drained Bailegap soils; and the very deep, well drained Laidig and Oriskany soils. Lehew and Lily soils are on the same landscape as the Dekalb soil. Bailegap soils are on the small, less steep side slopes. Laidig and Oriskany soils are on foot slopes and toe slopes along drainageways. Also included are some areas of extremely stony or bouldery soils and cliffs and escarpments.

Properties of the Dekalb soil—

Permeability: Rapid
Available water capacity: Very low
Depth to bedrock: 20 to 40 inches
Root zone: 20 to 40 inches
Shrink-swell potential: Low
Organic matter content: Moderate
Natural fertility: Low
Surface runoff: Rapid or very rapid
Erosion potential: High
Tilth: Restricted by the stones on the surface
Depth to the water table: More than 72 inches
Potential for frost action: Low

Nearly all areas are used as woodland.

This map unit is unsuited to cultivated crops. Because of the stones on the surface and the Rock outcrop, the use of machinery for seedbed preparation, cultivating, spraying, and harvesting is impractical.

This map unit is poorly to pasture and hay. The stones on the surface, the Rock outcrop, the very low available water capacity, acidity, and the low natural fertility restrict the establishment of grasses and legumes.

The potential productivity of the Dekalb soil for northern red oak is moderate. The estimated annual production of wood is 199 board feet per acre on north aspects and 177 board feet per acre on south aspects. The growth and survival of seeds and seedlings are limited by the very low available water capacity and the low natural fertility. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion. The Rock outcrop and the slope hinder the safe operation of heavy timber equipment. As a result, a cable system or other alternatives are needed for harvesting.

The slope, the Rock outcrop, and the depth to bedrock limit the use of this map unit as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. Blasting or building above the bedrock and landscaping with fill material help to overcome the Rock outcrop and the depth to bedrock. The deeper, less steep included soils are better sites.

The slope, the Rock outcrop, the depth to bedrock, and the rapid permeability limit the use of this map unit as a site for septic tank absorption fields. The rapid permeability results in a poor filtering capacity. The deeper, less steep included soils are better sites.

The slope, the Rock outcrop, and the depth to

bedrock limit the use of this map unit as a site for local roads and streets. Planning grades and routes so that rock removal is not needed and blasting help to overcome the Rock outcrop and the depth to bedrock. The roads should be designed so that they conform to the natural slope of the land.

The capability subclass is VIIs.

14A—Derroc cobbly loam, 0 to 4 percent slopes, occasionally flooded. This soil is very deep, nearly level, and well drained. It is on flood plains along streams and rivers. Areas are long and winding and range from about 4 to 50 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 7 inches, dark yellowish brown cobbly loam

Subsoil:
7 to 21 inches, yellowish brown very cobbly sandy loam

Substratum:
21 to 65 inches, dark yellowish brown extremely cobbly sandy loam

Included with this soil in mapping are the very deep Alonzville, Gladehill, and Wolfgap soils and the very deep, moderately well drained Irongate soils. Alonzville soils are on low terraces adjacent to streams and flood plains. Gladehill, Irongate, and Wolfgap soils are on the same landscape as the Derroc soil. Also included are soils that have a very cobbly or stony surface layer. Included soils make up about 15 percent of this map unit.

Soil properties—

Permeability: Moderately rapid or rapid in the subsoil and rapid or very rapid in the substratum
Available water capacity: Low
Depth to bedrock: More than 60 inches
Root zone: More than 60 inches
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Medium
Surface runoff: Slow
Erosion potential: Low
Tilth: Good, but cobbles interfere with tillage.
Depth to the water table: More than 72 inches
Potential for frost action: Moderate
Flooding: Occasional, from December through March

Most areas are used as pasture or hayland. Some small areas are used for woodland or cultivated crops.

This soil is moderately well suited to cultivated crops. Flooding occasionally damages crops and limits the use of machinery. The cobbles in the surface layer damage tillage equipment and interfere with planting. Conservation tillage conserves moisture and helps to control erosion.

This soil is moderately well suited to pasture. Establishing and maintaining a mixture of grasses and legumes, deferring grazing as needed, controlling weeds, using proper stocking rates, and applying fertilizer increase the productivity and carrying capacity of the pasture.

The potential productivity for eastern white pine is extremely high. The estimated annual production of wood is 919 board feet per acre. Wooded areas of this soil are managed for eastern white pine and mixed hardwoods. Seeds and seedlings survive and grow well if competing vegetation is controlled.

The occasional flooding and large stones limit the use of this soil as a site for dwellings. An alternative site should be selected.

The flooding, the moderately rapid or rapid permeability, and large stones limit the use of this soil as a site for septic tank absorption fields. The moderately rapid or rapid permeability results in a poor filtering capacity. An alternative site should be selected.

The flooding and large stones limit the use of this soil as a site for local roads and streets. Raising the surface by land shaping reduces the hazard of flooding. Removal of the large stones during road construction is necessary before a suitable base is provided.

The capability subclass is IIIs.

15A—Derroc very cobbly loam, 0 to 4 percent slopes, frequently flooded. This soil is very deep, nearly level, and well drained. It is on flood plains along streams and the James River. Areas are long and winding and range from about 4 to 35 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 7 inches, dark yellowish brown very cobbly loam

Subsoil:
7 to 21 inches, yellowish brown very cobbly sandy loam

Substratum:
21 to 65 inches, dark yellowish brown extremely cobbly sandy loam

Included with this soil in mapping are the very deep, well drained Gladehill and Wolfgap soils and the very deep, moderately well drained Irongate soils. Gladehill, Irongate, and Wolfgap soils are on the same landscape

as the Derroc soil. Also included are areas of soils that have a very stony surface layer. Included soils make up about 25 percent of this map unit.

Soil properties—

Permeability: Moderately rapid or rapid in the subsoil and rapid or very rapid in the substratum
Available water capacity: Low
Depth to bedrock: More than 60 inches
Root zone: More than 60 inches
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Medium
Surface runoff: Slow
Erosion potential: Low
Tilth: Good, but cobbles interfere with tillage.
Depth to the water table: More than 72 inches
Potential for frost action: Moderate
Flooding: Frequent, from December through March

Most areas are used as woodland. Some small areas are used as pasture or hayland.

This soil is poorly suited to cultivated crops. Flooding frequently damages crops and limits the use of machinery. The cobbles in the surface layer hinder tillage, damage tillage equipment, and interfere with planting. In cultivated areas conservation tillage conserves moisture and helps to control erosion.

This soil is moderately well suited to pasture. Establishing and maintaining a mixture of grasses and legumes, deferring grazing as needed, controlling weeds, using proper stocking rates, and applying fertilizer increase the productivity and carrying capacity of the pasture.

The potential productivity for eastern white pine is extremely high. The estimated annual production of wood is 919 board feet per acre. Wooded areas of this soil are managed for eastern white pine and mixed hardwoods. Seeds and seedlings survive and grow fairly well if competing vegetation is controlled.

The frequent flooding and large stones limit the use of this soil as a site for dwellings and for local roads and streets. An alternative site should be selected.

The frequent flooding, the moderately rapid or rapid permeability, and large stones limit the use of this soil as a site for septic tank absorption fields. The moderately rapid or rapid permeability results in a poor filtering capacity. An alternative site should be selected.

The capability subclass is IVs.

16C—Edneytown loam, 2 to 15 percent slopes, very stony. This gently sloping and strongly sloping soil is very deep and well drained. It is on the narrow to broad, convex tops of ridges on the Blue Ridge. Areas are oval or rectangular and range from about 4 to 20 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 7 inches, dark brown loam

Subsoil:
7 to 29 inches, strong brown clay loam
29 to 37 inches, strong brown sandy clay loam

Substratum:
37 to 62 inches, variegated brownish yellow, white, and black sandy loam

Included with this soil in mapping are the moderately deep, somewhat excessively drained Peaks soils and the very deep, well drained Hayesville and Thurmont soils. Peaks and Hayesville soils are on the same landscape as the Edneytown soil. Thurmont soils are in saddles and depressions and at the concave head of drainageways. Also included are some areas of rock outcrop and soils that do not have stones on the surface. Included areas make up about 15 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: 40 to 60 inches
Shrink-swell potential: Low
Organic matter content: Moderate
Natural fertility: Low
Surface runoff: Medium or rapid
Erosion potential: Medium
Tilth: Restricted by the stones on the surface
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as woodland. A few areas have been cleared of trees and are used as pasture.

This soil is unsuited to cultivated crops. Because of the stones on the surface, the use of machinery for seedbed preparation, cultivating, spraying, and harvesting is impractical.

This soil is moderately well suited to pasture and hay. The stones limit the use of machinery. Applying lime and fertilizer, deferring grazing as needed, and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for eastern white pine is very high. The estimated annual production of wood is 797 board feet per acre. Wooded areas of this soil are

managed for eastern white pine, yellow-poplar, and mixed hardwoods. Seeds and seedlings survive and grow well if competing vegetation is controlled. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion.

The slope limits the use of this soil as a site for dwellings. Land shaping and grading and designing the dwelling so that it conforms to the natural slope of the land help to overcome this limitation.

The slope limits the use of this soil as a site for septic tank absorption fields. Installing the field lines at the correct grade and on the contour helps to overcome this limitation.

The slope and the potential for frost action limit the use of this soil as a site for local roads and streets. The roads should be constructed on the contour or designed so that they conform to the natural slope of the land. Providing suitable subgrade or base material minimizes the damage caused by frost action.

The capability subclass is VIIs.

16D—Edneytown loam, 15 to 30 percent slopes, very stony. This moderately steep soil is very deep and well drained. It is on narrow to broad, convex summits, shoulders, and side slopes on the Blue Ridge. Areas are oval or rectangular and range from about 4 to 45 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 7 inches, dark brown loam

Subsoil:
7 to 29 inches, strong brown clay loam
29 to 37 inches, strong brown sandy clay loam

Substratum:
37 to 62 inches, variegated brownish yellow, white, and black sandy loam

Included with this soil in mapping are the moderately deep, somewhat excessively drained Peaks soils and the very deep, well drained Hayesville and Thurmont soils. Peaks and Hayesville soils are on the same landscape as the Edneytown soil. Thurmont soils are in saddles and depressions and at the concave head of drainageways. Also included are some areas of rock outcrop and soils that do not have stones on the surface. Included areas make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: 40 to 60 inches
Shrink-swell potential: Low
Organic matter content: Moderate
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Restricted by the stones on the surface
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as woodland. A few areas have been cleared of trees and are used as pasture.

This soil is unsuited to cultivated crops. Because of the stones on the surface, the use of machinery for seedbed preparation, cultivating, spraying, and harvesting is impractical.

This soil is moderately well suited to pasture and hay. The stones and the slope limit the use of machinery. Applying lime and fertilizer, deferring grazing as needed, and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for eastern white pine is very high. The estimated annual production of wood is 797 board feet per acre on north aspects and 705 board feet per acre on south aspects. Wooded areas of this soil are managed for eastern white pine, yellow-poplar, and mixed hardwoods. Seeds and seedlings survive and grow well if competing vegetation is controlled. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion. The slope hinders the safe operation of heavy harvesting equipment.

The slope limits the use of this soil as a site for dwellings. Land shaping and grading and designing the dwelling so that it conforms to the natural slope of the land help to overcome this limitation.

The slope limits the use of this soil as a site for septic tank absorption fields. Installing the field lines at the correct grade and on the contour helps to overcome this limitation. The less sloping included soils are better sites.

The slope and the potential for frost action limit the use of this soil as a site for local roads and streets. The roads should be constructed on the contour or designed so that they conform to the natural slope of the land. Providing suitable subgrade or base material minimizes the damage caused by frost action.

The capability subclass is VIIs.

16E—Edneytown loam, 30 to 60 percent slopes, very stony. This steep and steep soil is very deep and well drained. It is on the sides of ridges on the Blue Ridge. Areas are long and winding and range from about 10 to 150 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 7 inches, dark brown loam

Subsoil:
7 to 29 inches, strong brown clay loam
29 to 37 inches, strong brown sandy clay loam

Substratum:
37 to 62 inches, variegated brownish yellow, white, and black sandy loam

Included with this soil in mapping are the moderately deep, somewhat excessively drained Peaks soils and the very deep, well drained Hayesville and Thurmont soils. Peaks and Hayesville soils are on the same landscape as the Edneytown soil. Thurmont soils are on foot slopes and along drainageways. Also included are some areas of rock outcrop and soils that do not have stones on the surface. Included areas make up about 25 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: 40 to 60 inches
Shrink-swell potential: Low
Organic matter content: Moderate
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Restricted by the stones on the surface
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as woodland. A few areas have been cleared of trees and are used as pasture.

This soil is unsuited to cultivated crops. Because of the stones on the surface, the use of machinery for seedbed preparation, cultivating, spraying, and harvesting is impractical.

This soil is poorly suited to pasture and hay. The stones and the slope limit the use of machinery. Applying lime and fertilizer, deferring grazing as needed, and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for eastern white pine is very high. The estimated annual production of wood is 797 board feet per acre on north aspects and 705 board feet per acre on south aspects. Wooded areas of this soil are managed for eastern white pine, yellow-poplar, and mixed hardwoods. Seeds and seedlings survive and grow well if competing vegetation is controlled. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion. The slope hinders the safe operation of heavy equipment. As a result, a cable system or other alternatives are needed for harvesting.

The slope limits the use of this soil as a site for dwellings. Land shaping and grading help to overcome this limitation. The dwelling should be designed so that it conforms to the natural slope of the land. The less sloping included soils are better sites.

The slope limits the use of this soil as a site for septic tank absorption fields. Installing the field lines at the correct grade and on the contour helps to overcome this limitation. The less sloping included soils are better sites.

The slope and the potential for frost action limit the use of this soil as a site for local roads and streets. The roads should be constructed on the contour or designed so that they conform to the natural slope of the land. Providing suitable subgrade or base material minimizes the damage caused by frost action.

The capability subclass is VIIe.

17B—Ernest silt loam, 0 to 7 percent slopes. This very deep, nearly level and gently sloping, moderately well drained soil is on narrow to broad, concave foot slopes and colluvial fans. It has a fragipan. Shallow, intermittent drainageways commonly extend across this soil from the steeper slopes on the higher parts of the landscape. Areas are irregularly shaped. They range from 4 to 25 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 11 inches, dark yellowish brown silt loam

Subsoil:
11 to 20 inches, strong brown silty clay loam
20 to 27 inches, strong brown silty clay loam that has light gray and reddish yellow mottles
27 to 35 inches, yellowish brown silty clay loam that has light gray and reddish yellow mottles
35 to 43 inches, yellowish brown very channery silty clay loam that has light gray and reddish yellow mottles
43 to 65 inches, light brownish gray silty clay loam that has strong brown and yellowish brown mottles

Included with this soil in mapping are the very deep, well drained to excessively drained Rushtown and very deep, well drained Shelocta soils. These soils are on the same landscape as the Ernest soil. Also included are areas of soils that have a cobbly surface layer and

areas of wet soils. Included soils make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderate above the fragipan and slow or moderately slow in the fragipan
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: Restricted by the fragipan at a depth of 20 to 36 inches
Shrink-swell potential: Moderate
Organic matter content: Moderate
Natural fertility: Low
Surface runoff: Medium
Erosion potential: Medium
Tilth: Fair
Water table: Perched at a depth of 18 to 36 inches from December through April
Potential for frost action: Moderate

Most areas are used as pasture or hayland. A few areas are wooded or are used for cultivated crops.

This soil is moderately well suited to cultivated crops. It is soft when wet. As a result, the use of heavy equipment is restricted to dry periods. Alfalfa commonly is short lived because of seasonal wetness and restricted root growth. The soil is droughty during the growing season. The medium potential for erosion is a management concern. Other management concerns are the need to increase the content of organic matter and the need for lime and fertilizer to offset the acidity and low natural fertility of the soil. In cultivated areas conservation tillage, cover crops, and a crop rotation that includes grasses and legumes can help to control runoff and erosion. Crop residue should be kept on the surface or incorporated into the plow layer.

This soil is moderately well suited to pasture. The fragipan and the seasonal high water table restrict the root growth of some legumes. Establishing and maintaining a mixture of grasses and legumes and preventing overgrazing are the major management concerns. Proper stocking rates, rotational grazing, timely deferment of grazing, and applications of lime and fertilizer can help to maintain the pasture. If the pasture is overgrazed, the runoff rate increases and erosion is excessive. Grazing during wet periods often cuts up the sod and compacts the surface layer and thereby reduces yields and increases the hazard of erosion.

The potential productivity for northern red oak is moderately high. The estimated annual production of wood is 288 board feet per acre. Wooded areas of this soil are managed for eastern white pine and mixed hardwoods. The rooting depth is restricted by the fragipan. Some trees are uprooted during windy periods. Thinning that does not leave the remaining trees widely spaced helps to prevent uprooting. Seeds and seedlings survive and grow well if competing vegetation is controlled.

The seasonal high water table and the shrink-swell potential limit the use of this soil as a site for dwellings. Installing drains by the footings, shaping the land so that surface water and runoff are directed away from the dwelling, and building the dwelling in one of the higher areas in the unit help to overcome the seasonal wetness. The well drained included soils are better sites. Backfilling with sandy material and providing extra reinforcement in footings and foundations help to prevent the damage caused by shrinking and swelling.

The seasonal wetness and the moderately slow or slow permeability in the fragipan limit the use of this soil as a site for septic tank absorption fields. The well drained included soils are better sites.

Low strength limits the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material and otherwise improving the traffic-supporting capacity of the roads help to overcome this limitation.

The capability subclass is IIe.

17C—Ernest silt loam, 7 to 15 percent slopes. This very deep, strongly sloping, moderately well drained soil is on narrow to broad, concave foot slopes and colluvial fans. It has a fragipan. Shallow, intermittent drainageways commonly extend across this soil from the steeper slopes on the higher parts of the landscape. Areas are irregularly shaped. They range from 4 to 40 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 11 inches, dark yellowish brown silt loam

Subsoil:
11 to 20 inches, strong brown silty clay loam
20 to 27 inches, strong brown silty clay loam that has light gray and reddish yellow mottles
27 to 35 inches, yellowish brown silty clay loam that has light gray and reddish yellow mottles
35 to 43 inches, yellowish brown very channery silty clay loam that has light gray and reddish yellow mottles
43 to 65 inches, light brownish gray silty clay loam that has strong brown and yellowish brown mottles

Included with this soil in mapping are the moderately deep, well drained Berks soils; the very deep, well drained to excessively drained Rushtown soils; the very

deep, well drained Shelocta soils; and the shallow, somewhat excessively drained Weikert soils. Berks and Weikert soils are on the adjacent upland side slopes. Rushtown and Shelocta soils are on the same landscape as the Ernest soil. Also included are areas of soils that have a cobbly surface layer and areas of wet soils. Included soils make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderate above the fragipan and slow or moderately slow in the fragipan
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: Restricted by the fragipan at a depth of 20 to 36 inches
Shrink-swell potential: Moderate
Organic matter content: Moderate
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Fair
Water table: Perched at a depth of 18 to 36 inches from December through April
Potential for frost action: Moderate

Most areas are used as pasture or hayland. A few areas are wooded.

This soil is moderately well suited to cultivated crops. It is soft when wet. As a result, the use of heavy equipment is restricted to dry periods. Alfalfa commonly is short lived because of seasonal wetness and restricted root growth. The soil is droughty during the growing season. The high potential for erosion is a major management concern. Other management concerns are the need to increase the content of organic matter and the need for lime and fertilizer to offset the acidity and low natural fertility of the soil. In cultivated areas conservation tillage, cover crops, and a crop rotation that includes grasses and legumes can help to control runoff and erosion. Crop residue should be kept on the surface or incorporated into the plow layer.

This soil is moderately well suited to pasture. The fragipan and the seasonal high water table restrict the root growth of some legumes. Establishing and maintaining a mixture of grasses and legumes and preventing overgrazing are the major management concerns. Proper stocking rates, rotational grazing, timely deferment of grazing, and applications of lime and fertilizer can help to maintain the pasture. If the pasture is overgrazed, the runoff rate increases and erosion is excessive. Grazing during wet periods often cuts up the sod and compacts the surface layer and thereby reduces yields and increases the hazard of erosion.

The potential productivity for northern red oak is moderately high. The estimated annual production of wood is 288 board feet per acre. Wooded areas of this soil are managed for eastern white pine and mixed hardwoods. The rooting depth is restricted by the fragipan. Some trees are uprooted during windy periods. Thinning that does not leave the remaining trees widely spaced helps to prevent uprooting. Seeds and seedlings survive and grow well if competing vegetation is controlled.

The seasonal high water table and the shrink-swell potential limit the use of this soil as a site for dwellings. Installing drains by the footings, shaping the land so that surface water and runoff are directed away from the dwelling, and building the dwelling in one of the higher areas in the unit help to overcome the seasonal wetness. The well drained included soils are better sites. Backfilling with sandy material and providing extra reinforcement in footings and foundations help to prevent the damage caused by shrinking and swelling.

The seasonal wetness and the moderately slow or slow permeability in the fragipan limit the use of this soil as a site for septic tank absorption fields. The well drained included soils are better sites.

Low strength limits the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material and otherwise improving the traffic-supporting capacity of the roads help to overcome this limitation.

The capability subclass is IIIe.

18C—Ernest cobbly loam, 0 to 15 percent slopes, very stony. This very deep, nearly level to strongly sloping, moderately well drained soil is on the narrow to broad, concave foot slopes of mountains and along intermittent drainageways. It has a fragipan. Stones more than 10 inches in diameter and about 5 to 30 feet apart cover 0.1 to 3.0 percent of the surface. Areas are irregularly shaped. They range from 4 to 30 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 11 inches, dark yellowish brown cobbly loam

Subsoil:
11 to 20 inches, strong brown silty clay loam
20 to 27 inches, strong brown silty clay loam that has light gray and reddish yellow mottles
27 to 35 inches, yellowish brown silty clay loam that has light gray and reddish yellow mottles

35 to 43 inches, yellowish brown very channery silty clay loam that has light gray and reddish yellow mottles
43 to 65 inches, light brownish gray silty clay loam that has strong brown and yellowish brown mottles

Included with this soil in mapping are the very deep, well drained Laidig and Oriskany soils. These soils are in the same landscape position as the Ernest soil. Also included are soils that have an extremely stony surface and wet soils. Included soils make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderate above the fragipan and slow or moderately slow in the fragipan
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: Restricted by the fragipan at a depth of 20 to 36 inches
Shrink-swell potential: Moderate
Organic matter content: Moderate
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: Medium
Tilth: Fair
Water table: Perched at a depth of 18 to 36 inches from December through April
Potential for frost action: Moderate

Most areas are used as woodland. A few areas are used as pasture.

This soil is unsuited to cultivated crops. Because of the stones on the surface, the use of machinery for seedbed preparation, cultivating, spraying, and harvesting is impractical.

This soil is moderately well suited to pasture. The stones limit the use of machinery. The fragipan and the seasonal high water table restrict the root growth of some legumes. Establishing and maintaining a mixture of grasses and legumes and preventing overgrazing are the major management concerns. Timely deferment of grazing and applications of lime and fertilizer to offset the acidity and low natural fertility of the soil can help to maintain the pasture. If the pasture is overgrazed, the runoff rate increases and erosion is excessive. Grazing during wet periods often cuts up the sod and compacts the surface layer and thereby reduces yields and increases the hazard of erosion.

The potential productivity for northern red oak is moderately high. The estimated annual production of wood is 288 board feet per acre. Wooded areas of this soil are managed for eastern white pine and mixed hardwoods. The rooting depth is restricted by the fragipan. Some trees are uprooted during windy periods. Thinning that does not leave the remaining trees widely spaced helps to prevent uprooting. Seeds and seedlings survive and grow well if competing vegetation is controlled.

The seasonal high water table, the slope, and the shrink-swell potential limit the use of this soil as a site for dwellings. Installing drains by the footings, shaping the land so that surface water and runoff are directed away from the dwelling, and building the dwelling in one of the higher areas in the unit help to overcome the seasonal wetness. The well drained included soils are better sites. Backfilling with sandy material and providing extra reinforcement in footings and foundations help to prevent the damage caused by shrinking and swelling.

The seasonal wetness and the moderately slow or slow permeability in the fragipan limit the use of this soil as a site for septic tank absorption fields. The well drained included soils are better sites.

Low strength limits the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material and otherwise improving the traffic-supporting capacity of the roads help to overcome this limitation.

The capability subclass is VIs.

19B—Flatwoods silt loam, 2 to 7 percent slopes. This gently sloping soil is moderately deep and moderately well drained. It is on narrow shoulders and summits in the uplands. Areas commonly are irregularly shaped. They range from 4 to 50 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 2 inches, brown silt loam

Subsurface layer:
2 to 6 inches, brownish yellow silt loam

Subsoil:
6 to 13 inches, yellowish brown clay
13 to 17 inches, yellowish brown clay that has yellowish red and pale brown mottles
17 to 24 inches, mottled yellowish brown, strong brown, and light brownish gray clay
24 to 32 inches, mottled yellowish brown and gray clay

Bedrock:
32 inches, shale

Included with this soil in mapping are the moderately deep, well drained Berks soils; the very deep, moderately well drained Moomaw soils; and the

shallow, well drained Weikert soils. Berks and Weikert soils are on the same landscape as the Flatwoods soil. Moomaw soils are on the adjacent stream terraces. Also included are some areas of soils that have a gravelly surface layer, soils more than 40 inches deep, and severely eroded soils that have a surface layer of silty clay loam. Included soils make up about 15 percent of this map unit.

Soil properties—

Permeability: Moderately slow
Available water capacity: Low
Depth to bedrock: 20 to 40 inches
Root zone: 20 to 40 inches
Shrink-swell potential: Moderate
Organic matter content: Moderate
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: Medium
Tilth: Fair
Water table: Perched at a depth of 18 to 36 inches in winter and early spring
Potential for frost action: Moderate

Most areas are used for pasture or hay. Some areas are used for cultivated crops or woodland.

This soil is moderately well suited to cultivated crops. The medium potential for erosion is a management concern. Alfalfa commonly is short lived because of seasonal wetness. The soil can be easily tilled when moist, but the seasonal high water table sometimes delays tillage and planting. In cultivated areas the surface layer often has a thin crust after heavy rains. The soil is droughty during dry periods. Conservation tillage and a crop rotation that includes grasses and legumes help to control runoff and erosion, minimize crusting, and conserve moisture.

This soil is moderately well suited to hay and pasture. Grazing during wet periods often cuts up the sod and compacts the surface layer. Overgrazing reduces the quantity and quality of forage and increases the runoff rate and the hazard of erosion. Deferring grazing as needed and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for Virginia pine is high. The estimated annual production of wood is 581 board feet per acre. Wooded areas of this soil are managed for hardwoods and pine. During wet periods the soil is soft and cannot support heavy timber equipment.

The seasonal high water table and the moderate shrink-swell potential limit the use of this soil as a site for dwellings. Installing drains by the footings helps to overcome the seasonal wetness in areas used as sites for dwellings without basements. Providing extra reinforcement in the footings helps to prevent the damage caused by shrinking and swelling. Because of the seasonal high water table, dwellings with basements should not be built on this soil. Better suited soils should be selected.

The moderately slow permeability, the seasonal high water table, and the depth to bedrock limit the use of this soil as a site for septic tank absorption fields. Better suited soils should be selected.

Low strength limits the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material helps to overcome this limitation.

The capability subclass is IIIe.

19C—Flatwoods silt loam, 7 to 15 percent slopes. This strongly sloping soil is moderately deep and moderately well drained. It is on narrow shoulders, summits, and side slopes in the uplands. Areas commonly are irregularly shaped. They range from 4 to 50 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 2 inches, brown silt loam

Subsurface layer:
2 to 6 inches, brownish yellow silt loam

Subsoil:
6 to 13 inches, yellowish brown clay
13 to 17 inches, yellowish brown clay that has yellowish red and pale brown mottles
17 to 24 inches, mottled yellowish brown, strong brown, and light brownish gray clay
24 to 32 inches, mottled yellowish brown and gray clay

Bedrock:
32 inches, shale

Included with this soil in mapping are the moderately deep, well drained Berks and shallow, well drained Weikert soils. These soils are on the same landscape as the Flatwoods soil. Also included are some areas of soils that have a gravelly surface layer, soils more than 40 inches deep, and severely eroded soils that have a surface layer of silty clay loam. Included soils make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderately slow
Available water capacity: Low
Depth to bedrock: 20 to 40 inches
Root zone: 20 to 40 inches
Shrink-swell potential: Moderate

Organic matter content: Moderate
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Fair
Water table: Perched at a depth of 18 to 36 inches in winter and early spring
Potential for frost action: Moderate

Most areas are used for pasture or hay. Some areas are used for cultivated crops or woodland.

This soil is poorly suited to cultivated crops. The high potential for erosion is a management concern. Alfalfa commonly is short lived because of seasonal wetness. The soil can be easily tilled when moist, but the seasonal high water table sometimes delays tillage and planting. In cultivated areas the surface layer often has a thin crust after heavy rains. The soil is droughty during dry periods. Conservation tillage and a crop rotation that includes grasses and legumes help to control runoff and erosion, minimize crusting, and conserve moisture.

This soil is moderately well suited to hay and pasture. Grazing during wet periods often cuts up the sod and compacts the surface layer. Overgrazing reduces the quantity and quality of forage and increases the runoff rate and the hazard of erosion. Deferring grazing as needed and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for Virginia pine is high. The estimated annual production of wood is 581 board feet per acre. Wooded areas of this soil are managed for hardwoods and pine. During wet periods the soil is soft and cannot support heavy timber equipment.

The seasonal high water table, the slope, and the moderate shrink-swell potential limit the use of this soil as a site for dwellings. Installing drains by the footings helps to overcome the seasonal wetness in areas used as sites for dwellings without basements. The dwelling should be designed so that it conforms to the natural slope of the land. Land shaping may be needed. Providing extra reinforcement in the footings helps to prevent the damage caused by shrinking and swelling. Because of the seasonal high water table, dwellings with basements should not be built on this soil. Better suited soils should be selected.

The moderately slow permeability, the seasonal high water table, and the depth to bedrock limit the use of this soil as a site for septic tank absorption fields. Better suited soils should be selected.

Low strength limits the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material helps to overcome this limitation.

The capability subclass is IVe.

20B—Frederick loam, 2 to 7 percent slopes. This very deep, gently sloping, well drained soil is on the narrow to broad, convex summits and shoulders of ridges in a limestone valley. Areas range from 4 to 25 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 11 inches, dark yellowish brown loam

Subsoil:
11 to 29 inches, yellowish brown clay loam
29 to 55 inches, yellowish red clay that has reddish yellow mottles
55 to 65 inches, yellowish red clay that has red and reddish yellow mottles

Included with this soil in mapping are the very deep, well drained Groseclose and Timberville soils. Groseclose soils are on the same landscape as the Frederick soil. Timberville soils are in depressions and along intermittent drainageways. Also included are some areas of soils that are less than 60 inches deep over bedrock, soils that have a surface layer of gravelly loam, sinkholes, and rock outcrops. Included areas make up about 10 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Moderate
Depth to bedrock: More than 72 inches
Root zone: More than 60 inches
Shrink-swell potential: High
Organic matter content: Low
Natural fertility: Low
Surface runoff: Medium
Erosion potential: Medium
Tilth: Good
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used for cultivated crops or pasture. A few areas are wooded. This soil is classified as prime farmland.

This soil is well suited to cultivated crops. The medium potential for erosion is a management concern. In cultivated areas conservation tillage, cover crops, and a crop rotation that includes grasses and legumes can help to control runoff and erosion. Crop residue should be kept on the surface or incorporated into the plow layer.

This soil is well suited to hay and pasture.

Establishing and maintaining a mixture of grasses and legumes and preventing overgrazing are the major management concerns. Proper stocking rates, timely deferment of grazing, and applications of lime and fertilizer increase the production of feed and forage and help to control erosion. If the pasture is overgrazed, the runoff rate increases and erosion is excessive.

The potential productivity for northern red oak is moderately high. The estimated annual production of wood is 284 board feet per acre. Wooded areas of this soil are managed for mixed hardwoods, eastern white pine, and Virginia pine. Seeds and seedlings survive and grow well if competing vegetation is controlled. When wet, the soil is soft and cannot support heavy harvesting equipment.

The shrink-swell potential limits the use of this soil as a site for dwellings. Backfilling with sandy material and providing extra reinforcement in foundations and footings help to prevent the damage caused by shrinking and swelling.

The moderate permeability limits the use of this soil as a site for septic tank absorption fields. Excavating deeper and longer field lines increases the absorption area and thus helps to overcome the moderate permeability.

Low strength and the shrink-swell potential limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material and otherwise improving the traffic-supporting capacity of the roads help to overcome these limitations.

The capability subclass is IIe.

20C—Frederick loam, 7 to 15 percent slopes. This very deep, strongly sloping, well drained soil is on narrow, convex summits, shoulders, and side slopes in a limestone valley. Areas range from 5 to 80 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 11 inches, dark yellowish brown loam

Subsoil:
11 to 29 inches, yellowish brown clay loam
29 to 55 inches, yellowish red clay that has reddish yellow mottles
55 to 65 inches, yellowish red clay that has red and reddish yellow mottles

Included with this soil in mapping are the very deep, well drained Groseclose and Timberville soils. Groseclose soils are on the same landscape as the Frederick soil. Timberville soils are in depressions and along intermittent drainageways. Also included are some areas of soils that are less than 60 inches deep over bedrock, soils that have a surface layer of gravelly loam, sinkholes, and rock outcrops. Included areas make up about 10 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Moderate
Depth to bedrock: More than 72 inches
Root zone: More than 60 inches
Shrink-swell potential: High
Organic matter content: Low
Natural fertility: Low
Surface runoff: Medium
Erosion potential: High
Tilth: Good
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used for cultivated crops or pasture. A few areas are wooded.

This soil is moderately well suited to cultivated crops. The high potential for erosion is a management concern. In cultivated areas contour farming, terraces, stripcropping, conservation tillage, cover crops, and a crop rotation that includes grasses and legumes can help to control runoff and erosion. Crop residue should be kept on the surface or incorporated into the plow layer.

This soil is moderately well suited to hay and pasture. Establishing and maintaining a mixture of grasses and legumes and preventing overgrazing are the major management concerns. Proper stocking rates, timely deferment of grazing, and applications of lime and fertilizer increase the production of feed and forage and help to control erosion. If the pasture is overgrazed, the runoff rate increases and erosion is excessive.

The potential productivity for northern red oak is moderately high. The estimated annual production of wood is 284 board feet per acre. Wooded areas of this soil are managed for mixed hardwoods, eastern white pine, and Virginia pine. Seeds and seedlings survive and grow well if competing vegetation is controlled. When wet, the soil is soft and cannot support heavy harvesting equipment.

The slope and the shrink-swell potential limit the use of this soil as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. Land shaping may be needed. Backfilling with sandy material and providing extra reinforcement in foundations and footings help to prevent the damage caused by shrinking and swelling.

The moderate permeability and the slope limit the use of this soil as a site for septic tank absorption fields. Excavating deeper and longer field lines

increases the absorption area and thus helps to overcome the moderate permeability. Installing the field lines at the correct grade and on the contour helps to overcome the slope.

Low strength and the shrink-swell potential limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material and otherwise improving the traffic-supporting capacity of the roads help to overcome these limitations.

The capability subclass is IIIe.

20D—Frederick loam, 15 to 30 percent slopes. This very deep, moderately steep, well drained soil is on convex side slopes on ridges in a limestone valley. Areas range from 5 to 100 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 11 inches, dark yellowish brown loam

Subsoil:
11 to 29 inches, yellowish brown clay loam
29 to 55 inches, yellowish red clay that has reddish yellow mottles
55 to 65 inches, yellowish red clay that has red and reddish yellow mottles

Included with this soil in mapping are the moderately deep, well drained Carbo soils and the very deep, well drained Groseclose and Timberville soils. Carbo and Groseclose soils are on the same landscape as the Frederick soil. Timberville soils are along intermittent drainageways. Also included are some areas of soils that have a surface layer of gravelly loam and some areas of rock outcrop. Included areas make up about 15 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Moderate
Depth to bedrock: More than 72 inches
Root zone: More than 60 inches
Shrink-swell potential: High
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Good
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as hayland or pasture. A few areas are wooded or are used for cultivated crops.

This soil is poorly suited to cultivated crops. The high potential for erosion is a management concern. In cultivated areas contour farming, terraces, stripcropping, conservation tillage, cover crops, and a crop rotation that includes grasses and legumes can help to control runoff and erosion. Crop residue should be kept on the surface or incorporated into the plow layer.

This soil is moderately well suited to hay and pasture. Establishing and maintaining a mixture of grasses and legumes and preventing overgrazing are the major management concerns. Proper stocking rates, timely deferment of grazing, and applications of lime and fertilizer increase the production of feed and forage and help to control erosion. If the pasture is overgrazed, the runoff rate increases and erosion is excessive.

The potential productivity for northern red oak is moderately high on north aspects and moderate on south aspects. The estimated annual production of wood is 284 board feet per acre on north aspects and 268 board feet per acre on south aspects. Wooded areas of this soil are managed for mixed hardwoods, eastern white pine, and Virginia pine. Seeds and seedlings survive and grow well if competing vegetation is controlled. The slope hinders the safe operation of heavy harvesting equipment. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion.

The slope and the shrink-swell potential limit the use of this soil as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. Land shaping may be needed. Backfilling with sandy material and providing extra reinforcement in foundations and footings help to prevent the damage caused by shrinking and swelling.

The moderate permeability and the slope limit the use of this soil as a site for septic tank absorption fields. Excavating deeper and longer field lines increases the absorption area and thus helps to overcome the moderate permeability. Installing the field lines at the correct grade and on the contour helps to overcome the slope.

Low strength, the shrink-swell potential, and the slope limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material and otherwise improving the traffic-supporting capacity of the roads help to prevent the damage caused by low strength and by shrinking and swelling. The roads should be built on the contour or designed so that they conform to the natural slope of the land.

The capability subclass is IVe.

21C—Frederick silty clay loam, 7 to 15 percent slopes, severely eroded. This very deep, strongly sloping, well drained soil is on narrow, convex summits,

shoulders, and side slopes in a limestone valley. Areas range from 4 to 20 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 5 inches, strong brown silty clay loam

Subsoil:
5 to 21 inches, yellowish red clay
21 to 43 inches, yellowish red clay that has reddish yellow mottles
43 to 65 inches, yellowish red clay that has red and reddish yellow mottles

Included with this soil in mapping are the moderately deep, well drained Carbo soils and very deep, well drained Groseclose and Timberville soils. Carbo and Groseclose soils are on the same landscape as the Frederick soil. Timberville soils are along intermittent drainageways. Also included are some areas of soils that have a surface layer of loam or silt loam, sinkholes, and small areas of rock outcrop. Included areas make up about 15 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Moderate
Depth to bedrock: More than 72 inches
Root zone: More than 60 inches
Shrink-swell potential: High
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Fair at optimum soil moisture content
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used for cultivated crops or pasture. A few areas are wooded.

This soil is poorly suited to cultivated crops. When dry, the surface layer is hard and crusty and breaks up into clods. When wet, it sticks to plowshares, making seeded preparation difficult. The high potential for erosion is a another management concern. In cultivated areas contour farming, terraces, stripcropping, conservation tillage, cover crops, and a crop rotation that includes grasses and legumes can help to control runoff and erosion. Tilth can be improved by incorporating organic matter into the soil and by plowing at the optimum moisture content.

This soil is moderately well suited to hay and pasture. Establishing and maintaining a mixture of grasses and legumes and preventing overgrazing are the major management concerns. Grazing when the soil is too wet compacts the surface layer. Surface crusting restricts the emergence of some legumes. Proper stocking rates, timely deferment of grazing, and applications of lime and fertilizer increase the production of feed and forage and help to control erosion. If the pasture is overgrazed, the runoff rate increases and erosion is excessive.

The potential productivity for northern red oak is moderately high. The estimated annual production of wood is 284 board feet per acre. Wooded areas of this soil are managed for mixed hardwoods, eastern white pine, and Virginia pine. Seeds and seedlings survive and grow fairly well if competing vegetation is controlled. When wet, the soil is soft and cannot support heavy harvesting equipment.

The slope and the shrink-swell potential limit the use of this soil as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. Land shaping may be needed. Backfilling with sandy material and providing extra reinforcement in foundations and footings help to prevent the damage caused by shrinking and swelling.

The moderate permeability and the slope limit the use of this soil as a site for septic tank absorption fields. Excavating deeper and longer field lines increases the absorption area and thus helps to overcome the moderate permeability. Installing the field lines at the correct grade and on the contour helps to overcome the slope.

Low strength and the shrink-well potential limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material and otherwise improving the traffic-supporting capacity of the roads help to overcome these limitations.

The capability subclass is IVe.

21D—Frederick silty clay loam, 15 to 30 percent slopes, severely eroded. This very deep, moderately steep, well drained soil is on the sides of ridges in a limestone valley. Areas range from 4 to 15 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 5 inches, strong brown silty clay loam

Subsoil:
5 to 21 inches, yellowish red clay
21 to 43 inches, yellowish red clay that has reddish yellow mottles
43 to 65 inches, yellowish red clay that has red and reddish yellow mottles

Included with this soil in mapping are the moderately deep, well drained Carbo soils and the very deep, well drained Groseclose and Timberville soils. Carbo and Groseclose soils are on the same landscape as the Frederick soil. Timberville soils are along intermittent drainageways. Also included are some areas of soils that have a surface layer of loam or silt loam, sinkholes, and small areas of rock outcrop. Included areas make up about 25 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Moderate
Depth to bedrock: More than 72 inches
Root zone: More than 60 inches
Shrink-swell potential: High
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Fair at optimum soil moisture content
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used for cultivated crops or pasture. A few areas are wooded.

This soil is not suited to cultivated crops. The high potential for erosion is a management concern. When dry, the surface layer is hard and crusty and breaks up into clods. When wet, it sticks to plowshares, making seeded preparation difficult.

This soil is moderately well suited to hay and pasture. Establishing and maintaining a mixture of grasses and legumes and preventing overgrazing are the major management concerns. Grazing when the soil is too wet compacts the surface layer. Surface crusting restricts the emergence of some legumes. Proper stocking rates, timely deferment of grazing, and applications of lime and fertilizer increase the production of feed and forage and help to control erosion. If the pasture is overgrazed, the runoff rate increases and erosion is excessive.

The potential productivity for northern red oak is moderately high on north aspects and moderate on south aspects. The estimated annual production of wood is 284 board feet per acre on north aspects and 268 board feet per acre on south aspects. Wooded areas of this soil are managed for mixed hardwoods, eastern white pine, and Virginia pine. Seedling mortality is a management concern. The slope and the surface layer, which is soft when wet, hinder the safe operation of heavy harvesting equipment. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion.

The slope and the shrink-swell potential limit the use of this soil as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. Land shaping may be needed. Backfilling with sandy material and providing extra reinforcement in foundations and footings help to prevent the damage caused by shrinking and swelling.

The moderate permeability and the slope limit the use of this soil as a site for septic tank absorption fields. Excavating deeper and longer field lines increases the absorption area and thus helps to overcome the moderate permeability. Installing the field lines at the correct grade and on the contour helps to overcome the slope.

Low strength, the shrink-swell potential, and the slope limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material and otherwise improving the traffic-supporting capacity of the roads help to prevent the damage caused by low strength and by shrinking and swelling. The roads should be built on the contour or designed so that they conform to the natural slope of the land.

The capability subclass is VIe.

22C—Frederick gravelly loam, 7 to 15 percent slopes. This very deep, strongly sloping, well drained soil is on narrow to broad, convex summits and shoulders in a limestone valley. Areas range from 4 to 25 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 11 inches, yellowish brown gravelly loam

Subsoil:
11 to 29 inches, yellowish red clay
29 to 55 inches, yellowish red clay that has reddish yellow mottles
55 to 65 inches, yellowish red clay that has red and reddish yellowish mottles

Included with this soil in mapping are the very deep, well drained Groseclose and Timberville soils. Groseclose soils are on the same landscape as the Frederick soil. Timberville soils are in depressions and along intermittent drainageways. Also included are some areas of soils that are less than 60 inches deep over bedrock, soils that have a surface layer of very gravelly loam, sinkholes, and rock outcrop. Included areas make up about 15 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Moderate
Depth to bedrock: More than 72 inches
Root zone: More than 60 inches

Shrink-swell potential: High
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Good, but gravel interferes with tillage.
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used for cultivated crops or pasture. A few areas are wooded.

This soil is moderately well suited to cultivated crops. The high potential for erosion is a management concern. The gravel in the surface layer damages tillage equipment and interferes with planting. In cultivated areas contour farming, terraces, stripcropping, conservation tillage, cover crops, and a crop rotation that includes grasses and legumes can help to control runoff and erosion. Crop residue should be kept on the surface or incorporated into the plow layer.

This soil is well suited to hay and pasture. Establishing and maintaining a mixture of grasses and legumes and preventing overgrazing are the major management concerns. Proper stocking rates, timely deferment of grazing, and applications of lime and fertilizer increase the production of feed and forage and help to control erosion. If the pasture is overgrazed, the runoff rate increases and erosion is excessive.

The potential productivity for northern red oak is moderately high. The estimated annual production of wood is 284 board feet per acre. Wooded areas of this soil are managed for mixed hardwoods, eastern white pine, and Virginia pine. Seeds and seedlings survive and grow well if competing vegetation is controlled. When wet, the soil is soft and cannot support heavy harvesting equipment.

The slope and the shrink-swell potential limit the use of this soil as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. Land shaping may be needed. Backfilling with sandy material and providing extra reinforcement in foundations and footings help to prevent the damage caused by shrinking and swelling.

The moderate permeability and the slope limit the use of this soil as a site for septic tank absorption fields. Excavating deeper and longer field lines increases the absorption area and thus helps to overcome the moderate permeability. Installing the field lines at the correct grade and on the contour helps to overcome the slope.

Low strength and the shrink-swell potential limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material and otherwise improving the traffic-supporting capacity of the roads help to overcome these limitations.

The capability subclass is IIIe.

22D—Frederick gravelly loam, 15 to 30 percent slopes. This very deep, moderately steep, well drained soil is on the convex side slopes of ridges in a limestone valley. Areas range from 5 to 125 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 11 inches, yellowish brown gravelly loam

Subsoil:
11 to 29 inches, yellowish red clay
29 to 55 inches, yellowish red clay that has reddish yellow mottles
55 to 65 inches, yellowish red clay that has red and reddish yellowish mottles

Included with this soil in mapping are the moderately deep, well drained Carbo soils and the very deep, well drained Groseclose and Timberville soils. Carbo and Groseclose soils are on the same landscape as the Frederick soil. Timberville soils are along intermittent drainageways. Also included are some areas of soils that have a surface layer of very gravelly or cobbly loam, sinkholes, and rock outcrop. Included areas make up about 15 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Moderate
Depth to bedrock: More than 72 inches
Root zone: More than 60 inches
Shrink-swell potential: High
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Good, but gravel interferes with tillage.
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as pasture (fig. 4). A few areas are wooded or are used for cultivated crops.

This soil is poorly suited to cultivated crops. The high potential for erosion is a management concern. The gravel in the surface layer damages tillage equipment and interferes with planting. In cultivated areas contour farming, terraces, stripcropping, conservation tillage, cover crops, and a crop rotation that includes grasses and legumes can help to control runoff and erosion.

Figure 4.—Fescue pasture in an area of Frederick gravelly loam, 15 to 30 percent slopes.

Crop residue should be kept on the surface or incorporated into the plow layer.

This soil is moderately well suited to hay and pasture. Establishing and maintaining a mixture of grasses and legumes and preventing overgrazing are the major management concerns. Proper stocking rates, timely deferment of grazing, and applications of lime and fertilizer increase the production of feed and forage and help to control erosion. If the pasture is overgrazed, the runoff rate increases and erosion is excessive.

The potential productivity for northern red oak is moderately high on north aspects and moderate on south aspects. The estimated annual production of wood is 284 board feet per acre on north aspects and 268 board feet per acre on south aspects. Wooded areas of this soil are managed for mixed hardwoods, eastern white pine, and Virginia pine. Seeds and seedlings survive and grow well if competing vegetation is controlled. The slope hinders the safe operation of heavy harvesting equipment. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion.

The slope and the shrink-swell potential limit the use of this soil as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. Land shaping may be needed. Backfilling with sandy material and providing extra reinforcement in foundations and footings help to prevent the damage caused by shrinking and swelling.

The moderate permeability and the slope limit the use of this soil as a site for septic tank absorption fields. Excavating deeper and longer field lines increases the absorption area and thus helps to overcome the moderate permeability. Installing the field lines at the correct grade and on the contour helps to overcome the slope.

Low strength, the shrink-swell potential, and the slope limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material and otherwise improving the traffic-supporting capacity of the roads help to prevent the damage caused by shrinking and swelling and by low strength. The roads should be built on the contour or designed so that they conform to the natural slope of the land.

The capability subclass is IVe.

22E—Frederick gravelly loam, 30 to 45 percent slopes. This very deep, steep and very steep, well drained soil is on the narrow, convex side slopes of ridges in a limestone valley. Areas range from 4 to 15 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 11 inches, yellowish brown gravelly loam

Subsoil:
11 to 29 inches, yellowish red clay
29 to 55 inches, yellowish red clay that has reddish yellow mottles
55 to 65 inches, yellowish red clay that has red and reddish yellowish mottles

Included with this soil in mapping are the moderately deep, well drained Carbo soils and the very deep, well drained Groseclose and Timberville soils. Carbo and Groseclose soils are on the same landscape as the Frederick soil. Timberville soils are on foot slopes and along intermittent drainageways. Also included are some areas of soils that have a surface layer of very gravelly or cobbly loam, sinkholes, and rock outcrop. Included areas make up about 25 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Moderate
Depth to bedrock: More than 72 inches
Root zone: More than 60 inches
Shrink-swell potential: High
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Good, but gravel interferes with tillage.
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as woodland. A few areas are used as pasture.

This soil is not suited to cultivated crops because of the slope and the high potential for erosion. The slope hinders the safe operation of tillage and harvesting equipment.

This soil is moderately well suited to hay and pasture. The slope limits the use of machinery. Establishing and maintaining a mixture of grasses and legumes and preventing overgrazing are the major management concerns. Proper stocking rates, timely deferment of grazing, and applications of lime and fertilizer increase the production of feed and forage and help to control erosion. If the pasture is overgrazed, the runoff rate increases and erosion is excessive.

The potential productivity for northern red oak is moderately high on north aspects and moderate on south aspects. The estimated annual production of wood is 284 board feet per acre on north aspects and 268 board feet per acre on south aspects. Wooded areas of this soil are managed for mixed hardwoods, eastern white pine, and Virginia pine. Seedling survival is limited on south aspects. The slope hinders the safe operation of heavy harvesting equipment.

The slope and the shrink-swell potential limit the use of this soil as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. Land shaping may be needed. The less sloping included soils are better sites. Backfilling with sandy material and providing extra reinforcement in foundations and footings help to prevent the damage caused by shrinking and swelling.

The moderate permeability and the slope limit the use of this soil as a site for septic tank absorption fields. Excavating deeper and longer field lines increases the absorption area and thus helps to overcome the moderate permeability. Installing the field lines at the correct grade and on the contour helps to overcome the slope. The less sloping included areas are better sites.

Low strength, the shrink-swell potential, and the slope limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material and otherwise improving the traffic-supporting capacity of the roads help to prevent the damage caused by shrinking and swelling and by low strength. The roads should be built on the contour or designed so that they conform to the natural slope of the land.

The capability subclass is VIIe.

23C—Frederick very gravelly loam, 7 to 15 percent slopes. This very deep, strongly sloping, well drained soil is on the narrow to broad, convex side slopes of ridges in a limestone valley. Areas range from 5 to 40 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 11 inches, brown very gravelly loam

Subsoil:
11 to 29 inches, yellowish red clay
29 to 55 inches, yellowish red clay that has reddish yellow mottles

55 to 65 inches, yellowish red clay that has red and reddish yellowish mottles

Included with this soil in mapping are the very deep, well drained Groseclose and Timberville soils. Groseclose soils are on the same landscape as the Frederick soil. Timberville soils are in depressions and along intermittent drainageways. Also included are some areas of soils that are less than 60 inches deep over bedrock, soils that have a surface layer of very cobbly loam, sinkholes, and rock outcrop. Included areas make up about 25 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Moderate
Depth to bedrock: More than 72 inches
Root zone: More than 60 inches
Shrink-swell potential: High
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Good, but gravel interferes with tillage.
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as woodland. A few areas are used as pasture.

This soil is poorly suited to cultivated crops. The gravel in the surface layer significantly hinders tillage, damages tillage equipment, and interferes with planting. The high potential for erosion is a management concern. In cultivated areas contour farming, terraces, stripcropping, conservation tillage, cover crops, and a crop rotation that includes grasses and legumes can help to control runoff and erosion. Crop residue should be kept on the surface or incorporated into the plow layer.

This soil is moderately well suited to hay and pasture. Establishing and maintaining a mixture of grasses and legumes and preventing overgrazing are the major management concerns. Proper stocking rates, timely deferment of grazing, and applications of lime and fertilizer increase the production of feed and forage and help to control erosion. If the pasture is overgrazed, the runoff rate increases and erosion is excessive.

The potential productivity for northern red oak is moderately high. The estimated annual production of wood is 284 board feet per acre. Wooded areas of this soil are managed for mixed hardwoods, eastern white pine, and Virginia pine. Seedling survival is limited by the gravel in the surface layer. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion.

The slope and the shrink-swell potential limit the use of this soil as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. Land shaping may be needed. Backfilling with sandy material and providing extra reinforcement in foundations and footings help to prevent the damage caused by shrinking and swelling.

The moderate permeability and the slope limit the use of this soil as a site for septic tank absorption fields. Excavating deeper and longer field lines increases the absorption area and thus helps to overcome the moderate permeability. Installing the field lines at the correct grade and on the contour helps to overcome the slope.

Low strength and the shrink-swell potential limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material and otherwise improving the traffic-supporting capacity of the roads help to overcome these limitations.

The capability subclass is IVs.

23D—Frederick very gravelly loam, 15 to 30 percent slopes. This very deep, moderately steep, well drained soil is on the convex side slopes of ridges in a limestone valley. Areas range from 5 to 45 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 11 inches, brown very gravelly loam

Subsoil:
11 to 29 inches, yellowish red clay
29 to 55 inches, yellowish red clay that has reddish yellow mottles
55 to 65 inches, yellowish red clay that has red and reddish yellowish mottles

Included with this soil in mapping are the very deep, well drained Groseclose and Timberville soils. Groseclose soils are on the same landscape as the Frederick soil. Timberville soils along intermittent drainageways. Also included are some areas of soils that are less than 60 inches deep over bedrock, soils that have a surface layer of very cobbly loam, sinkholes, and rock outcrop. Included areas make up about 25 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Moderate
Depth to bedrock: More than 72 inches
Root zone: More than 60 inches
Shrink-swell potential: High

Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Good, but gravel interferes with tillage.
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as woodland. A few areas are used as pasture.

This soil is not suited to cultivated crops. The gravel in the surface layer hinders tillage, damages tillage equipment, and interferes with planting. The high potential for erosion is a management concern.

This soil is moderately well suited to hay and pasture. Establishing and maintaining a mixture of grasses and legumes and preventing overgrazing are the major management concerns. Proper stocking rates, timely deferment of grazing, and applications of lime and fertilizer increase the production of feed and forage and help to control erosion. If the pasture is overgrazed, the runoff rate increases and erosion is excessive.

The potential productivity for northern red oak is moderately high on north aspects and moderate on south aspects. The estimated annual production of wood is 284 board feet per acre on north aspects and 268 board feet per acre on south aspects. Wooded areas of this soil are managed for mixed hardwoods, eastern white pine, and Virginia pine. Seedling survival is limited by the gravel in the surface layer. The slope hinders the safe operation of heavy harvesting equipment. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion.

The slope and the shrink-swell potential limit the use of this soil as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. Land shaping may be needed. Backfilling with sandy material and providing extra reinforcement in foundations and footings help to prevent the damage caused by shrinking and swelling.

The moderate permeability and the slope limit the use of this soil as a site for septic tank absorption fields. Excavating deeper and longer field lines increases the absorption area and thus helps to overcome the moderate permeability. Installing the field lines at the correct grade and on the contour helps to overcome the slope.

Low strength, the shrink-swell potential, and the slope limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material and otherwise improving the traffic-supporting capacity of the roads help to prevent the damage caused by low strength and by shrinking and swelling. The roads should be built on the contour or designed so that they conform to the natural slope of the land.

The capability subclass is VIs.

24C—Frederick loam, 7 to 15 percent slopes, very rocky. This very deep, strongly sloping, well drained soil is on the narrow, convex summits, shoulders, and side slopes of ridges in a limestone valley. Limestone outcrops cover 2 to 10 percent of the surface. They are about 100 to 300 feet apart. Areas range from 4 to 100 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 11 inches, dark yellowish brown loam

Subsoil:
11 to 29 inches, yellowish red clay
29 to 55 inches, yellowish red clay that has reddish yellow mottles
55 to 65 inches, yellowish red clay that has red and reddish yellow mottles

Included with this soil in mapping are the moderately deep, well drained Carbo soils and the very deep, well drained Groseclose and Timberville soils. Carbo soils are adjacent to the rock outcrops. Groseclose soils are on the same landscape as the Frederick soil. Timberville soils are in depressions and along drainageways. Also included are some areas of soils that have a surface layer of gravelly loam and some areas of sinkholes. Included areas make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Moderate
Depth to bedrock: More than 72 inches
Root zone: More than 60 inches
Shrink-swell potential: High
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Good, but the rock outcrops interfere with tillage.
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as woodland or pasture. A few areas are used for hay.

This soil is poorly suited to cultivated crops. The rock outcrops interfere with tillage. In cultivated areas conservation tillage, cover crops, and a crop rotation that includes grasses and legumes can help to control

runoff and erosion. Crop residue should be kept on the surface or incorporated into the plow layer.

This soil is moderately well suited to hay and pasture. Establishing and maintaining a mixture of grasses and legumes and preventing overgrazing are the major management concerns. Proper stocking rates, rotational grazing, timely deferment of grazing, and applications of lime and fertilizer increase the production of feed and forage and help to control erosion. If the pasture is overgrazed, the runoff rate increases and erosion is excessive.

The potential productivity for northern red oak is moderately high. The estimated annual production of wood is 284 board feet per acre. Wooded areas of this soil are managed for mixed hardwoods, eastern white pine, and Virginia pine. Seeds and seedlings survive and grow well if competing vegetation is controlled. When wet, the soil is soft and cannot support heavy harvesting equipment.

The slope, the rock outcrops, and the shrink-swell potential limit the use of this soil as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. Land shaping may be needed. The dwelling should be built in an area where the rock outcrops are spaced far apart. Backfilling with sandy material and providing extra reinforcement in foundations and footings help to prevent the damage caused by shrinking and swelling.

The moderate permeability, the slope, and the rock outcrops limit the use of this soil as a site for septic tank absorption fields. Excavating deeper and longer field lines increases the absorption area and thus helps to overcome the moderate permeability. Installing the field lines at the correct grade and on the contour helps to overcome the slope. Because of the rock outcrops, care is needed in selecting sites for the absorption fields.

Low strength, the shrink-swell potential, and the rock outcrops limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material and otherwise improving the traffic-supporting capacity of the roads help to prevent the damage caused by low strength and by shrinking and swelling. Properly planning grades and routes is an alternative to blasting and removing the rock outcrops.

The capability subclass is VIs.

24D—Frederick loam, 15 to 30 percent slopes, very rocky. This very deep, moderately steep, well drained soil is on the convex side slopes of ridges in a limestone valley. Limestone outcrops cover 2 to 10 percent of the surface. They are about 100 to 300 feet apart. Areas range from 5 to 150 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 11 inches, dark yellowish brown loam

Subsoil:
11 to 29 inches, yellowish red clay
29 to 55 inches, yellowish red clay that has reddish yellow mottles
55 to 65 inches, yellowish red clay that has red and reddish yellow mottles

Included with this soil in mapping are the shallow, well drained Opequon soils; the moderately deep, well drained Carbo soils; and the very deep, well drained Groseclose and Timberville soils. Carbo and Opequon soils are adjacent to the rock outcrops. Groseclose soils are on the same landscape as the Frederick soil. Timberville soils are on foot slopes and along intermittent drainageways. Also included are some areas of soils that have slopes of more than 30 percent, soils that have a surface layer of gravelly loam, and sinkholes. Included areas make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Moderate
Depth to bedrock: More than 72 inches
Root zone: More than 60 inches
Shrink-swell potential: High
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Good, but the rock outcrops interfere with tillage.
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as woodland or pasture. A few areas are used for hay.

This soil is not suited to cultivated crops. The rock outcrops and the slope interfere with tillage.

This soil is moderately well suited to hay and pasture. Establishing and maintaining a mixture of grasses and legumes and preventing overgrazing are the major management concerns. Proper stocking rates, rotational grazing, timely deferment of grazing, and applications of lime and fertilizer increase the production of feed and forage and help to control erosion. If the pasture is overgrazed, the runoff rate increases and erosion is excessive.

The potential productivity for northern red oak is

moderately high on north aspects and moderate on south aspects. The estimated annual production of wood is 284 board feet per acre on north aspects and 268 board feet per acre on south aspects. Wooded areas of this soil are managed for mixed hardwoods, eastern white pine, and Virginia pine. Seeds and seedlings survive and grow well if competing vegetation is controlled. The slope and the rock outcrops hinder the safe operation of heavy harvesting equipment.

The slope, the rock outcrops, and the shrink-swell potential limit the use of this soil as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. Land shaping may be needed. The dwelling should be built in an area where the rock outcrops are spaced far apart. Backfilling with sandy material and providing extra reinforcement in foundations and footings help to prevent the damage caused by shrinking and swelling.

The moderate permeability, the slope, and the rock outcrops limit the use of this soil as a site for septic tank absorption fields. Excavating deeper and longer field lines increases the absorption area and thus helps to overcome the moderate permeability. Installing the field lines at the correct grade and on the contour helps to overcome the slope. Because of the rock outcrops, care is needed in selecting sites for the absorption fields.

Low strength, the shrink-swell potential, the slope, and the rock outcrops limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material and otherwise improving the traffic-supporting capacity of the roads help to prevent the damage caused by low strength and by shrinking and swelling. The roads should be built on the contour or designed so that they conform to the natural slope of the land. Properly planning grades and routes is an alternative to blasting and removing the rock outcrops.

The capability subclass is VIs.

25C—Frederick-Urban land complex, 2 to 15 percent slopes. This map unit consists of gently sloping and strongly sloping, very deep, well drained Frederick soils intermingled with Urban land. It is on the convex summits, shoulders, and side slopes of ridges in a limestone valley. The Frederick soils and Urban land occur as areas so intermingled that mapping them separately is not practical. The unit is about 25 percent Urban land, 25 percent relatively undisturbed Frederick soil, 30 percent disturbed Frederick soil, and 20 percent other soils. Areas range from about 3 to 25 acres in size.

The typical sequence, depth, and composition of the layers in the undisturbed Frederick soil are as follows—

Surface layer:
0 to 11 inches, dark yellowish brown loam

Subsoil:
11 to 29 inches, yellowish red clay
29 to 55 inches, yellowish red clay that has reddish yellow mottles
55 to 65 inches, yellowish red clay that has red and reddish yellow mottles

The disturbed Frederick soil has been graded, cut, filled, or otherwise altered during urbanization. In some areas as much as 5 feet of fill material has been added, and in other areas as much as three-quarters of the profile has been removed. The fill material commonly is from adjacent areas that have been cut or graded.

The Urban land generally is covered by asphalt, concrete, buildings, or other structures. In open areas most or all the soil profile has been removed.

Included in this map unit are the moderately deep, well drained Carbo and Chilhowie soils and the very deep, well drained Groseclose and Timberville soils. Carbo, Chilhowie, and Groseclose soils are on the same landscape as the Frederick soil. Timberville soils are in intermittent drainageways. Also included are some areas of soils that have a gravelly surface layer and some areas of rock outcrop.

Properties of the undisturbed Frederick soil—

Permeability: Moderate
Available water capacity: Moderate
Depth to bedrock: More than 72 inches
Root zone: More than 60 inches
Shrink-swell potential: High
Organic matter content: Low
Natural fertility: Low
Surface runoff: Medium or rapid
Erosion potential: Medium
Tilth: Good
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

The slope and the shrink-swell potential limit the use of undisturbed areas as sites for dwellings. Land shaping and grading and designing the dwelling so that it conforms to the natural slope of the land help to overcome the slope. Backfilling with sandy material and providing extra reinforcement in foundations and footings help to prevent the damage caused by shrinking and swelling.

The moderate permeability and the slope limit the use of undisturbed areas as sites for septic tank absorption fields. Excavating deeper and longer field lines increases the absorption area and thus helps to overcome the moderate permeability. Installing the field

lines at the correct grade and on the contour helps to overcome the slope.

Low strength, the shrink-swell potential, and the slope limit the use of undisturbed areas as sites for local roads and streets. Providing suitable subgrade or base material helps to prevent the damage caused by low strength and by shrinking and swelling. The roads should be built on the contour or designed so that they conform to the natural slope of the land.

No capability classification is assigned.

25D—Frederick-Urban land complex, 15 to 30 percent slopes. This map unit consists of moderately steep, very deep, well drained Frederick soils intermingled with Urban land. It is on the convex side slopes of ridges in a limestone valley. The Frederick soils and Urban land occur as areas so intermingled that mapping them separately is not practical. The unit is about 25 percent Urban land, 25 percent relatively undisturbed Frederick soil, 30 percent disturbed Frederick soil, and 20 percent other soils. Areas range from about 3 to 15 acres in size.

The typical sequence, depth, and composition of the layers in the undisturbed Frederick soil are as follows—

Surface layer:
0 to 11 inches, dark yellowish brown loam

Subsoil:
11 to 29 inches, yellowish red clay
29 to 55 inches, yellowish red clay that has reddish yellow mottles
55 to 65 inches, yellowish red clay that has red and reddish yellow mottles

The disturbed Frederick soil has been graded, cut, filled, or otherwise altered during urbanization. In some areas as much as 5 feet of fill material has been added, and in other areas as much as three-quarters of the profile has been removed. The fill material commonly is from adjacent areas that have been cut or graded.

The Urban land generally is covered by asphalt, concrete, buildings, or other structures. In open areas most or all the soil profile has been removed.

Included in this map unit are the moderately deep, well drained Carbo and Chilhowie soils and the very deep, well drained Groseclose and Timberville soils. Carbo, Chilhowie, and Groseclose soils are on the same landscape as the Frederick soil. Timberville soils are on foot slopes and along intermittent drainageways. Also included are some areas of soils that have a gravelly surface layer and some areas of rock outcrop.

Properties of the undisturbed Frederick soil—

Permeability: Moderate
Available water capacity: Moderate
Depth to bedrock: More than 72 inches
Root zone: More than 60 inches
Shrink-swell potential: High
Organic matter content: Low
Natural fertility: Low
Surface runoff: Medium or rapid
Erosion potential: Medium
Tilth: Good
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

The slope and the shrink-swell potential limit the use of undisturbed areas as sites for dwellings. Land shaping and grading and designing the dwelling so that it conforms to the natural slope of the land help to overcome the slope. Backfilling with sandy material and providing extra reinforcement in foundations and footings help to prevent the damage caused by shrinking and swelling.

The moderate permeability and the slope limit the use of undisturbed areas as sites for septic tank absorption fields. Excavating deeper and longer field lines increases the absorption area and thus helps to overcome the moderate permeability. Installing the field lines at the correct grade and on the contour helps to overcome the slope.

Low strength, the shrink-swell potential, and the slope limit the use of undisturbed areas as sites for local roads and streets. Providing suitable subgrade or base material helps to prevent the damage caused by low strength and by shrinking and swelling. The roads should be built on the contour or designed so that they conform to the natural slope of the land.

No capability classification is assigned.

26C—Gilpin silt loam, 7 to 15 percent slopes. This strongly sloping soil is moderately deep and well drained. It is on slightly convex summits, shoulders, and side slopes. Areas are roughly oval or elongated. They range from about 4 to 35 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 1 inch, very dark brown silt loam

Subsurface layer:
1 to 5 inches, light olive brown silt loam

Subsoil:
5 to 19 inches, yellowish brown silty clay loam
19 to 28 inches, yellowish brown channery silty clay loam

Substratum:
28 to 34 inches, strong brown very channery silty clay loam

Bedrock:
34 inches, shale

Included with this soil in mapping are the moderately deep, well drained Berks and shallow, somewhat excessively drained Weikert soils. These soils are on the same landscape as the Gilpin soil. Also included are some areas of soils that are deep and soils that have a surface layer of silty clay loam. Included soils make up about 15 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Low
Depth to bedrock: 20 to 40 inches
Root zone: 20 to 40 inches
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: Medium
Tilth: Fair
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as woodland. A few areas are used as pasture.

This soil is moderately well suited to cultivated crops. The main limitations are the low available water capacity and the medium potential for erosion. In cultivated areas conservation tillage, cover crops, and a crop rotation that includes grasses and legumes can help to control runoff and erosion and conserve moisture.

This soil is moderately well suited to hay and pasture. Overgrazing reduces the quantity and quality of forage and increases the runoff rate and the hazard of erosion. Deferring grazing as needed and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for northern red oak is moderately high. The estimated annual production of wood is 288 board feet per acre. Wooded areas of this soil are managed for eastern white pine, Virginia pine, and mixed hardwoods. Seeds and seedlings survive and grow well if competing vegetation is controlled.

The slope and the depth to bedrock limit the use of this soil as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. The deeper included soils are better sites for dwellings with basements.

The depth to bedrock and the moderate permeability limit the use of this soil as a site for septic tank absorption fields. Better suited soils should be selected.

The potential for frost action and the slope limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material helps to prevent the damage caused by frost action. The roads should be built on the contour or designed so that they conform to the natural slope of the land.

The capability subclass is IIIe.

27A—Gladehill fine sandy loam, 0 to 3 percent slopes, occasionally flooded. This soil is very deep, nearly level, and well drained. It is on flood plains along the major streams and rivers. Areas are long and winding and range from about 4 to 30 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 5 inches, very dark grayish brown fine sandy loam

Subsoil:
5 to 12 inches, dark brown fine sandy loam
12 to 42 inches, dark yellowish brown fine sandy loam

Substratum:
42 to 60 inches, dark yellowish brown loam
60 to 72 inches, dark brown fine sandy loam

Included with this soil in mapping are the very deep, well drained Derroc and Wolfgap soils and the very deep, moderately well drained Irongate soils. Derroc and Irongate soils are in slight depressions and channel scours. Wolfgap soils are on low terraces adjacent to streams and flood plains. Included soils make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderately rapid
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: More than 60 inches
Shrink-swell potential: Low
Organic matter content: Moderate
Natural fertility: High
Surface runoff: Slow
Erosion potential: Low
Tilth: Good
Depth to the water table: More than 72 inches

Flooding: Occasional, usually from December through March
Potential for frost action: Moderate

Most areas are used for cultivated crops or hay. Some areas are used as woodland or pasture. This soil is classified as prime farmland.

This soil is well suited to cultivated crops. Flooding occasionally damages crops and limits the use of machinery. Conservation tillage conserves moisture and helps to control erosion.

This soil is well suited to pasture and hay. Establishing and maintaining a mixture of grasses and legumes, deferring grazing as needed, controlling weeds, using proper stocking rates, and applying fertilizer increase the productivity and carrying capacity of the pasture.

The potential productivity for yellow-poplar is high. The estimated annual production of wood is 530 board feet per acre. Seeds and seedlings survive and grow well if competing vegetation is controlled.

The occasional flooding limits the use of this soil as a site for dwellings and septic tank absorption fields. An alternative site should be selected.

The flooding and the potential for frost action limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material helps to prevent the damage to road surfaces caused by frost action. Raising the surface by land shaping reduces the hazard of flooding.

The capability subclass is IIe.

28B—Groseclose silt loam, 2 to 7 percent slopes. This very deep, gently sloping, well drained soil is on narrow, convex summits, shoulders, and side slopes in a limestone valley. Areas range from 3 to 20 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 7 inches, dark yellowish brown silt loam

Subsoil:
7 to 13 inches, yellowish brown clay
13 to 26 inches, strong brown clay
26 to 37 inches, strong brown silty clay loam
37 to 50 inches, yellowish brown silty clay loam

Substratum:
50 to 65 inches, yellowish brown, light gray, and red silty clay loam

Included with this soil in mapping are the moderately deep, well drained Carbo and Chilhowie soils and the very deep, well drained Timberville soils. Carbo and Chilhowie soils are on the same landscape as the Groseclose soil. Timberville soils are in depressions and along intermittent drainageways. Also included are some areas of severely eroded soils that have a surface layer of silty clay loam, soils that have a surface layer of gravelly silt loam, and rock outcrop. Included areas make up about 20 percent of this map unit.

Soil properties—

Permeability: Slow
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: More than 60 inches
Shrink-swell potential: High
Organic matter content: Low
Natural fertility: Low
Surface runoff: Medium
Erosion potential: Medium
Tilth: Good
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used for cultivated crops or pasture. A few areas are wooded.

This soil is well suited to cultivated crops. The medium potential for erosion is a management concern. In cultivated areas conservation tillage, cover crops, and a crop rotation that includes grasses and legumes can help to control runoff and erosion. Crop residue should be kept on the surface or incorporated into the plow layer.

This soil is well suited to hay and pasture. Establishing and maintaining a mixture of grasses and legumes and preventing overgrazing are the major management concerns. Proper stocking rates, timely deferment of grazing, and applications of lime and fertilizer increase the production of feed and forage and help to control erosion. If the pasture is overgrazed, the runoff rate increases and erosion is excessive.

The potential productivity for northern red oak is moderately high. The estimated annual production of wood is 302 board feet per acre. Wooded areas of this soil are managed for mixed hardwoods, yellow-poplar, eastern white pine, and Virginia pine. Seeds and seedlings survive and grow well if competing vegetation is controlled. When wet, the soil is soft and cannot support heavy harvesting equipment.

The shrink-swell potential limits the use of this soil as a site for dwellings. Backfilling with sandy material and providing extra reinforcement in foundations and footings help to prevent the damage caused by shrinking and swelling.

The slow permeability limits the use of this soil as a site for septic tank absorption fields. Excavating wider,

deeper, and longer field lines increases the absorption area and thus helps to overcome the slow permeability.

Low strength and the shrink-swell potential limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material and otherwise improving the traffic-supporting capacity of the roads help to prevent the damage caused by low strength and by shrinking and swelling.

The capability subclass is IIe.

28C—Groseclose silt loam, 7 to 15 percent slopes. This very deep, strongly sloping, well drained soil is on narrow, convex summits, shoulders, and side slopes in a limestone valley. Areas range from 5 to 40 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 7 inches, dark yellowish brown silt loam

Subsoil:
7 to 13 inches, yellowish brown clay
13 to 26 inches, strong brown clay
26 to 37 inches, strong brown silty clay loam
37 to 50 inches, yellowish brown silty clay loam

Substratum:
50 to 65 inches, yellowish brown, light gray, and red silty clay loam

Included with this soil in mapping are the moderately deep, well drained Carbo, Chilhowie, and Litz soils and the very deep, well drained Timberville soils. Carbo, Chilhowie, and Litz soils are on the same landscape as the Groseclose soil. Timberville soils are in depressions and along intermittent drainageways. Also included are some areas of severely eroded soils that have a surface layer of silty clay loam, soils that have a surface layer of gravelly silt loam, and rock outcrop. Included areas make up about 20 percent of this map unit.

Soil properties—

Permeability: Slow
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: More than 60 inches
Shrink-swell potential: High
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Good
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used for cultivated crops or pasture. A few areas are wooded.

This soil is moderately well suited to cultivated crops. The high potential for erosion is a management concern. In cultivated areas contour farming, terraces, stripcropping, conservation tillage, cover crops, and a crop rotation that includes grasses and legumes can help to control runoff and erosion. Crop residue should be kept on the surface or incorporated into the plow layer.

This soil is moderately well suited to hay and pasture. Establishing and maintaining a mixture of grasses and legumes and preventing overgrazing are the major management concerns. Proper stocking rates, timely deferment of grazing, and applications of lime and fertilizer increase the production of feed and forage and help to control erosion. If the pasture is overgrazed, the runoff rate increases and erosion is excessive.

The potential productivity for northern red oak is moderately high. The estimated annual production of wood is 302 board feet per acre. Wooded areas of this soil are managed for mixed hardwoods, yellow-poplar, eastern white pine, and Virginia pine. Seeds and seedlings survive and grow well if competing vegetation is controlled. When wet, the soil is soft and cannot support heavy harvesting equipment.

The slope and the shrink-swell potential limit the use of this soil as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. Land shaping may be needed. Backfilling with sandy material and providing extra reinforcement in foundations and footings help to prevent the damage caused by shrinking and swelling.

The slow permeability and the slope limit the use of this soil as a site for septic tank absorption fields. Excavating wider, deeper, and longer field lines increases the absorption area and thus helps to overcome the slow permeability. Installing the field lines at the correct grade and on the contour helps to overcome the slope.

Low strength and the shrink-swell potential limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material and otherwise improving the traffic-supporting capacity of the roads help to prevent the damage caused by low strength and by shrinking and swelling.

The capability subclass is IIIe.

28D—Groseclose silt loam, 15 to 30 percent slopes. This very deep, moderately steep, well drained soil is on the convex side slopes of ridges in a limestone valley. Areas range from 4 to 50 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 7 inches, dark yellowish brown silt loam

Subsoil:
7 to 13 inches, yellowish brown clay
13 to 26 inches, strong brown clay
26 to 37 inches, strong brown silty clay loam
37 to 50 inches, yellowish brown silty clay loam

Substratum:
50 to 65 inches, yellowish brown, light gray, and red silty clay loam

Included with this soil in mapping are the moderately deep, well drained Carbo, Chilhowie, and Litz soils and the very deep, well drained Timberville soils. Carbo, Chilhowie, and Litz soils are on the same landscape as the Groseclose soil. Timberville soils are on foot slopes and along intermittent drainageways. Also included are some areas of severely eroded soils that have a surface layer of silty clay loam, soils that have a surface layer of gravelly silt loam, and rock outcrop. Included areas make up about 20 percent of this map unit.

Soil properties—

Permeability: Slow
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: More than 60 inches
Shrink-swell potential: High
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Good
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as hayland or pasture. A few areas are used for cultivated crops or are wooded.

This soil is poorly suited to cultivated crops. The high potential for erosion is a management concern. In cultivated areas contour farming, terraces, stripcropping, conservation tillage, cover crops, and a crop rotation that includes grasses and legumes can help to control runoff and erosion. Crop residue should be kept on the surface or incorporated into the plow layer.

This soil is moderately well suited to hay and pasture. Establishing and maintaining a mixture of grasses and legumes and preventing overgrazing are the major management concerns. Proper stocking rates, timely deferment of grazing, and applications of lime and fertilizer increase the production of feed and forage and help to control erosion. If the pasture is overgrazed, the runoff rate increases and erosion is excessive.

The potential productivity for northern red oak is moderately high. The estimated annual production of wood is 302 board feet per acre on north aspects and 280 board feet per acre on south aspects. Wooded areas of this soil managed for mixed hardwoods, yellow-poplar, eastern white pine, and Virginia pine. Seeds and seedlings survive and grow well if competing vegetation is controlled. The slope and the surface layer, which is soft when wet, hinder the safe operation of heavy harvesting equipment. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion.

The slope and the shrink-swell potential limit the use of this soil as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. Land shaping may be needed. Backfilling with sandy material and providing extra reinforcement in foundations and footings help to prevent the damage caused by shrinking and swelling.

Low strength, the shrink-swell potential, and the slope limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material and otherwise improving the traffic-supporting capacity of the roads help to prevent the damage caused by low strength and by shrinking and swelling. The roads should be built on the contour or designed so that they conform to the natural slope of the land.

The slow permeability and the slope limit the use of this soil as a site for septic tank absorption fields. Excavating wider, deeper, and longer field lines increases the absorption area and thus helps to overcome the slow permeability. Installing the field lines at the correct grade and on the contour helps to overcome the slope.

The capability subclass is IVe.

29C—Groseclose silty clay loam, 7 to 15 percent slopes, severely eroded. This very deep, strongly sloping, well drained soil is on narrow, convex summits, shoulders, and side slopes in a limestone valley. Areas range from 4 to 30 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 7 inches, yellowish brown silty clay loam

Subsoil:
7 to 10 inches, yellowish brown clay
10 to 23 inches, strong brown clay
23 to 34 inches, strong brown silty clay loam
34 to 47 inches, yellowish brown silty clay loam

Substratum:
47 to 65 inches, yellowish brown, light gray, and red silty clay loam

Included with this soil in mapping are the moderately deep, well drained Carbo and Chilhowie soils and the very deep, well drained Timberville soils. Carbo and Chilhowie soils are on the same landscape as the Groseclose soil. Timberville soils are along intermittent drainageways. Also included are some areas of soils that have a surface layer of silt loam, sinkholes, and rock outcrop. Included areas make up about 20 percent of this map unit.

Soil properties—

Permeability: Slow
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: More than 60 inches
Shrink-swell potential: High
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Good
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used for cultivated crops or pasture. A few areas are wooded.

This soil is poorly suited to cultivated crops. When dry, the surface layer is hard and crusty and breaks up into clods. When wet, it sticks to plowshares, making seeded preparation difficult. The high potential for erosion is a another management concern. In cultivated areas contour farming, terraces, stripcropping, conservation tillage, cover crops, and a crop rotation that includes grasses and legumes can help to control runoff and erosion. Tilth can be improved by incorporating organic matter into the soil and by plowing at the optimum moisture content.

This soil is moderately well suited to hay and pasture. Establishing and maintaining a mixture of grasses and legumes and preventing overgrazing are the major management concerns. Grazing when the soil is too wet compacts the surface layer. Surface crusting restricts the emergence of some legumes. Proper stocking rates, timely deferment of grazing, and applications of lime and fertilizer increase the production of feed and forage and help to control erosion. If the pasture is overgrazed, the runoff rate increases and erosion is excessive.

The potential productivity for northern red oak is moderately high. The estimated annual production of wood is 302 board feet per acre. Wooded areas of this soil are managed for mixed hardwoods, eastern white pine, and Virginia pine. Seeds and seedlings survive and grow fairly well if competing vegetation is controlled. When wet, the soil is soft and cannot support heavy harvesting equipment.

The slope and the shrink-swell potential limit the use of this soil as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. Land shaping may be needed. Backfilling with sandy material and providing extra reinforcement in foundations and footings help to prevent the damage caused by shrinking and swelling.

The slow permeability and the slope limit the use of this soil as a site for septic tank absorption fields. Excavating deeper and longer field lines increases the absorption area and thus helps to overcome the slow permeability. Installing the field lines at the correct grade and on the contour helps to overcome the slope.

Low strength and the shrink-swell potential limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material and otherwise improving the traffic-supporting capacity of the roads help to overcome these limitations.

The capability subclass is IVe.

29D—Groseclose silty clay loam, 15 to 30 percent slopes, severely eroded. This very deep, moderately steep, well drained soil is on the sides of ridges in a limestone valley. Areas range from 4 to 20 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 7 inches, yellowish brown silty clay loam

Subsoil:
7 to 10 inches, yellowish brown clay
10 to 23 inches, strong brown clay
23 to 34 inches, strong brown silty clay loam
34 to 47 inches, yellowish brown silty clay loam

Substratum:
47 to 65 inches, yellowish brown, light gray, and red silty clay loam

Included with this soil in mapping are the moderately deep, well drained Carbo and Chilhowie soils and the very deep, well drained Timberville soils. Carbo and Chilhowie soils are on the same landscape as the Groseclose soil. Timberville soils are along intermittent drainageways. Also included are some areas of soils that have a surface layer of silt loam, sinkholes, and rock outcrop. Included areas make up about 25 percent of this map unit.

Soil properties—

Permeability: Slow
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: More than 60 inches
Shrink-swell potential: High
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Good
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as hayland or pasture. A few areas are wooded.

This soil is not suited to cultivated crops because of the high potential for erosion and the effects of past erosion. When dry, the surface layer is hard and crusty and breaks up into clods. When wet, it sticks to plowshares, making seeded preparation difficult.

This soil is moderately well suited to hay and pasture. Establishing and maintaining a mixture of grasses and legumes and preventing overgrazing are the major management concerns. Grazing when the soil is too wet compacts the surface layer. Surface crusting restricts the emergence of some legumes. Proper stocking rates, timely deferment of grazing, and applications of lime and fertilizer increase the production of feed and forage and help to control erosion. If the pasture is overgrazed, the runoff rate increases and erosion is excessive.

The potential productivity for northern red oak is moderately high. The estimated annual production of wood is 302 board feet per acre on north aspects and 280 board feet per acre on south aspects. Wooded areas of this soil are managed for mixed hardwoods, eastern white pine, and Virginia pine. Seedling mortality is a management concern. The slope and the surface layer, which is soft when wet, hinder the safe operation of heavy harvesting equipment. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion.

The slope and the shrink-swell potential limit the use of this soil as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. Land shaping may be needed. Backfilling with sandy material and providing extra reinforcement in foundations and footings help to prevent the damage caused by shrinking and swelling.

The slow permeability and the slope limit the use of this soil as a site for septic tank absorption fields. Excavating deeper and longer field lines increases the absorption area and thus helps to overcome the slow permeability. Installing the field lines at the correct grade and on the contour helps to overcome the slope.

Low strength, the shrink-swell potential, and the slope limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material and otherwise improving the traffic-supporting capacity of the roads help to prevent the damage caused by low strength and by shrinking and swelling. The roads should be built on the contour or designed so that they conform to the natural slope of the land.

The capability subclass is VIe.

30C—Groseclose-Litz complex, 7 to 15 percent slopes. These strongly sloping, well drained soils occur as areas so intermingled that mapping them separately is not practical. This map unit is about 50 percent very deep Groseclose soil, 35 percent moderately deep Litz soil, and 15 percent other soils. Areas are long and winding and range from about 4 to 40 acres in size.

The typical sequence, depth, and composition of the layers in the Groseclose soil are as follows—

Surface layer:
0 to 7 inches, dark yellowish brown silt loam

Subsoil:
7 to 13 inches, yellowish brown clay
13 to 26 inches, strong brown clay
26 to 37 inches, strong brown silty clay loam
37 to 50 inches, yellowish brown silty clay loam

Substratum:
50 to 65 inches, yellowish brown, light gray, and red silty clay loam

The typical sequence, depth, and composition of the layers in the Litz soil are as follows—

Surface layer:
0 to 5 inches, dark brown channery silt loam

Subsurface layer:
5 to 9 inches, yellowish brown channery silt loam

Subsoil:
9 to 13 inches, yellowish brown very channery silt loam
13 to 20 inches, yellowish brown extremely channery silt loam

Substratum:
20 to 29 inches, yellowish brown, weak red, and gray, weathered shale

Bedrock:
29 inches, shale

Included with these soils in mapping are the shallow, well drained Chiswell soils; the moderately deep, well drained Chilhowie soils; the very deep, moderately well drained Ernest soils; and the very deep, well drained Timberville soils. Chilhowie and Chiswell soils are on the same landscape as the Groseclose and Litz soils. Ernest and Timberville soils are in saddles, in depressions, and at the head of drainageways. Also included are some areas of severely eroded soils that have a surface layer of silty clay loam or silty clay and some areas of rock outcrop.

Soil properties—

Permeability: Slow in the Groseclose soil and moderate in the Litz soil
Available water capacity: Moderate in the Groseclose soil and low in the Litz soil
Depth to bedrock: More than 60 inches in the Groseclose soil and 20 to 40 inches in the Litz soil
Root zone: More than 60 inches in the Groseclose soil and 20 to 40 inches in the Litz soil
Shrink-swell potential: High in the Groseclose soil and low in the Litz soil
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Good
Depth to the water table: More than 72 inches
Potential for frost action: Moderate in the Groseclose soil and low in the Litz soil

Most areas are used as pasture. A small acreage is used for cultivated crops, orchards, homesite development, or woodland.

This map unit is moderately well suited to cultivated crops. The high potential for erosion is a management concern. The low available water capacity and a moderate rooting depth are limitations in areas of the Litz soil. Most crops on the Litz soil show evidence of moisture stress during dry periods. In cultivated areas conservation tillage and a crop rotation that includes grasses and legumes help to control runoff and erosion and conserve moisture.

This map unit is moderately well suited to hay and pasture. The moderate depth to bedrock in the Litz soil restricts the growth of some grasses and legumes. Grazing when the soil is too wet compacts the surface layer. Overgrazing reduces the quantity and quality of forage. Deferring grazing as needed and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for northern red oak is moderately high. The estimated annual production of wood is 302 board feet per acre on the Groseclose soil and 288 board feet per acre on the Litz soil. Wooded areas of this map unit managed for Virginia pine, eastern white pine, yellow-poplar, and mixed hardwoods. The Groseclose soil is soft when wet. As a result, the use of timber equipment is limited. The low available water capacity in the Litz soil limits seedling survival and growth.

The slope of both soils and the high shrink-swell potential in the Groseclose soil limit the use of this map unit as a site for dwellings. The moderate depth to bedrock in the Litz soil is a limitation on sites for dwellings with basements. Land shaping and grading help to overcome the slope. Reinforcing footings and foundations and backfilling with sandy material help to prevent the structural damage caused by shrinking and swelling.

The slope of both soils, the depth to bedrock in the Litz soil, and the slow permeability in the Groseclose soil limit the use of this map unit as a site for septic tank absorption fields. Increasing the size of the absorption field, digging deeper trenches under the distribution tile, and installing the absorption field on the contour help to overcome the slow permeability. In some areas bedrock close to the surface can interfere with the installation of the fields and with the movement of effluent in the soil.

Low strength and the high shrink-swell potential in areas of the Groseclose soil and the slope and potential for frost action in areas of the Litz soil limit the use of this map unit as a site for local roads and streets. Providing suitable subgrade or base material helps to prevent the damage to pavement caused by low strength, frost action, and shrinking and swelling. The roads should be built on the contour or designed so that they conform to the natural slope of the land.

The capability subclass is IIIe.

30D—Groseclose-Litz complex, 15 to 30 percent slopes. These moderately steep, well drained soils occur as areas so intermingled that mapping them separately is not practical. This map unit is about 50 percent very deep Groseclose soil, 35 percent moderately deep Litz soil, and 15 percent other soils. Areas are long and winding and range from about 4 to 65 acres in size.

The typical sequence, depth, and composition of the layers in the Groseclose soil are as follows—

Surface layer:
0 to 7 inches, dark yellowish brown silt loam

Subsoil:
7 to 13 inches, yellowish brown clay
13 to 26 inches, strong brown clay

26 to 37 inches, strong brown silty clay loam
37 to 50 inches, yellowish brown silty clay loam

Substratum:
50 to 65 inches, yellowish brown, light gray, and red silty clay loam

The typical sequence, depth, and composition of the layers in the Litz soil are as follows—

Surface layer:
0 to 5 inches, dark brown channery silt loam

Subsurface layer:
5 to 9 inches, yellowish brown channery silt loam

Subsoil:
9 to 13 inches, yellowish brown very channery silt loam
13 to 20 inches, yellowish brown extremely channery silt loam

Substratum:
20 to 29 inches, yellowish brown, weak red, and gray, weathered shale

Bedrock:
29 inches, shale

Included with these soils in mapping are the shallow, well drained Chiswell soils; the moderately deep, well drained Chilhowie soils; the very deep, moderately well drained Ernest soils; and the very deep, well drained Timberville soils. Chilhowie and Chiswell soils are on the same landscape as the Groseclose and Litz soils. Ernest and Timberville soils are in saddles, in depressions, and at the head of drainageways. Also included are some areas of severely eroded soils that have a surface layer of silty clay loam or silty clay and some areas of rock outcrop.

Soil properties—

Permeability: Slow in the Groseclose soil and moderate in the Litz soil
Available water capacity: Moderate in the Groseclose soil and low in the Litz soil
Depth to bedrock: More than 60 inches in the Groseclose soil and 20 to 40 inches in the Litz soil
Root zone: More than 60 inches in the Groseclose soil and 20 to 40 inches in the Litz soil
Shrink-swell potential: High in the Groseclose soil and low in the Litz soil
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Good
Depth to the water table: More than 72 inches
Potential for frost action: Moderate in the Groseclose soil and low in the Litz soil

Most areas are used as pasture (fig. 5). A small acreage is used for cultivated crops, orchards, homesite development, or woodland.

This map unit is poorly suited to cultivated crops. The high potential for erosion is a management concern. The low available water capacity and a moderate rooting depth are limitations in areas of the Litz soil. Most crops on the Litz soil show evidence of moisture stress during dry periods. In cultivated areas conservation tillage and a crop rotation that includes grasses and legumes help to control runoff and erosion and conserve moisture.

This map unit is moderately well suited to hay and pasture. The moderate depth to bedrock in the Litz soil restricts the growth of some grasses and legumes. Grazing when the soil is too wet compacts the surface layer. Overgrazing reduces the quantity and quality of forage. Deferring grazing as needed and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for northern red oak is moderately high. The estimated annual production of wood on north aspects is 302 board feet per acre on the Groseclose soil and 288 board feet per acre on the Litz soil. The estimated annual production of wood on south aspects is 270 board feet per acre on the Groseclose soil and 255 board feet per acre on the Litz soil. Wooded areas of this map unit managed for Virginia pine, eastern white pine, yellow-poplar, and mixed hardwoods. The Groseclose soil is soft when wet. As a result, the use of heavy harvesting equipment is limited. The low available water capacity in the Litz soil limits seedling survival and growth.

The slope of both soils and the high shrink-swell potential in the Groseclose soil limit the use of this map unit as a site for dwellings. The moderate depth to bedrock in the Litz soil is a limitation on sites for dwellings with basements. Land shaping and grading help to overcome the slope. Reinforcing footings and foundations and backfilling with sandy material help to prevent the structural damage caused by shrinking and swelling.

The slope of both soils, the depth to bedrock in the Litz soil, and the slow permeability in the Groseclose soil limit the use of this map unit as a site for septic tank absorption fields. Installing the field lines on the contour and at the correct grade helps to overcome the slope. Increasing the size of the absorption field, digging deeper trenches under the distribution tile, and installing the absorption field on the contour help to

Figure 5.—Orchardgrass and fescue pasture in an area of Groseclose-Litz complex, 15 to 30 percent slopes.

overcome the slow permeability. In some areas bedrock close to the surface can interfere with the installation of the fields and with the movement of effluent in the soil.

The slope of both soils, low strength and the high shrink-swell potential in areas of the Groseclose soil, and the potential for frost action in areas of the Litz soil limit the use of this map unit as a site for local roads and streets. The roads should be built on the contour or designed so that they conform to the natural slope of the land. Providing suitable subgrade or base material helps to prevent the damage to pavement caused by low strength, frost action, and shrinking and swelling.

The capability subclass is IVe.

30E—Groseclose-Litz complex, 30 to 45 percent slopes. These steep and very steep, well drained soils occur as areas so intermingled that mapping them separately is not practical. This map unit is about 45 percent very deep Groseclose soil, 35 percent moderately deep Litz soil, and 20 percent other soils. Areas are long and winding and range from about 4 to 25 acres in size.

The typical sequence, depth, and composition of the layers in the Groseclose soil are as follows—

Surface layer:

0 to 7 inches, dark yellowish brown silt loam

Subsoil:
7 to 13 inches, yellowish brown clay
13 to 26 inches, strong brown clay
26 to 37 inches, strong brown silty clay loam
37 to 50 inches, yellowish brown silty clay loam

Substratum:
50 to 65 inches, yellowish brown, light gray, and red silty clay loam

The typical sequence, depth, and composition of the layers in the Litz soil are as follows—

Surface layer:
0 to 5 inches, dark brown channery silt loam

Subsurface layer:
5 to 9 inches, yellowish brown channery silt loam

Subsoil:
9 to 13 inches, yellowish brown very channery silt loam
13 to 20 inches, yellowish brown extremely channery silt loam

Substratum:
20 to 29 inches, yellowish brown, weak red, and gray, weathered shale

Bedrock:
29 inches, shale

Included with these soils in mapping are the shallow, well drained Chiswell soils; the moderately deep, well drained Chilhowie soils; the very deep, moderately well drained Ernest soils; and the very deep, well drained Timberville soils. Chilhowie and Chiswell soils are on the same landscape as the Groseclose and Litz soils. Ernest and Timberville soils are on foot slopes and along drainageways. Also included are some areas of severely eroded soils that have a surface layer of silty clay loam or silty clay and some areas of rock outcrop.

Soil properties—

Permeability: Slow in the Groseclose soil and moderate in the Litz soil
Available water capacity: Moderate in the Groseclose soil and low in the Litz soil
Depth to bedrock: More than 60 inches in the Groseclose soil and 20 to 40 inches in the Litz soil
Root zone: More than 60 inches in the Groseclose soil and 20 to 40 inches in the Litz soil
Shrink-swell potential: High in the Groseclose soil and low in the Litz soil
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Good
Depth to the water table: More than 72 inches
Potential for frost action: Moderate in the Groseclose soil and low in the Litz soil

Most areas are used as woodland. A small acreage is used for pasture or orchards.

This map unit is not suited to cultivated crops because of the high potential for erosion on both soils and the low available water capacity and moderate rooting depth in the Litz soil.

This map unit is moderately well suited to hay and pasture. The slope limits the use of machinery. The moderate depth to bedrock in the Litz soil restricts the growth of some grasses and legumes. Grazing when the soil is too wet compacts the surface layer. Overgrazing reduces the quantity and quality of forage. Deferring grazing as needed and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for northern red oak is moderately high. The estimated annual production of wood on north aspects is 302 board feet per acre on the Groseclose soil and 288 board feet per acre on the Litz soil. The estimated annual production of wood on south aspects is 288 board feet per acre on the Groseclose soil and 255 board feet per acre on the Litz soil. Wooded areas of this map unit managed for Virginia pine, eastern white pine, yellow-poplar, and mixed hardwoods. The slope hinders the safe operation of heavy harvesting equipment. The low available water capacity in the Litz soil limits seedling survival and growth.

The slope of both soils and the high shrink-swell potential in the Groseclose soil limit the use of this map unit as a site for dwellings. The moderate depth to bedrock limits the use of the Litz soil as a site for dwellings with basements. Land shaping and grading help to overcome the slope. Reinforcing footings and foundations and backfilling with sandy material help to prevent the structural damage caused by shrinking and swelling.

The slope of both soils, the depth to bedrock in the Litz soil, and the slow permeability in the Groseclose soil severely limit the use of this map unit as a site for septic tank absorption fields. Areas of better suited soils should be selected.

The slope of both soils, low strength and the high shrink-swell potential in areas of the Groseclose soil, and the potential for frost action in areas of the Litz soil limit the use of this map unit as a site for local roads and streets. The roads should be built on the contour or designed so that they conform to the natural slope of the land. Providing suitable subgrade or base material

helps to prevent the damage to pavement caused by low strength, frost action, and shrinking and swelling.

The capability subclass is VIIe.

31C—Hayesville loam, 7 to 15 percent slopes. This very deep, strongly sloping, well drained soil is on narrow to broad, convex summits, shoulders, and side slopes on the Blue Ridge. Areas range from 5 to 30 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 10 inches, yellowish brown loam

Subsoil:
10 to 19 inches, yellowish red clay
19 to 36 inches, red clay
36 to 43 inches, red and strong brown sandy clay loam
43 to 54 inches, strong brown and brownish yellow sandy clay loam

Substratum:
54 to 65 inches, yellow and reddish yellow sandy loam

Included with this soil in mapping are the moderately deep, somewhat excessively drained Peaks and very deep, well drained Edneytown soils. These soils are on the same landscape as the Hayesville soil. Also included are some areas of soils that have a surface layer of gravelly loam and some areas of rock outcrop. Included areas make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: More than 60 inches
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: Medium
Tilth: Good
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as woodland or pasture. A few areas are cultivated.

This soil is moderately well suited to cultivated crops. The medium potential for erosion is a management concern. In cultivated areas contour farming, terraces, stripcropping, conservation tillage, cover crops, and a crop rotation that includes grasses and legumes can help to control runoff and erosion. Crop residue should be kept on the surface or incorporated into the plow layer.

This soil is moderately well suited to hay and pasture. Establishing and maintaining a mixture of grasses and legumes and preventing overgrazing are the major management concerns. Proper stocking rates, timely deferment of grazing, and applications of lime and fertilizer increase the production of feed and forage and help to control erosion. If the pasture is overgrazed, the runoff rate increases and erosion is excessive.

The potential productivity for eastern white pine is extremely high. The estimated annual production of wood is 940 board feet per acre. Wooded areas of this soil managed for mixed hardwoods, eastern white pine, and Virginia pine. Seeds and seedlings survive and grow well if competing vegetation is controlled. When wet, the soil is soft and cannot support heavy harvesting equipment.

The slope limits the use of this soil as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. Land shaping may be needed.

The moderate permeability and the slope limit the use of this soil as a site for septic tank absorption fields. Excavating deeper and longer field lines increases the absorption area and thus helps to overcome the moderate permeability. Installing the field lines at the correct grade and on the contour helps to overcome the slope.

The slope, the potential for frost action, and low strength limit the use of this soil as a site for local roads and streets. Land shaping and grading are needed. The roads should be built on the contour or designed so that they conform to the natural slope of the land. Providing suitable subgrade or base material and otherwise improving the traffic-supporting capacity of the roads help to prevent the damage caused by frost action and low strength.

The capability subclass is IIIe.

31D—Hayesville loam, 15 to 30 percent slopes. This very deep, moderately steep, well drained soil is on narrow to broad, convex summits, shoulders, and side slopes on the Blue Ridge. Areas range from 5 to 30 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 10 inches, yellowish brown loam

Subsoil:
10 to 19 inches, yellowish red clay

19 to 36 inches, red clay
36 to 43 inches, red and strong brown sandy clay loam
43 to 54 inches, strong brown and brownish yellow sandy clay loam

Substratum:
54 to 65 inches, yellow and reddish yellow sandy loam

Included with this soil in mapping are the moderately deep, somewhat excessively drained Peaks and very deep, well drained Edneytown soils. These soils are on the same landscape as the Hayesville soil. Also included are some areas of soils that have a surface layer of gravelly loam and some areas of rock outcrop. Included areas make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: More than 60 inches
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Good
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as woodland or pasture.

This soil is poorly suited to cultivated crops. The high potential for erosion is a management concern. In cultivated areas contour farming, terraces, stripcropping, conservation tillage, cover crops, and a crop rotation that includes grasses and legumes can help to control runoff and erosion. Crop residue should be kept on the surface or incorporated into the plow layer.

This soil is moderately well suited to hay and pasture. Establishing and maintaining a mixture of grasses and legumes and preventing overgrazing are the major management concerns. Proper stocking rates, timely deferment of grazing, and applications of lime and fertilizer increase the production of feed and forage and help to control erosion. If the pasture is overgrazed, the runoff rate increases and erosion is excessive.

The potential productivity for eastern white pine is extremely high. The estimated annual production of wood is 940 board feet per acre. Wooded areas of this soil managed for mixed hardwoods, eastern white pine, and Virginia pine. Seeds and seedlings survive and grow well if competing vegetation is controlled. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion. The slope hinders the safe operation of heavy harvesting equipment.

The slope limits the use of this soil as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. Land shaping may be needed.

The moderate permeability and the slope limit the use of this soil as a site for septic tank absorption fields. Excavating deeper and longer field lines increases the absorption area and thus helps to overcome the moderate permeability. Installing the field lines at the correct grade and on the contour helps to overcome the slope.

The slope, the potential for frost action, and low strength limit the use of this soil as a site for local roads and streets. Land shaping and grading are needed. The roads should be built on the contour or designed so that they conform to the natural slope of the land. Providing suitable subgrade or base material and otherwise improving the traffic-supporting capacity of the roads help to prevent the damage caused by frost action and low strength.

The capability subclass is IVe.

32A—Irongate loam, 0 to 3 percent slopes, occasionally flooded. This soil is very deep, nearly level, and moderately well drained. It is on flood plains along the major streams and the James River. Areas are long and winding and range from about 4 to 20 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 13 inches, dark brown loam

Subsoil:
13 to 19 inches, dark yellowish brown silt loam
19 to 29 inches, dark brown loam that has grayish brown and dark yellowish brown mottles
29 to 41 inches, dark brown fine sandy loam that has grayish brown and dark yellowish brown mottles

Substratum:
41 to 49 inches, dark yellowish brown fine sandy loam that has grayish brown mottles
49 to 62 inches, dark yellowish brown loam that has light brownish gray and strong brown mottles

Included with this soil in mapping are the very deep, well drained Derroc and Gladehill soils. These soils are in the slightly higher areas. They make up about 15 percent of this map unit.

Soil properties—

Permeability: Moderate in the subsoil and moderately rapid in the substratum
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: More than 60 inches
Shrink-swell potential: Low
Organic matter content: Moderate
Natural fertility: Low or medium
Surface runoff: Slow
Erosion potential: Low
Tilth: Good
Depth to the water table: 18 to 36 inches from December through April
Potential for frost action: Moderate
Flooding: Occasional, from December through May (usually in winter)

Most areas are used as pasture or hayland. Some areas are used for cultivated crops or woodland. This soil is classified as prime farmland.

This soil is well suited to cultivated crops. Alfalfa may be short lived because of seasonal wetness. Flooding occasionally damages crops and limits the use of machinery. Conservation tillage conserves moisture and helps to control erosion.

This soil is well suited to pasture and hay. Establishing and maintaining a mixture of grasses and legumes, deferring grazing as needed, controlling weeds, using proper stocking rates, and applying lime and fertilizer increase the productivity and carrying capacity of the pasture.

The potential productivity for yellow-poplar is high. The estimated annual production of wood is 610 board feet per acre. Seeds and seedlings survive and grow well if competing vegetation is controlled.

The occasional flooding and the seasonal high water table limit the use of this soil as a site for dwellings and septic tank absorption fields. An alternative site should be selected.

The flooding and the potential for frost action limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material helps to prevent the damage to road surfaces caused by frost action. Raising the surface by land shaping reduces the hazard of flooding.

The capability subclass is IIw.

33B—Laidig fine sandy loam, 2 to 7 percent slopes. This gently sloping soil is very deep and well drained. It is on colluvial fans, at the concave head of drainageways, and on foot slopes in the Blue Ridge and Appalachian Mountains. It has a fragipan. Areas are long and winding or roughly oval and range from about 4 to 15 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 1 inch, very dark grayish brown fine sandy loam

Subsurface layer:
1 to 7 inches, light yellowish brown fine sandy loam

Subsoil:
7 to 14 inches, brownish yellow loam
14 to 32 inches, yellowish brown clay loam
32 to 42 inches, yellowish brown channery clay loam that has strong brown and light yellowish brown mottles
42 to 65 inches, yellowish brown cobbly clay loam that has strong brown and light brownish gray mottles

Included with this soil in mapping are the very deep, moderately well drained Ernest soils and the very deep, well drained Tumbling soils. Ernest soils are in depressions. Tumbling soils are on the same landscape as the Laidig soil. Also included are some areas of soils that have cobbles on the surface, soils that have a substratum of clay, and soils that have a fragipan within a depth of 30 inches. Included soils make up about 15 percent of this map unit.

Soil properties—

Permeability: Moderate or moderately rapid above the fragipan and slow or moderately slow in the fragipan
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: Restricted by fragipan at a depth of 30 to 50 inches
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low
Surface runoff: Medium
Erosion potential: Medium
Tilth: Good
Water table: Perched at a depth of 30 to 48 inches in winter and early spring
Potential for frost action: Moderate

Most areas are used as pasture or woodland. A small acreage is used for cultivated crops. This soil is classified as prime farmland.

This soil is well suited to cultivated crops. The medium potential for erosion is a management concern. Conservation tillage, cover crops, and a crop rotation

that includes grasses and legumes can help to control runoff and erosion and conserve moisture.

This soil is well suited to hay and pasture. Overgrazing reduces the quantity and quality of forage and increases the runoff rate and the hazard of erosion. Deferring grazing as needed and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for scarlet oak is moderate. The estimated annual production of wood is 240 board feet per acre. Wooded areas of this soil are managed mainly for mixed hardwoods. Few limitations affect woodland management. Seeds and seedlings survive and grow well.

The seasonal high water table limits the use of this soil as a site for dwellings with basements. Installing drains by the footings and adequately sealing the basement walls and foundations help to overcome the seasonal wetness. The included Tumbling soils are better sites.

The slow or moderately slow permeability in the fragipan and the seasonal wetness limit the use of this soil as a site for septic tank absorption fields. Better suited soils, such as the included Tumbling soils, should be selected.

The potential for frost action limits the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material helps to overcome this limitation.

The capability subclass is IIe.

33C—Laidig fine sandy loam, 7 to 15 percent slopes. This strongly sloping soil is very deep and well drained. It is on colluvial fans, at the concave head of drainageways, and on foot slopes in the Blue Ridge and Appalachian Mountains. It has a fragipan. Areas are long and winding or roughly rectangular and range from about 5 to 150 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 1 inch, very dark grayish brown fine sandy loam

Subsurface layer:
1 to 7 inches, light yellowish brown fine sandy loam

Subsoil:
7 to 14 inches, brownish yellow loam
14 to 32 inches, yellowish brown clay loam
32 to 42 inches, yellowish brown channery clay loam that has strong brown and light yellowish brown mottles
42 to 65 inches, yellowish brown cobbly clay loam that has strong brown and light brownish gray mottles

Included with this soil in mapping are the moderately deep, well drained Berks and Gilpin soils; the very deep, moderately well drained Ernest soils; and the very deep, well drained Tumbling soils. Berks and Gilpin soils are on the adjacent uplands or on breaks to steeper slopes. Ernest soils are in depressions. Tumbling soils are on the same landscape as the Laidig soil. Also included are some areas of soils that have cobbles on the surface, soils that have a substratum of clay, and soils that have a fragipan within a depth of 30 inches. Included soils make up about 15 percent of this map unit.

Soil properties—

Permeability: Moderate or moderately rapid above the fragipan and slow or moderately slow in the fragipan
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: Restricted by fragipan at a depth of 30 to 50 inches
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Good
Water table: Perched at a depth of 30 to 48 inches in winter and early spring
Potential for frost action: Moderate

Most areas are used as woodland. A small acreage is used for cultivated crops or pasture.

This soil is moderately well suited to cultivated crops. The main limitations are the slope and the high potential for erosion. Conservation tillage, cover crops, and a crop rotation that includes grasses and legumes can help to control runoff and erosion and conserve moisture.

This soil is moderately well suited to hay and pasture. Overgrazing reduces the quantity and quality of forage and increases the runoff rate and the hazard of erosion. Deferring grazing as needed and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for scarlet oak is moderate. The estimated annual production of wood is 240 board feet per acre. Wooded areas of this soil are managed mainly for mixed hardwoods. Few limitations affect

woodland management. Seeds and seedlings survive and grow well.

The slope and the seasonal high water table limit the use of this soil as a site for dwellings. Land shaping and grading and designing the dwelling so that it conforms to the natural slope of the land help to overcome the slope. The seasonal wetness especially limits the use of this soil as a site for dwellings with basements, but installing drains by the footings and adequately sealing the basement walls and foundations help to overcome this limitation. The included Tumbling soils are better sites.

The slow or moderately slow permeability in the fragipan and the seasonal wetness limit the use of this soil as a site for septic tank absorption fields. Better suited soils, such as the included Tumbling soils, should be selected.

The potential for frost action and the slope limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material helps to overcome the potential for frost action. The roads should be built on the contour or designed so that they conform to the natural slope of the land.

The capability subclass is IIIe.

34B—Laidig cobbly fine sandy loam, 2 to 7 percent slopes. This gently sloping soil is very deep and well drained. It is on colluvial fans, at the concave head of drainageways, and on foot slopes in the Blue Ridge and Appalachian Mountains. It has a fragipan. Areas are long and winding or roughly rectangular and range from about 4 to 20 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 1 inch, very dark grayish brown cobbly fine sandy loam

Subsurface layer:
1 to 7 inches, light yellowish brown cobbly fine sandy loam

Subsoil:
7 to 14 inches, brownish yellow loam
14 to 32 inches, yellowish brown clay loam
32 to 42 inches, yellowish brown gravelly clay loam that has strong brown and light yellowish brown mottles
42 to 65 inches, yellowish brown cobbly clay loam that has strong brown and light brownish gray mottles

Included with this soil in mapping are the moderately deep, well drained Berks and Gilpin soils; the very deep, moderately well drained Ernest soils; and the very deep, well drained Tumbling soils. Berks and Gilpin soils are on the adjacent uplands or on breaks to steeper slopes. Ernest soils are in depressions. Tumbling soils are on the same landscape as the Laidig soil. Also included are some areas of soils that have stones on the surface and soils that have a fragipan within a depth of 30 inches. Included soils make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderate or moderately rapid above the fragipan and moderately slow in the fragipan
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: Restricted by the fragipan at a depth of 30 to 50 inches
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low
Surface runoff: Medium
Erosion potential: Medium
Tilth: Good, but cobbles interfere with tillage.
Water table: Perched at a depth of 30 to 48 inches in winter and early spring
Potential for frost action: Moderate

Most areas are used as woodland. A small acreage is used as pasture.

This soil is moderately well suited to cultivated crops. The main limitations are the slope, the low available water capacity, the medium potential for erosion, and the cobbles in the surface layer. The cobbles damage tillage equipment and interfere with planting. Conservation tillage, cover crops, and a crop rotation that includes grasses and legumes can help to control runoff and erosion and conserve moisture.

This soil is moderately well suited to hay and pasture. Overgrazing reduces the quantity and quality of forage and increases the runoff rate and the hazard of erosion. Deferring grazing as needed and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for scarlet oak is moderate. The estimated annual production of wood is 240 board feet per acre. Wooded areas of this soil are managed mainly for mixed hardwoods. Few limitations affect woodland management. Seeds and seedlings survive and grow well.

The seasonal high water table limits the use of this soil as a site for dwellings with basements. Installing drains by the footings and adequately sealing the basement walls and foundations help to overcome the seasonal wetness. The included Tumbling soils are better sites.

The moderately slow permeability in the fragipan and the seasonal wetness limit the use of this soil as a site for septic tank absorption fields. Better suited soils, such as the included Tumbling soils, should be selected.

The potential for frost action limits the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material helps to prevent the damage caused by frost action.

The capability subclass is IIIs.

34C—Laidig cobbly fine sandy loam, 7 to 15 percent slopes. This strongly sloping soil is very deep and well drained. It is on colluvial fans, at the concave head of drainageways, and on foot slopes in the Blue Ridge and Appalachian Mountains. It has a fragipan. Areas are long and winding or roughly rectangular and range from about 5 to 150 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 1 inch, very dark grayish brown cobbly fine sandy loam

Subsurface layer:
1 to 7 inches, light yellowish brown cobbly fine sandy loam

Subsoil:
7 to 14 inches, brownish yellow loam
14 to 32 inches, yellowish brown clay loam
32 to 42 inches, yellowish brown channery clay loam that has strong brown and light yellowish brown mottles
42 to 65 inches, yellowish brown cobbly clay loam that has strong brown and light brownish gray mottles

Included with this soil in mapping are the moderately deep, well drained Berks and Gilpin soils; the very deep, moderately well drained Ernest soils; and the very deep, well drained Tumbling soils. Berks and Gilpin soils are on the adjacent uplands or on breaks to steeper slopes. Ernest soils are in depressions. Tumbling soils are on the same landscape as the Laidig soil. Also included are some areas of soils that have stones on the surface, soils that have a substratum of clay, and soils that have a fragipan within a depth of 30 inches. Included soils make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderate or moderately rapid above the fragipan and moderately slow in the fragipan
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: Restricted by the fragipan at a depth of 30 to 50 inches
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Good, but cobbles interfere with tillage.
Water table: Perched at a depth of 30 to 48 inches in winter and early spring
Potential for frost action: Moderate

Most areas are used as woodland. A small acreage is used as pasture.

This soil is poorly suited to cultivated crops. The main limitations are the slope, the low available water capacity, the high potential for erosion, and the cobbles in the surface layer. The cobbles damage tillage equipment and interfere with planting. Conservation tillage, cover crops, and a crop rotation that includes grasses and legumes can help to control runoff and erosion and conserve moisture.

This soil is moderately well suited to hay and pasture. Overgrazing reduces the quantity and quality of forage and increases the runoff rate and the hazard of erosion. Deferring grazing as needed and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for scarlet oak is moderate. The estimated annual production of wood is 240 board feet per acre. Wooded areas of this soil are managed mainly for mixed hardwoods. Few limitations affect woodland management. Seeds and seedlings survive and grow well.

The slope and the seasonal high water table limit the use of this soil as a site for dwellings. Land shaping and grading and designing the dwelling so that it conforms to the natural slope of the land help to overcome the slope. Installing drains by the footings and adequately sealing the basement walls and foundations help to overcome the seasonal wetness. The included Tumbling soils are better sites.

The moderately slow permeability in the fragipan and the seasonal wetness limit the use of this soil as a site for septic tank absorption fields. Better suited soils, such as the included Tumbling soils, should be selected.

The potential for frost action, low strength, and the slope limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material helps to prevent the damage caused by low strength and frost action. The roads should be built on

the contour or designed so that they conform to the natural slope of the land.

The capability subclass is IVs.

34D—Laidig cobbly fine sandy loam, 15 to 30 percent slopes. This moderately steep soil is very deep and well drained. It is on colluvial fans, at the concave head of drainageways, and on foot slopes in the Blue Ridge and Appalachian Mountains. It has a fragipan. Areas are long and winding or roughly rectangular and range from about 10 to 50 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 1 inch, very dark grayish brown cobbly fine sandy loam

Subsurface layer:
1 to 7 inches, light yellowish brown cobbly fine sandy loam

Subsoil:
7 to 14 inches, brownish yellow loam
14 to 32 inches, yellowish brown clay loam
32 to 42 inches, yellowish brown channery clay loam that has strong brown and light yellowish brown mottles
42 to 65 inches, yellowish brown cobbly clay loam that has strong brown and light brownish gray mottles

Included with this soil in mapping are the moderately deep, well drained Berks, Dekalb, and Gilpin soils; the very deep, moderately well drained Ernest soils; and the very deep, well drained Tumbling soils. Berks, Dekalb, and Gilpin soils are on the adjacent uplands or on breaks to steeper slopes. Ernest soils are on toe slopes. Tumbling soils are on the same landscape as the Laidig soil. Also included are some areas of soils that have stones on the surface, soils that have a substratum of clay, and soils that have a fragipan within a depth of 30 inches. Included soils make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderate or moderately rapid above the fragipan and moderately slow in the fragipan
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: Restricted by the fragipan at a depth of 30 to 50 inches
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Good, but cobbles interfere with tillage.
Water table: Perched at a depth of 30 to 48 inches in winter and early spring
Potential for frost action: Moderate

Most areas are used as woodland. A small acreage is used as pasture.

This soil is unsuited to cultivated crops because of the slope, the low available water capacity, the high potential for erosion, and the cobbles in the surface layer. The cobbles damage tillage equipment and interfere with planting.

This soil is moderately well suited to hay and pasture. Overgrazing reduces the quantity and quality of forage and increases the runoff rate and the hazard of erosion. Deferring grazing as needed and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for scarlet oak is moderately high on north aspects and moderate on south aspects. The estimated annual production of wood is 260 board feet per acre on north aspects and 240 board feet per acre on south aspects. Wooded areas of this soil are managed for mixed hardwoods. Seeds and seedlings survive and grow well. The slope hinders the safe operation of heavy timber equipment.

The slope and the seasonal high water table limit the use of this soil as a site for dwellings. Land shaping and grading and designing the dwelling so that it conforms to the natural slope of the land help to overcome the slope. Installing drains by the footings and adequately sealing the basement walls and foundations help to overcome the seasonal wetness. The included Tumbling soils are better sites.

The moderately slow permeability in the fragipan and the seasonal wetness limit the use of this soil as a site for septic tank absorption fields. Better suited soils, such as the included Tumbling soils, should be selected.

The potential for frost action and the slope limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material helps to prevent the damage caused by frost action. The roads should be built on the contour or designed so that they conform to the natural slope of the land.

The capability subclass is VIs.

35C—Laidig cobbly fine sandy loam, 2 to 15 percent slopes, very stony. This gently sloping and strongly sloping soil is very deep and well drained. It is on colluvial fans, at the concave head of drainageways, and on foot slopes in the Blue Ridge and Appalachian

Mountains. It has a fragipan. Stones more than 10 inches in diameter and about 5 to 30 feet apart cover 0.1 to 3.0 percent of the surface. Areas are long and winding or roughly rectangular and range from about 5 to 150 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 1 inch, very dark grayish brown cobbly fine sandy loam

Subsurface layer:
1 to 7 inches, light yellowish brown cobbly fine sandy loam

Subsoil:
7 to 14 inches, brownish yellow loam
14 to 32 inches, yellowish brown clay loam
32 to 42 inches, yellowish brown channery clay loam that has strong brown and light yellowish brown mottles
42 to 65 inches, yellowish brown cobbly clay loam that has strong brown and light brownish gray mottles

Included with this soil in mapping are the moderately deep, well drained Berks, Dekalb, and Lily soils; the very deep, moderately well drained Ernest soils; and the very deep, well drained Oriskany and Tumbling soils. Berks, Dekalb, Lily, and Weikert soils are on the adjacent uplands or on breaks to steeper slopes. Ernest soils are in depressions. Oriskany and Tumbling soils are on the same landscape as the Laidig soil. Also included are areas of soils that have fewer stones on the surface and soils that have boulders on the surface. Included soils make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderate or moderately rapid above the fragipan and slow or moderately slow in the fragipan
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: Restricted by the fragipan at a depth of 30 to 50 inches
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid

Most areas are used as woodland. A small acreage is used as pasture.

This soil is unsuited to cultivated crops. Because of the stones on the surface, the use of machinery for seedbed preparation, cultivating, spraying, and harvesting is impractical.

This soil is moderately well suited to pasture. The stones limit the use of machinery. Overgrazing reduces the quantity and quality of forage and increases the runoff rate and the hazard of erosion. Deferring grazing as needed and applying good pasture management increase the production of feed and forage and help to control erosion.

The potential productivity for scarlet oak is moderate. The estimated annual production of wood is 240 board feet per acre. Wooded areas of this soil are managed for mixed hardwoods. Few limitations affect woodland management. Seeds and seedlings survive and grow well.

The slope and the seasonal high water table limit the use of this soil as a site for dwellings. Land shaping and grading and designing the dwelling so that it conforms to the natural slope of the land help to overcome the slope. Installing drains by the footings and adequately sealing the basement walls and foundations help to overcome the seasonal wetness. The included Tumbling soils are better sites.

The slow or moderately slow permeability in the fragipan and the seasonal wetness limit the use of this soil as a site for septic tank absorption fields. Better suited soils, such as the included Tumbling soils, should be selected.

The potential for frost action and the slope limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material helps to prevent the damage caused by frost action. The roads should be built on the contour or designed so that they conform to the natural slope of the land.

The capability subclass is VIIs.

35D—Laidig cobbly fine sandy loam, 15 to 30 percent slopes, very stony. This moderately steep soil is very deep and well drained. It is on colluvial fans, at the concave head of drainageways, and on foot slopes in the Blue Ridge and Appalachian Mountains. It has a fragipan. Stones more than 10 inches in diameter and about 5 to 30 feet apart cover 0.1 to 3.0 percent of the surface. Areas are long and winding or roughly rectangular and range from about 5 to 50 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 1 inch, very dark grayish brown cobbly fine sandy loam

Subsurface layer:
1 to 7 inches, light yellowish brown cobbly fine sandy loam

Subsoil:
7 to 14 inches, brownish yellow loam
14 to 32 inches, yellowish brown clay loam
32 to 42 inches, yellowish brown channery clay loam that has strong brown and light yellowish brown mottles
42 to 65 inches, yellowish brown cobbly clay loam that has strong brown and light brownish gray mottles

Included with this soil in mapping are the moderately deep, well drained Berks, Dekalb, and Lily soils; the very deep, moderately well drained Ernest soils; and the very deep, well drained Oriskany and Tumbling soils. Berks, Dekalb, Lily, and Weikert soils are on the adjacent uplands or on breaks to steeper slopes. Ernest soils are on toe slopes and in depressions. Oriskany and Tumbling soils are on the same landscape as the Laidig soil. Also included are areas of soils that have fewer stones on the surface and soils that have boulders on the surface. Included soils make up about 25 percent of this map unit.

Soil properties—

Permeability: Moderate or moderately rapid above the fragipan and slow or moderately slow in the fragipan
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: Restricted by the fragipan at a depth of 30 to 50 inches
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Restricted by the stones on the surface
Water table: Perched at a depth of 30 to 48 inches in winter and early spring
Potential for frost action: Moderate

Most areas are used as woodland. A small acreage is used as pasture.

This soil is unsuited to cultivated crops. Because of the stones on the surface, the use of machinery for seedbed preparation, cultivating, spraying, and harvesting is impractical.

This soil is moderately well suited to pasture. The stones limit the use of machinery. Overgrazing reduces the quantity and quality of forage and increases the runoff rate and the hazard of erosion. Deferring grazing as needed and applying good pasture management increase the production of feed and forage and help to control erosion.

The potential productivity for scarlet oak is moderately high on north aspects and moderate on south aspects. The estimated annual production of wood is 260 board feet per acre on north aspects and 240 board feet per acre on south aspects. Wooded areas of this soil are managed for mixed hardwoods. Seeds and seedlings survive and grow well. The slope hinders the safe operation of heavy harvesting equipment.

The slope and the seasonal high water table limit the use of this soil as a site for dwellings. Land shaping and grading and designing the dwelling so that it conforms to the natural slope of the land help to overcome the slope. Installing drains by the footings and adequately sealing the basement walls and foundations help to overcome the seasonal wetness. The included Tumbling soils are better sites.

The slow or moderately slow permeability in the fragipan, the slope, and the seasonal wetness limit the use of this soil as a site for septic tank absorption fields. Better suited soils, such as the included Tumbling soils, should be selected.

The potential for frost action and the slope limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material helps to prevent the damage caused by frost action. The roads should be built on the contour or designed so that they conform to the natural slope of the land.

The capability subclass is VIIs.

35E—Laidig cobbly fine sandy loam, 30 to 45 percent slopes, very stony. This very steep soil is very deep and well drained. It is on colluvial fans and foot slopes in the Blue Ridge and Appalachian Mountains. It has a fragipan. Stones more than 10 inches in diameter and about 5 to 30 feet apart cover 0.1 to 3.0 percent of the surface. Areas are oval or roughly rectangular and range from about 5 to 25 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 1 inch, very dark grayish brown cobbly fine sandy loam

Subsurface layer:
1 to 7 inches, light yellowish brown cobbly fine sandy loam

Subsoil:
7 to 14 inches, brownish yellow loam
14 to 32 inches, yellowish brown clay loam
32 to 42 inches, yellowish brown channery clay

loam that has strong brown and light yellowish brown mottles
42 to 65 inches, yellowish brown cobbly clay loam that has strong brown and light brownish gray mottles

Included with this soil in mapping are the moderately deep, well drained Berks, Dekalb, and Lily soils; the very deep, moderately well drained Ernest soils; and the very deep, well drained Oriskany soils. Berks, Dekalb, Lily, and Weikert soils are on the adjacent uplands or on breaks to steeper slopes. Ernest soils are on toe slopes. Oriskany soils are on the same landscape as the Laidig soil. Also included are areas of soils that have fewer stones on the surface, soils that have boulders on the surface, and soils that have a clayey substratum. Included soils make up about 25 percent of this map unit.

Soil properties—

Permeability: Moderate or moderately rapid above the fragipan and slow or moderately slow in the fragipan
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: Restricted by the fragipan at a depth of 30 to 50 inches
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Restricted by the stones on the surface
Water table: Perched at a depth of 30 to 48 inches in winter and early spring
Potential for frost action: Moderate

Nearly all areas are used as woodland.

This soil is unsuited to cultivated crops. Because of the stones on the surface, the use of machinery for seedbed preparation, cultivating, spraying, and harvesting is impractical.

This soil is poorly suited to pasture. The stones limit the use of machinery. Overgrazing reduces the quantity and quality of forage and increases the runoff rate and the hazard of erosion. Deferring grazing as needed and applying good pasture management increase the production of feed and forage and help to control erosion.

The potential productivity for scarlet oak is moderately high on north aspects and moderate on south aspects. The estimated annual production of wood is 260 board feet per acre on north aspects and 240 board feet per acre on south aspects. Wooded areas of this soil are managed for mixed hardwoods. Seeds and seedlings survive and grow well. The slope hinders the safe operation of heavy timber equipment. As a result, a cable system or other alternatives are needed for harvesting.

The slope and the seasonal high water table limit the use of this soil as a site for dwellings. Land shaping and grading and designing the dwelling so that it conforms to the natural slope of the land help to overcome the slope. Installing drains by the footings and adequately sealing the basement walls and foundations help to overcome the seasonal wetness. The better suited included soils should be considered.

The slow or moderately slow permeability in the fragipan, the slope, and the seasonal wetness limit the use of this soil as a site for septic tank absorption fields. Better suited soils should be selected.

The potential for frost action and the slope limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material helps to prevent the damage caused by frost action. The roads should be built on the contour or designed so that they conform to the natural slope of the land.

The capability subclass is VIIe.

36D—Lehew-Dekalb complex, 15 to 30 percent slopes, extremely stony. These moderately deep, moderately steep soils are on the summits, shoulders, and side slopes of ridges. They occur as areas so closely intermingled that mapping them separately is not practical. This map unit is about 45 percent well drained to excessively drained Lehew soil, 35 percent well drained Dekalb soil, and 20 percent other soils. Stones more than 10 inches in diameter and about 2 to 5 feet apart cover 3 to 15 percent of the surface. Areas are roughly rectangular or long and winding and range from about 5 to 50 acres in size.

The typical sequence, depth, and composition of the layers in the Lehew soil are as follows—

Surface layer:
0 to 1 inch, dark brown very channery fine sandy loam

Subsurface layer:
1 to 6 inches, reddish brown very channery fine sandy loam

Subsoil:
6 to 18 inches, reddish brown very channery loam
18 to 26 inches, reddish brown very channery fine sandy loam

Substratum:
26 to 31 inches, dark reddish brown extremely flaggy sandy loam

Bedrock:
31 inches, fractured, red sandstone

The typical sequence, depth, and composition of the layers in the Dekalb soil are as follows—

Surface layer:
0 to 1 inch, dark brown channery fine sandy loam

Subsurface layer:
1 to 6 inches, yellowish brown channery fine sandy loam

Subsoil:
6 to 21 inches, brownish yellow very channery fine sandy loam
21 to 32 inches, yellowish brown very channery fine sandy loam

Substratum:
32 to 34 inches, yellowish brown extremely flaggy fine sandy loam

Bedrock:
34 inches, fractured sandstone

Included with these soils in mapping are the moderately deep, well drained Lily soils; the deep, well drained Bailegap soils; the very deep, well drained Laidig soils; and the very deep, moderately well drained Ernest soils. Bailegap and Lily soils are on the same landscape as the Lehew and Dekalb soils. Ernest and Laidig soils are in saddles and depressions and at the concave head of drainageways. Also included are soils that have fewer stones on the surface and slopes of less than 15 percent.

Soil properties—

Permeability: Moderately rapid or rapid in the Lehew soil and rapid in the Dekalb soil
Available water capacity: Very low
Depth to bedrock: 20 to 40 inches
Root zone: 20 to 40 inches
Shrink-swell potential: Low
Organic matter content: Moderate
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Restricted by the stones on the surface
Depth to the water table: More than 72 inches
Potential for frost action: Low

Nearly all areas are used as woodland.

This map unit is unsuited to cultivated crops. Because of the stones on the surface, the use of machinery for seedbed preparation, spraying, and harvesting is impractical.

This map unit is poorly suited to pasture. The stones on the surface, the very low available water capacity, acidity, and the low natural fertility restrict the establishment of grasses and legumes on these soils. Applying lime and fertilizer, deferring grazing as needed, and applying good pasture management increase the production of feed and forage and help to control erosion.

The potential productivity for northern red oak is moderate. The estimated annual production of wood is 230 board feet per acre on north aspects and 218 board feet per acre on south aspects. Wooded areas of this map unit are managed for mixed hardwoods and pine. The growth and survival of seeds and seedlings are limited by the very low available water capacity and the low natural fertility. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion. The slope and the stones on the surface hinder the safe operation of heavy timber equipment.

The slope, the depth to bedrock, and large stones limit the use of this map unit as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. Because of the large stones and the moderate depth to bedrock, excavating is difficult. Building above the bedrock and landscaping with fill material help to overcome the depth to bedrock. The deeper included soils are better sites.

The slope, the depth to bedrock, and the moderately rapid or rapid permeability limit the use of this map unit as a site for septic tank absorption fields. The moderately rapid or rapid permeability results in a poor filtering capacity. The deeper, less steep included soils are better sites.

The slope, large stones, and the depth to bedrock limit the use this map unit as a site for local roads and streets. Planning grades and routes so that rock removal is not needed and blasting help to overcome the depth to bedrock. The roads should be designed so that they conform to the natural slope of the land. Removal of the large stones during road construction is necessary before a suitable base is provided.

The capability subclass is VIIs.

36E—Lehew-Dekalb complex, 30 to 60 percent slopes, extremely stony. These moderately deep, steep and very steep soils are on the side slopes of mountains. They occur as areas so closely intermingled that mapping them separately is not practical. This map unit is about 40 percent well drained to excessively drained Lehew soil, 35 percent well drained Dekalb soil, and 25 percent other soils. Stones more than 10 inches in diameter and about 2 to 5 feet apart cover 3 to 15 percent of the surface. Areas are roughly rectangular or

long and winding and range from about 20 to more than 200 acres in size.

The typical sequence, depth, and composition of the layers in the Lehew soil are as follows—

Surface layer:
0 to 1 inch, dark brown very channery fine sandy loam

Subsurface layer:
1 to 6 inches, reddish brown very channery fine sandy loam

Subsoil:
6 to 18 inches, reddish brown very channery loam
18 to 26 inches, reddish brown very channery fine sandy loam

Substratum:
26 to 31 inches, dark reddish brown extremely flaggy sandy loam

Bedrock:
31 inches, fractured, red sandstone

The typical sequence, depth, and composition of the layers in the Dekalb soil are as follows—

Surface layer:
0 to 1 inch, dark brown channery fine sandy loam

Subsurface layer:
1 to 6 inches, yellowish brown channery fine sandy loam

Subsoil:
6 to 21 inches, brownish yellow very channery fine sandy loam
21 to 32 inches, yellowish brown very channery fine sandy loam

Substratum:
32 to 34 inches, yellowish brown extremely flaggy fine sandy loam

Bedrock:
34 inches, fractured sandstone

Included with these soils in mapping are the moderately deep, well drained Lily soils; the deep, well drained Bailegap soils; and the very deep, well drained Laidig and Oriskany soils. Bailegap and Lily soils are on the same landscape as the Lehew and Dekalb soils. Laidig and Oriskany soils are on foot slopes and along drainageways. Also included are soils that have fewer stones on the surface and slopes of less than 30 percent.

Soil properties—

Permeability: Moderately rapid or rapid in the Lehew soil and rapid in the Dekalb soil
Available water capacity: Very low
Depth to bedrock: 20 to 40 inches
Root zone: 20 to 40 inches
Shrink-swell potential: Low
Organic matter content: Moderate
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Restricted by the stones on the surface
Depth to the water table: More than 72 inches
Potential for frost action: Low

Nearly all areas are used as woodland.

This map unit is unsuited to cultivated crops. Because of the stones on the surface, the use of machinery for seedbed preparation, spraying, and harvesting is impractical.

This map unit is poorly suited to pasture. The stones on the surface, the very low available water capacity, acidity, and the low natural fertility restrict the establishment of grasses and legumes on these soils. Applying lime and fertilizer, deferring grazing as needed, and applying good pasture management increase the production of feed and forage and help to control erosion.

The potential productivity for northern red oak is moderate. The estimated annual production of wood is 230 board feet per acre on north aspects and 218 board feet per acre on south aspects. Wooded areas of this map unit are managed for mixed hardwoods and pine. The growth and survival of seeds and seedlings are limited by the very low available water capacity and the low natural fertility. The slope and the stones on the surface hinder the safe operation of heavy timber equipment. As a result, a cable system or other alternatives are needed for harvesting.

The slope, the depth to bedrock, and large stones limit the use of this map unit as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. Because of the large stones and the moderate depth to bedrock, excavating is difficult. Building above the bedrock and landscaping with fill material help to overcome the depth to bedrock. The deeper included soils are better sites.

The slope, the depth to bedrock, and the moderately rapid or rapid permeability limit the use of this map unit as a site for septic tank absorption fields. The moderately rapid or rapid permeability results in a poor filtering capacity. The deeper, less steep included soils are better sites.

The slope, large stones, and the depth to bedrock

limit the use of this map unit as a site for local roads and streets. Planning grades and routes so that rock removal is not needed and blasting help to overcome the depth to bedrock. The roads should be designed so that they conform to the natural slope of the land. Removal of the large stones during road construction is necessary before a suitable base is provided.

The capability subclass is VIIe.

37C—Lily gravelly sandy loam, 2 to 15 percent slopes, very stony. This gently sloping and strongly sloping soil is moderately deep and well drained. It is on narrow to broad, convex summits and shoulders in the Appalachian Mountains. Stones more than 10 inches in diameter and about 5 to 30 feet apart cover 0.1 to 3.0 percent of the surface. Areas are long and winding and range from about 5 to 50 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 3 inches, dark brown gravelly sandy loam

Subsurface layer:
3 to 8 inches, light brown gravelly sandy loam

Subsoil:
8 to 29 inches, strong brown gravelly loam

Bedrock:
29 inches, fractured sandstone

Included with this soil in mapping are the moderately deep, well drained Dekalb soils; the moderately deep, somewhat excessively drained Lehew soils; the deep, well drained Bailegap soils; and the very deep, well drained Laidig soils. Bailegap, Dekalb, and Lehew soils are on the same landscape as the Lily soil. Laidig soils are in saddles and depressions and at the concave head of drainageways. Also included are some areas of rock outcrop. Included areas make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderately rapid
Available water capacity: Low
Depth to bedrock: 20 to 40 inches
Root zone: 20 to 40 inches
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low
Surface runoff: Slow or medium
Erosion potential: High
Tilth: Restricted by the stones on the surface
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Nearly all areas are used as woodland.

This soil is unsuited to cultivated crops. Because of the stones on the surface, the use of machinery for seedbed preparation, cultivating, spraying, and harvesting is impractical.

This soil is poorly suited to pasture and hay. The stones on the surface, the low available water capacity, acidity, and the low natural fertility restrict the establishment of grasses and legumes. Applying lime and fertilizer, deferring grazing as needed, and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for scarlet oak is moderate. The estimated annual production of wood is 240 board feet per acre. Wooded areas of this soil are managed for mixed hardwoods. The growth and survival of seeds and seedlings are limited by the low available water capacity and the low natural fertility. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion.

The depth to bedrock and the slope limit the use of this soil as a site for dwellings. Building above the bedrock and landscaping with fill material help to overcome the depth to bedrock. The deeper included soils are better sites. The dwelling should be designed so that it conforms to the natural slope of the land.

The depth to bedrock limits the use of this soil as a site for septic tank absorption fields. The deeper included soils are better sites.

The depth to bedrock, the slope, and the potential for frost action limit the use of this soil as a site for local roads and streets. Planning grades and routes so that rock removal is not needed and blasting help to overcome the depth to bedrock. The roads should be designed so that they conform to the natural slope of the land. Providing suitable subgrade or base material helps to prevent the damage to road surfaces caused by frost action.

The capability subclass is VIIs.

37D—Lily gravelly sandy loam, 15 to 30 percent slopes, very stony. This moderately steep soil is moderately deep and well drained. It is on narrow to broad, convex summits, shoulders, and side slopes in the Appalachian Mountains. Stones more than 10 inches in diameter and about 5 to 30 feet apart cover 0.1 to 3.0 percent of the surface. Areas are long and winding and range from about 15 to 100 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 3 inches, dark brown gravelly sandy loam

Subsurface layer:
3 to 8 inches, light brown gravelly sandy loam

Subsoil:
8 to 29 inches, strong brown gravelly loam

Bedrock:
29 inches, fractured sandstone

Included with this soil in mapping are the moderately deep, well drained Dekalb soils; the moderately deep, somewhat excessively drained Lehew soils; the deep, well drained Bailegap soils; and the very deep, well drained Laidig soils. Bailegap, Dekalb, and Lehew soils are on the same landscape as the Lily soil. Laidig soils are in saddles and depressions and at the concave head of drainageways. Also included are some areas of rock outcrop. Included areas make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderately rapid
Available water capacity: Low
Depth to bedrock: 20 to 40 inches
Root zone: 20 to 40 inches
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Restricted by the stones on the surface
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Nearly all areas are used as woodland.

This soil is unsuited to cultivated crops. Because of the stones on the surface, the use of machinery for seedbed preparation, cultivating, spraying, and harvesting is impractical.

This soil is poorly suited to pasture and hay. The stones on the surface, the low available water capacity, acidity, and the low natural fertility restrict the establishment of grasses and legumes. Applying lime and fertilizer, deferring grazing as needed, and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for scarlet oak is moderate. The estimated annual production of wood is 240 board feet per acre on north aspects and 232 board feet per acre on south aspects. Wooded areas of this soil are managed for mixed hardwoods. The growth and survival of seeds and seedlings are limited by the low available water capacity and the low natural fertility. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion. The slope hinders the safe operation of heavy timber equipment.

The slope and the depth to bedrock limit the use of this soil as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. Building above the bedrock and landscaping with fill material help to overcome the depth to bedrock. The deeper included soils are better sites.

The slope and the depth to bedrock limit the use of this soil as a site for septic tank absorption fields. The deeper, less steep included soils are better sites.

The slope, the depth to bedrock, and the potential for frost action limit the use of this soil as a site for local roads and streets. Planning grades and routes so that rock removal is not needed and blasting help to overcome the depth to bedrock. The roads should be designed so that they conform to the natural slope of the land. Providing suitable subgrade or base material helps to prevent the damage to road surfaces caused by frost action.

The capability subclass is VIIs.

37E—Lily gravelly sandy loam, 30 to 60 percent slopes, very stony. This steep and very steep soil is moderately deep and well drained. It is on convex side slopes in the Appalachian Mountains. Stones more than 10 inches in diameter and about 5 to 30 feet apart cover 0.1 to 3.0 percent of the surface. Areas are long and winding and range from about 15 to 75 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 3 inches, dark brown gravelly sandy loam

Subsurface layer:
3 to 8 inches, light brown gravelly sandy loam

Subsoil:
8 to 29 inches, strong brown gravelly loam

Bedrock:
29 inches, fractured sandstone

Included with this soil in mapping are the moderately deep, well drained Dekalb soils; the moderately deep, somewhat excessively drained Lehew soils; the deep, well drained Bailegap soils; and the very deep, well drained Laidig soils. Bailegap, Dekalb, and Lehew soils are on the same landscape as the Lily soil. Laidig soils are in saddles and depressions and at the concave head of drainageways. Also included are some areas of rock outcrop. Included areas make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderately rapid
Available water capacity: Low
Depth to bedrock: 20 to 40 inches
Root zone: 20 to 40 inches
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Restricted by the stones on the surface
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Nearly all areas are used as woodland.

This soil is unsuited to cultivated crops. Because of the stones on the surface, the use of machinery for seedbed preparation, cultivating, spraying, and harvesting is impractical.

This soil is poorly suited to pasture and hay. The stones on the surface, the low available water capacity, acidity, and the low natural fertility restrict the establishment of grasses and legumes. Applying lime and fertilizer, deferring grazing as needed, and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for scarlet oak is moderate. The estimated annual production of wood is 240 board feet per acre on north aspects and 232 board feet per acre on south aspects. Wooded areas of this soil are managed for mixed hardwoods. The growth and survival of seeds and seedlings are limited by the low available water capacity and the low natural fertility. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion. The slope hinders the safe operation of heavy timber equipment. As a result, a cable system or other alternatives are needed for harvesting.

The slope and the depth to bedrock limit the use of this soil as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. Building above the bedrock and landscaping with fill material help to overcome the depth to bedrock. The deeper included soils are better sites.

The slope and the depth to bedrock limit the use of this soil as a site for septic tank absorption fields. The deeper, less steep included soils are better sites.

The slope, the depth to bedrock, and the potential for frost action limit the use of this soil as a site for local roads and streets. Planning grades and routes so that rock removal is not needed and blasting help to overcome the depth to bedrock. The roads should be designed so that they conform to the natural slope of the land. Providing suitable subgrade or base material helps to prevent the damage to road surfaces caused by frost action.

The capability subclass is VIIe.

38A—Lindside silt loam, 0 to 2 percent slopes, occasionally flooded. This soil is very deep, nearly level, and moderately well drained. It is on flood plains along the major streams and rivers. Areas are long and winding and range from about 5 to 75 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 5 inches, brown silt loam

Subsoil:
5 to 14 inches, yellowish brown silt loam that has pale brown mottles
14 to 24 inches, yellowish brown silt loam that has pale brown and light brownish gray mottles
24 to 33 inches, yellowish brown silt loam that has light gray and pale brown mottles and thin strata of fine sandy loam

Substratum:
33 to 46 inches, pale brown silt loam that has light gray and strong brown mottles
46 to 65 inches, pale brown and dark grayish brown, stratified loam and silt loam

Included with this soil in mapping are the very deep, well drained Gladehill and Wolfgap soils. These soils are in the slightly higher areas. They make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderately slow or moderate
Available water capacity: High
Depth to bedrock: More than 60 inches
Root zone: More than 60 inches
Shrink-swell potential: Low
Organic matter content: Moderate
Natural fertility: High
Surface runoff: Slow
Erosion potential: Low
Tilth: Good
Depth to the water table: 18 to 36 inches from December through April
Potential for frost action: High
Flooding: Occasional, from December through April (usually during winter)

Most areas are used for cultivated crops or hay. Some areas are used as woodland or pasture. This soil is classified as prime farmland.

This soil is well suited to cultivated crops. Alfalfa may be short lived because of seasonal wetness. Flooding occasionally damages crops and limits the use of machinery. Lime is generally not needed. Conservation tillage conserves moisture and helps to control erosion.

This soil is well suited to pasture and hay. Establishing and maintaining a mixture of grasses and legumes, deferring grazing as needed, controlling weeds, using proper stocking rates, and applying fertilizer increase the productivity and carrying capacity of the pasture.

The potential productivity for yellow-poplar is high. The estimated annual production of wood is 540 board feet per acre. Seeds and seedlings survive and grow well if competing vegetation is controlled.

The occasional flooding and the seasonal high water table are the major limitations affecting the use of this soil as a site for dwellings and septic tank absorption fields. An alternative site should be selected.

The flooding and the potential for frost action limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material helps to prevent the damage to road surfaces caused by frost action. Raising the surface by land shaping reduces the hazard of flooding.

The capability subclass is IIw.

39A—Massanetta silt loam, 0 to 3 percent slopes, occasionally flooded. This soil is very deep, nearly level, and moderately well drained. It is on flood plains along small streams in a limestone valley. Areas are long and winding and range from about 4 to 20 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 11 inches, very dark grayish brown silt loam

Subsoil:
11 to 17 inches, very dark gray silt loam
17 to 28 inches, dark grayish brown silty clay loam

Substratum:
28 to 34 inches, grayish brown gravelly loam
34 to 40 inches, dark gray silt loam
40 to 52 inches, grayish brown silt loam that has pale brown mottles
52 to 65 inches, dark gray silt loam

Included with this soil in mapping are the very deep, well drained Gladehill and Wolfgap soils. These soils are in the slightly higher areas. They make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: High
Depth to bedrock: More than 60 inches
Root zone: More than 60 inches
Shrink-swell potential: Low
Organic matter content: High
Natural fertility: High
Surface runoff: Slow
Erosion potential: Low
Tilth: Good
Depth to the water table: 24 to 42 inches from January through April
Potential for frost action: Moderate
Flooding: Occasional, from May through September (usually during summer)

Most areas are used as pasture or hayland. Some areas are used for woodland or cultivated crops. This soil is classified as prime farmland.

This soil is well suited to cultivated crops. Alfalfa may be short lived because of seasonal wetness. Flooding occasionally damages crops and limits the use of machinery. An alkaline reaction results in some deficiencies in micronutrients. In cultivated areas conservation tillage conserves moisture and helps to control erosion.

This soil is well suited to pasture and hay. Establishing and maintaining a mixture of grasses and legumes, deferring grazing as needed, controlling weeds, using proper stocking rates, and applying fertilizer increase the productivity and carrying capacity of the pasture.

The potential productivity for yellow-poplar is high. The estimated annual production of wood is 540 board feet per acre. Seeds and seedlings survive and grow well if competing vegetation is controlled.

The occasional flooding and the seasonal high water table limit the use of this soil as a site for dwellings and septic tank absorption fields. An alternative site should be selected.

The flooding and the potential for frost action limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material helps to prevent the damage to road surfaces caused by frost action. Raising the surface by land shaping reduces the hazard of flooding.

The capability subclass is IIw.

40B—Moomaw loam, 2 to 7 percent slopes. This gently sloping soil is very deep and moderately well drained. It is on stream terraces throughout the survey area. It has a fragipan. Areas are long and winding or

oval, paralleling the course of the adjacent streams. They range from about 4 to 50 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 1 inch, grayish brown loam

Subsurface layer:
1 to 9 inches, pale brown loam

Subsoil:
9 to 21 inches, light yellowish brown loam
21 to 42 inches, brownish yellow loam
42 to 55 inches, yellowish brown clay loam that has red and gray mottles
55 to 65 inches, yellowish brown very cobbly clay loam that has red and light brownish gray mottles

Included with this soil in mapping are the very deep, well drained Alonzville soils; the moderately deep, well drained Berks soils; and the very deep, somewhat poorly drained Tygart soils. Alonzville soils are in the slightly higher areas and along the boundaries of this unit. Berks soils are on the adjacent uplands. Tygart soils are in slight depressions. Also included are some areas of soils that have a cobbly surface layer. Included soils make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderate above the fragipan and slow or moderately slow in the fragipan
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: Restricted by the fragipan at a depth of 18 to 30 inches
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low
Surface runoff: Medium
Erosion potential: Medium
Tilth: Good
Water table: Perched at a depth of 18 to 36 inches in winter and early spring
Potential for frost action: Moderate

Most areas are used as pasture or hayland. A few areas are used for cultivated crops or woodland.

This soil is moderately well suited to cultivated crops. The medium potential for erosion is a management concern. A shallow rooting depth, acidity, and the low natural fertility limit plant growth and crop yields. Alfalfa commonly is short lived because of seasonal wetness and restricted root growth. In cultivated areas contour farming, conservation tillage, and a crop rotation that includes grasses and legumes help to control runoff and erosion and conserve moisture.

This soil is moderately well suited to pasture. A shallow rooting depth, acidity, and the low natural fertility limit plant growth and yields. Establishing and maintaining a mixture of grasses and legumes, deferring grazing as needed, controlling weeds, using proper stocking rates, and applying lime and fertilizer increase the production of feed and forage and help to control erosion.

The potential productivity for eastern white pine is very high. The estimated annual production of wood is 681 board feet per acre. Wooded areas of this soil are managed for eastern white pine, Virginia pine, and mixed hardwoods. Seeds and seedlings survive and grow well if competing vegetation is controlled. The soil is soft when wet. As a result, the use of heavy equipment is restricted to dry periods. The rooting depth is restricted by the fragipan. Some trees are uprooted during windy periods. Thinning that does not leave the remaining trees widely spaced helps to prevent uprooting.

The seasonal high water table limits the use of this soil as a site for dwellings. Installing foundation drains and sealing foundations help to overcome the wetness. The well drained included soils are better sites.

The seasonal high water table and the slow or moderately slow permeability in the fragipan limit the use of this soil as a site for septic tank absorption fields. The well drained included soils are better sites.

The potential for frost action and the seasonal high water table limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material helps to prevent the damage to pavement caused by frost action. Installing a drainage system helps to prevent the damage caused by the seasonal high water table.

The capability subclass is IIe.

40C—Moomaw loam, 7 to 15 percent slopes. This strongly sloping soil is very deep and moderately well drained. It is on stream terraces throughout the survey area. It has a fragipan. Areas are long and winding or oval, paralleling the course of the adjacent streams. They range from about 4 to 50 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 1 inch, grayish brown loam

Subsurface layer:
1 to 9 inches, pale brown loam

Subsoil:

9 to 21 inches, light yellowish brown loam
21 to 42 inches, brownish yellow loam
42 to 55 inches, yellowish brown clay loam that has red and gray mottles
55 to 65 inches, yellowish brown very cobbly clay loam that has red and light brownish gray mottles

Included with this soil in mapping are the very deep, well drained Alonzville soils; the moderately deep, well drained Berks soils; and the very deep, somewhat poorly drained Tygart soils. Alonzville soils are in the slightly higher areas and along the boundaries of this unit. Berks soils are on the adjacent uplands. Tygart soils are in slight depressions. Also included are some areas of soils that have a cobbly surface layer. Included soils make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderate above the fragipan and slow or moderately slow in the fragipan
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: Restricted by the fragipan at a depth of 18 to 30 inches
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Good
Water table: Perched at a depth of 18 to 36 inches in winter and early spring
Potential for frost action: Moderate

Most areas are used as woodland. A few areas are used for cultivated crops or pasture.

This soil is moderately well suited to cultivated crops. A shallow rooting depth, acidity, and the low natural fertility limit plant growth and crop yields. Alfalfa commonly is short lived because of seasonal wetness and restricted root growth. In cultivated areas contour farming, conservation tillage, and a crop rotation that includes grasses and legumes help to control runoff and erosion and conserve moisture.

This soil is moderately well suited to pasture. A shallow rooting depth, acidity, and the low natural fertility limit plant growth and yields. Establishing and maintaining a mixture of grasses and legumes, deferring grazing as needed, controlling weeds, using proper stocking rates, and applying lime and fertilizer increase the production of feed and forage and help to control erosion.

The potential productivity for eastern white pine is very high. The estimated annual production of wood is 681 board feet per acre. Wooded areas of this soil are managed for eastern white pine, Virginia pine, and mixed hardwoods. Seeds and seedlings survive and grow well if competing vegetation is controlled. The soil is soft when wet. As a result, the use of heavy equipment is restricted to dry periods. The rooting depth is restricted by the fragipan. Some trees are uprooted during windy periods. Thinning that does not leave the remaining trees widely spaced helps to prevent uprooting.

The seasonal high water table and the slope limit the use of this soil as a site for dwellings. Installing foundation drains and sealing foundations help to overcome the wetness. The well drained included soils are better sites. The dwelling should be designed so that it conforms to the natural slope of the land. Land shaping may be needed.

The seasonal high water table and the slow permeability in the fragipan limit the use of this soil as a site for septic tank absorption fields. The well drained included soils are better sites.

The potential for frost action, the seasonal high water table, and the slope limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material helps to prevent the damage to pavement caused by frost action. Installing a drainage system helps to prevent the damage caused by the seasonal high water table and frost action. Building the roads on the contour helps to overcome the slope.

The capability subclass is IIIe.

41C—Oriskany very cobbly sandy loam, 2 to 15 percent slopes, extremely bouldery. This gently sloping and strongly sloping soil is very deep and well drained. It is on colluvial fans and the foot slopes of mountains. Boulders more than 2 feet in diameter and about 4 to 10 feet apart cover 3 to 15 percent of the surface. Areas are long and winding or roughly rectangular and range from about 4 to 25 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:

0 to 2 inches, very dark brown very cobbly sandy loam

Subsurface layer:

2 to 9 inches, yellowish brown very cobbly sandy loam

Subsoil:

9 to 34 inches, brown very cobbly sandy clay loam
34 to 56 inches, strong brown extremely cobbly clay loam

Substratum:
56 to 74 inches, strong brown very cobbly sandy clay loam

Included with this soil in mapping are the moderately deep, well drained Berks soils; the very deep, moderately well drained Ernest soils; and the very deep, well drained Laidig soils. Berks soils are on the adjacent uplands or on breaks to steeper slopes. Ernest soils are in depressions and along drainageways. Laidig soils are on the same landscape as the Oriskany soil. Also included are soils that have fewer boulders on the surface and soils that have a rubbly surface. Included soils make up about 15 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Low
Depth to bedrock: More than 60 inches
Root zone: 40 to more than 60 inches
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low
Surface runoff: Medium or rapid
Erosion potential: Medium
Tilth: Restricted by the stones and boulders on the surface
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as woodland. A small acreage is used as pasture.

This soil is unsuited to cultivated crops. Because of the stones and boulders on the surface, the use of machinery for seedbed preparation, cultivating, spraying, and harvesting is impractical.

This soil is poorly suited to pasture. The boulders limit the use of machinery. Overgrazing reduces the quantity and quality of forage and increases the runoff rate and the hazard of erosion. Deferring grazing as needed and applying good pasture management increase the production of feed and forage and help to control erosion.

The potential productivity for northern red oak is moderately high. The estimated annual production of wood is 288 board feet per acre. Wooded areas of this soil are managed mainly for mixed hardwoods and yellow-poplar. The boulders on the surface limit the use of harvesting equipment. The survival of seeds and seedlings is limited by droughtiness.

The slope and large stones and boulders limit the use of this soil as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. Excavating and disposing of stones and boulders can be difficult.

Large stones and the slope limit the use of this soil as a site for septic tank absorption fields. Land shaping or installing the field lines on the contour helps to overcome the slope. Excavating the large stones can be difficult, and material that has fewer stones should be used for backfilling.

Large stones and the slope limit the use of this soil as a site for local roads and streets. The roads should be built on the contour or designed so that they conform to the natural slope of the land. Removal of the large stones during road construction is necessary before a suitable base is provided.

The capability subclass is VIIs.

41D—Oriskany very cobbly sandy loam, 15 to 30 percent slopes, extremely bouldery. This moderately steep soil is very deep and well drained. It is on colluvial fans, at the head of drainageways, and on the foot slopes of mountains. Boulders more than 2 feet in diameter and about 4 to 10 feet apart cover 3 to 15 percent of the surface. Areas are long and winding or roughly rectangular and range from about 4 to 30 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 2 inches, very dark brown very cobbly sandy loam

Subsurface layer:
2 to 9 inches, yellowish brown very cobbly sandy loam

Subsoil:
9 to 34 inches, brown very cobbly sandy clay loam
34 to 56 inches, strong brown extremely cobbly clay loam

Substratum:
56 to 74 inches, strong brown very cobbly sandy clay loam

Included with this soil in mapping are the moderately deep, well drained Berks and Dekalb soils; the very deep, moderately well drained Ernest soils; and the very deep, well drained Laidig soils. Berks and Dekalb soils are on the adjacent uplands or on breaks to steeper slopes. Ernest soils are in depressions and along drainageways. Laidig soils are on the same landscape as the Oriskany soil. Also included are soils that have fewer boulders on the surface and soils that have a rubbly surface. Included soils make up about 15 percent of this map unit.

Soil properties—

Permeability: Moderate

Available water capacity: Low
Depth to bedrock: More than 60 inches
Root zone: 40 to more than 60 inches
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Restricted by the stones and boulders on the surface
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as woodland. A small acreage is used as pasture.

This soil is unsuited to cultivated crops. Because of the stones and boulders on the surface, the use of machinery for seedbed preparation, cultivating, spraying, and harvesting is impractical.

This soil is poorly suited to pasture. The boulders limit the use of machinery. Overgrazing reduces the quantity and quality of forage and increases the runoff rate and the hazard of erosion. Deferring grazing as needed and applying good pasture management increase the production of feed and forage and help to control erosion.

The potential productivity for northern red oak is moderately high. The estimated annual production of wood is 288 board feet per acre on north aspects and 277 board feet per acre on south aspects. Wooded areas of this soil are managed mainly for mixed hardwoods and yellow-poplar. The boulders on the surface and the slope limit the use of harvesting equipment. Seeds and seedlings survive and grow well.

The slope and large stones and boulders limit the use of this soil as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. Excavating and disposing of stones and boulders can be difficult.

Large stones and the slope limit the use of this soil as a site for septic tank absorption fields. Land shaping or installing the field lines on the contour helps to overcome the slope. Excavating the large stones can be difficult, and material that has fewer stones should be used for backfilling.

Large stones and the slope limit the use of this soil as a site for local roads and streets. The roads should be built on the contour or designed so that they conform to the natural slope of the land. Removal of the large stones during road construction is necessary before a suitable base is provided.

The capability subclass is VIIs.

42E—Oriskany extremely cobbly sandy loam, 30 to 60 percent slopes, rubbly. This steep and very steep soil is very deep and well drained. It is at the head of drainageways and on side slopes in the mountains. Boulders more than 2 feet in diameter and about 1 to 4 feet apart cover 15 to 75 percent of the surface. Areas are long and narrow and range from about 4 to 30 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 2 inches, very dark brown very cobbly sandy loam

Subsurface layer:
2 to 9 inches, yellowish brown very cobbly sandy loam

Subsoil:
9 to 34 inches, brown very cobbly sandy clay loam
34 to 56 inches, strong brown extremely cobbly clay loam

Substratum:
56 to 74 inches, strong brown very cobbly sandy clay loam

Included with this soil in mapping are the moderately deep, well drained Berks soils; the moderately deep, somewhat excessively drained Lehew and Dekalb soils; and the very deep, well drained Laidig soils. Berks, Lehew, and Dekalb soils are on the adjacent uplands. Laidig soils are on the same landscape as the Oriskany soil. Also included are areas that have fewer boulders on the surface. Included soils make up about 25 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Low
Depth to bedrock: More than 60 inches
Root zone: 40 to more than 60 inches
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Restricted by the stones and boulders on the surface
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as woodland. A very small acreage is used as permanent native pasture.

This soil is unsuited to cultivated crops. Because of the stones and boulders on the surface and the slope, the use of machinery for seedbed preparation, cultivating, spraying, and harvesting is impractical.

This soil is not suited to pasture. The stones and boulders on the surface and the slope limit the use of machinery and restrict the establishment of grasses and legumes.

The potential productivity for northern red oak is moderately high. The estimated annual production of wood is 288 board feet per acre on north aspects and 277 board feet per acre on south aspects. Wooded areas of this soil are managed mainly for mixed hardwoods and yellow-poplar. The survival of seeds and seedlings is limited by droughtiness. The boulders on the surface and the slope limit the use of harvesting equipment. As a result, a cable system or other alternatives are needed for harvesting.

The slope and large stones and boulders limit the use of this soil as a site for dwellings and septic tank absorption fields. An alternative site should be selected.

Large stones and the slope limit the use of this soil as a site for local roads and streets. The roads should be built on the contour or designed so that they conform to the natural slope of the land. Removal of the large stones during road construction is necessary before a suitable base is provided.

The capability subclass is VIIIs.

43E—Peaks gravelly sandy loam, 30 to 60 percent slopes, very stony. This steep and very steep soil is moderately deep and somewhat excessively drained. It is on convex side slopes on the Blue Ridge. Stones more than 10 inches in diameter and about 5 to 30 feet apart cover 0.1 to 3.0 percent of the surface. Areas are long and winding and range from about 10 to 50 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 4 inches, dark brown gravelly sandy loam

Subsoil:
4 to 16 inches, dark yellowish brown very gravelly sandy loam

Substratum:
16 to 24 inches, dark yellowish brown extremely channery sandy loam

Bedrock:
24 inches, granite gneiss

Included with this soil in mapping are the very deep, well drained Edneytown soils. These soils are on the same landscape as the Peaks soil. Also included are areas of rock outcrop and areas of soils that have an extremely stony surface and slopes of less than 30 percent. Included areas make up about 20 percent of this map unit.

Soil properties—
Permeability: Rapid
Available water capacity: Low
Depth to bedrock: 20 to 40 inches
Root zone: 20 to 40 inches
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low
Surface runoff: Very rapid
Erosion potential: High
Tilth: Restricted by the stones on the surface
Depth to the water table: More than 60 inches
Potential for frost action: Low

Nearly all areas are used as woodland.

This soil is not suited to cultivated crops. Because of the slope and the stones on the surface, the use of machinery for seedbed preparation, cultivating, spraying, and harvesting is impractical.

This soil is poorly suited to hay and pasture. The stones on the surface, the slope, the low available water capacity, the low natural fertility, and a high content of coarse fragments restrict the establishment of grasses and legumes. Applying fertilizer and lime and deferring grazing as needed increase the production of feed and forage.

The potential productivity for northern red oak is moderate. The estimated annual production of wood is 219 board feet per acre on north aspects and 204 board feet per acre on south aspects. The growth and survival of seeds and seedlings are limited by the low available water capacity and the low natural fertility. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion. The slope hinders the safe operation of heavy timber equipment. As a result, a cable system or other alternatives are needed for harvesting.

The slope and the depth to bedrock limit the use of this soil as a site for dwellings. The dwelling should be designed so that it conforms to the natural slope of the land. Less sloping soils are better sites. Building above the bedrock and landscaping with fill material help to overcome the depth to bedrock. The deeper included soils are better sites.

The slope, the depth to bedrock, and the rapid permeability limit the use of this soil as a site for septic tank absorption fields. The rapid permeability results in a poor filtering capacity. The deeper, less steep included soils are better sites.

The slope and the depth to bedrock limit the use of this soil as a site for local roads and streets. Planning grades and routes so that rock removal is not needed

and blasting help to overcome the depth to bedrock. The roads should be designed so that they conform to the natural slope of the land.

The capability subclass is VIIe.

43F—Peaks gravelly sandy loam, 60 to 80 percent slopes, very stony. This very steep soil is moderately deep and somewhat excessively drained. It is on convex side slopes on the Blue Ridge. Stones more than 10 inches in diameter and about 5 to 30 feet apart cover 0.1 to 3.0 percent of the surface. Areas are long and winding and range from about 30 to 200 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 4 inches, dark brown gravelly sandy loam

Subsoil:
4 to 16 inches, dark yellowish brown very gravelly sandy loam

Substratum:
16 to 24 inches, dark yellowish brown extremely channery sandy loam

Bedrock:
24 inches, granite gneiss

Included with this soil in mapping are the very deep, well drained Edneytown soils. These soils are on the same landscape as the Peaks soil. Also included are areas of rock outcrop and areas of soils that have an extremely stony surface and slopes of less than 60 percent. Included areas make up about 25 percent of this map unit.

Soil properties—

Permeability: Rapid
Available water capacity: Low
Depth to bedrock: 20 to 40 inches
Root zone: 20 to 40 inches
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low
Surface runoff: Very rapid
Erosion potential: High
Tilth: Restricted by the stones on the surface
Depth to the water table: More than 60 inches
Potential for frost action: Low

Nearly all areas are used as woodland.

This soil is not suited to cultivated crops. Because of the slope and the stones on the surface, the use of machinery for seedbed preparation, cultivating, spraying, and harvesting is impractical.

This soil is poorly suited to hay and pasture. The stones on the surface, the slope, the low available water capacity, the low natural fertility, and a high content of coarse fragments restrict the establishment of grasses and legumes. Applying fertilizer and lime and deferring grazing as needed increase the production of feed and forage. The slope and the stones on the surface hinder the safe operation of machinery.

The potential productivity for northern red oak is moderate. The estimated annual production of wood is 219 board feet per acre on north aspects and 204 board feet per acre on south aspects. The growth and survival of seeds and seedlings are limited by the low available water capacity and the low natural fertility. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion. The slope hinders the safe operation of heavy timber equipment. As a result, a cable system or other alternatives are needed for harvesting.

The slope, the depth to bedrock, and the rapid permeability limit the use of this soil as a site for septic tank absorption fields. The rapid permeability results in a poor filtering capacity. The deeper, less steep included soils are better sites.

The slope and the depth to bedrock limit the use of this soil as a site for local roads and streets. Planning grades and routes so that rock removal is not needed and blasting help to overcome the depth to bedrock. The roads should be designed so that they conform to the natural slope of the land.

The capability subclass is VIIe.

44—Pits, quarries. This map unit consists of open excavations from which limestone, shale, or iron ore is mined. Little or no vegetation grows in these excavations. In some of the excavations, pools of water are common.

Limestone and dolomite pits are near Buchanan, Blue Ridge, Eagle Rock, and Rocky Point. They are as much as 100 acres in size. They are used as a source of crushed stone for road construction or as a source of agricultural lime.

The shale pits are near U.S. Highway 460 in Webster. They are as much as 80 acres in size. The shale is used in the manufacture of bricks.

Limestone and shale pits west of Haymakertown are sources of material used in the manufacture of cement. They range from 10 to 40 acres in size.

Abandoned pits west of Oriskany formerly were sources of iron ore. They are as much as 75 acres in size.

Because of the depth to bedrock and a low available water capacity, this map unit is not suited to farming, woodland, or wildlife habitat. The suitability for urban

and recreational uses is fair or poor. Onsite investigation is needed to determine the suitability for any intended use.

No capability classification is assigned.

45A—Purdy silty clay loam, 0 to 4 percent slopes. This nearly level and gently sloping soil is very deep and poorly drained. It is on slightly concave terraces along the major streams and the James River. Areas are long and winding or oval and range from about 4 to 15 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 7 inches, dark grayish brown silty clay loam

Subsoil:
7 to 11 inches, light brownish gray silty clay loam
11 to 22 inches, gray clay that has strong brown mottles
22 to 32 inches, dark gray clay that has strong brown mottles

Substratum:
32 to 47 inches, gray and light gray clay loam
47 to 55 inches, light gray silty clay loam that has strong brown and greenish gray mottles
55 to 65 inches, gray and light gray clay loam that has yellowish brown mottles

Included with this soil in mapping are the very deep, somewhat poorly drained Tygart soils and the very deep, moderately well drained Moomaw and Zoar soils. Moomaw and Zoar soils are in the slightly higher areas. Tygart soils are on the same landscape as the Purdy soil. Also included are some areas of soils that are ponded in late winter and soils that have slopes of more than 4 percent. Included soils make up about 15 percent of this map unit.

Soil properties—

Permeability: Very slow or slow
Available water capacity: Moderate
Root zone: Restricted by the water table
Shrink-swell potential: Moderate
Organic matter content: Moderate
Natural fertility: Low
Surface runoff: Slow or medium
Erosion potential: Low
Tilth: Fair at optimum soil moisture content
Depth to the water table: 12 inches from winter through late spring
Potential for frost action: Moderate

Most areas are used as pasture. A few areas are used for cultivated crops or woodland (fig. 6).

Because of the seasonal high water table, this soil is poorly suited to cultivated crops. It is soft when wet. As a result, the use of heavy equipment is restricted to dry periods. Alfalfa is short lived because of seasonal wetness. In cultivated areas conservation tillage and a crop rotation that includes grasses and legumes help to control runoff, improve tilth, and conserve moisture.

This soil is moderately well suited to pasture. Establishing and maintaining a mixture of grasses and legumes, deferring grazing as needed, controlling weeds, using proper stocking rates, and applying lime and fertilizer increase the production of feed and forage and help to control erosion. Grazing during wet periods often cuts up the sod and compacts the surface layer and thereby reduces yields and increases the hazard of erosion.

The potential productivity for yellow-poplar is high. The estimated annual production of wood is 500 board feet per acre. Wooded areas of this soil are managed for eastern white pine, Virginia pine, and yellow-poplar. Seeds and seedlings survive and grow well if competing vegetation is controlled. The soil is soft when wet. As a result, the use of heavy timber equipment is restricted to dry periods. The rooting depth is restricted by the seasonal high water table. Some trees are uprooted during windy periods. Thinning that does not leave the remaining trees widely spaced helps to prevent uprooting.

The seasonal high water table limits the use of this soil as a site for dwellings. An alternative site should be selected.

The seasonal high water table and the very slow or slow permeability in the subsoil limit the use of this soil as a site for septic tank absorption fields. An alternative site should be selected.

Low strength, the potential for frost action, and the seasonal high water table limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material helps to prevent the damage to pavement caused by low strength and frost action.

The capability subclass is IVw.

46F—Rock outcrop-Opequon complex, 45 to 100 percent slopes. This map unit consists of outcrops of limestone bedrock intermingled with a steep and very steep, shallow, well drained Opequon soil. It is on side slopes above streams and rivers in a limestone valley. The Rock outcrop and Opequon soil occur as areas so intermingled that mapping them separately is not practical. The unit is about 60 percent Rock outcrop, 25 percent Opequon soil, and 15 percent other soils. Areas

Figure 6.—A wooded area of Purdy silty clay loam, 0 to 4 percent slopes. This soil is suited to water-tolerant tree species, such as white oak.

are long and winding and range from 5 to 35 acres in size.

The typical sequence, depth, and composition of the layers in the Opequon soil are as follows—

Surface layer:
0 to 6 inches, dark brown silty clay loam

Subsoil:
6 to 17 inches, yellowish red clay

Bedrock:
17 inches, limestone

Included in this map unit are the moderately deep, well drained Carbo and Litz soils. These soils are on the same landscape as the Opequon soil. Also included are some areas of cliffs and escarpments adjacent to the larger streams and the James River.

Properties of the Opequon soil—

Permeability: Slow or moderately slow
Available water capacity: Very low
Depth to bedrock: 12 to 20 inches
Root zone: Same as the depth to bedrock
Shrink-swell potential: High
Organic matter content: Moderate
Natural fertility: High
Surface runoff: Very rapid
Erosion potential: High
Tilth: Severely limited by the Rock outcrop
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as woodland. A few small areas have been cleared of trees and are used as pasture.

This unit is not suited to cultivated crops. The Rock outcrop and the slope limit the use of machinery for seedbed preparation, cultivation, spraying, and harvesting.

This map unit is poorly suited to pasture. The slope and the Rock outcrop limit the use of machinery. The very firm clay in the subsoil, the shallowness to bedrock, and droughtiness during the growing season restrict the growth of some grasses and legumes. Grazing when the soil is too wet compacts the surface layer. Timely deferment of grazing, applications of fertilizer, and weed and brush control increase the production of forage and help to control erosion.

The potential productivity of the Opequon soil for Virginia pine is moderately high. The estimated annual production of wood is 390 board feet on north aspects and 288 board feet per acre on south aspects. Areas of this map unit are managed for Virginia pine and mixed hardwoods. The survival of seeds and seedlings is affected by droughtiness during the growing season. Windthrow is a hazard on the Opequon soil. The Rock outcrop and the slope hinder the safe operation of heavy equipment. As a result, a cable system or other alternatives are needed for harvesting.

The slope, the depth to bedrock, the Rock outcrop, and the high shrink-swell potential limit the use of this map unit as a site for dwellings, septic tank absorption fields, and local roads and streets. Overcoming these limitations is difficult and expensive. Alternative soils that are deeper and not so steep should be considered.

The capability subclass is VIIs.

47C—Rushtown very channery silt loam, 3 to 15 percent slopes. This gently sloping and strongly sloping soil is very deep and excessively drained. It is on foot slopes and colluvial fans below uplands underlain by shale and siltstone. Areas are roughly oval or rectangular and range from about 4 to 25 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 13 inches, brown very channery silt loam

Subsoil:
13 to 19 inches, strong brown very channery silt loam
19 to 27 inches, strong brown extremely channery silt loam

Substratum:
27 to 57 inches, yellowish brown extremely channery silt loam
57 to 65 inches, strong brown very channery silt loam

Included with this soil in mapping are the very deep, well drained Shelocta soils and the very deep, moderately well drained Ernest soils. Shelocta soils are in the slightly higher areas. Ernest soils are in depressions. Also included are soils that have a flaggy surface layer. Included soils make up about 15 percent of this map unit.

Soil properties—

Permeability: Rapid or very rapid
Available water capacity: Low
Depth to bedrock: More than 60 inches
Root zone: 20 to 40 inches
Shrink-swell potential: Low
Organic matter content: Moderate
Natural fertility: Low
Surface runoff: Medium
Erosion potential: Medium
Tilth: Fair; shale channers interfere with tillage.

Depth to the water table: More than 72 inches
Potential for frost action: Low

Most areas are used as pasture. A few areas are used for cultivated crops or woodland.

This soil is poorly suited to cultivated crops. The rock fragments in the surface layer damage tillage equipment and interfere with planting. The soil is droughty during dry periods. The medium potential for erosion also is a management concern. Conservation tillage, cover crops, and a crop rotation that includes grasses and legumes can help to control runoff and erosion, minimize crusting, and conserve moisture.

This soil is moderately well suited to hay and pasture. Overgrazing reduces the quantity and quality of forage and increases the runoff rate and the hazard of erosion. Deferring grazing as needed and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for eastern white pine is high. The estimated annual production of wood is 664 board feet per acre. Wooded areas of this soil are managed for eastern white pine, Virginia pine, and mixed hardwoods. The low available water capacity limits seedling survival and growth.

The slope limits the use of this soil as a site for dwellings. Land shaping and grading and designing the dwelling so that it conforms to the natural slope of the land help to overcome this limitation. The dwelling should not be built in areas of the included Ernest soils, which have a seasonal high water table.

The very rapid or rapid permeability limits the use of this soil as a site for septic tank absorption fields. The soil may not adequately filter the effluent. As a result, the ground water may be contaminated. The included Shelocta soils are better sites.

The slope limits the use of this soil as a site for local roads and streets. Land shaping and grading are needed. The roads should be built on the contour or designed so that they conform to the natural slope of the land.

The capability subclass is IVe.

48C—Sequoia silt loam, 7 to 15 percent slopes. This strongly sloping soil is moderately deep and well drained. It is on the slightly convex summits, shoulders, and side slopes of mountain foothills. Areas are roughly oval or elongated. They range from about 4 to 25 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 2 inches, dark brown silt loam

Subsurface layer:
2 to 6 inches, yellowish brown silt loam

Subsoil:
6 to 13 inches, strong brown channery silty clay
13 to 24 inches, yellowish red channery clay that has red mottles
24 to 30 inches, yellowish red channery silty clay

Bedrock:
30 inches, brownish yellow, soft shale

Included with this soil in mapping are the moderately deep, well drained Berks and Chilhowie soils. These soils are on the same landscape as the Sequoia soil. Also included are some areas of soils that have a surface layer of silty clay loam and some areas of very stony soils. Included soils make up about 15 percent of this map unit.

Soil properties—

Permeability: Moderately slow
Available water capacity: Moderate
Depth to bedrock: 20 to 40 inches
Root zone: 20 to 40 inches
Shrink-swell potential: Moderate
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Fair
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as woodland. A few areas are used as pasture.

This soil is poorly suited to cultivated crops. The high potential for erosion is a management concern. Conservation tillage, cover crops, and a crop rotation that includes grasses and legumes can help to control runoff and erosion and conserve moisture.

This soil is moderately well suited to hay and pasture. Overgrazing reduces the quantity and quality of forage and increases the runoff rate and the hazard of erosion. Deferring grazing as needed and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for Virginia pine is high. The estimated annual production of wood is 599 board feet per acre. Wooded areas of this soil are managed for Virginia pine, eastern white pine, and mixed hardwoods. Seeds and seedlings survive and grow well.

The moderate shrink-swell potential, the slope, and the depth to bedrock limit the use of this soil as a site for dwellings. Providing extra reinforcement in the

footings helps to overcome the shrink-swell potential. The dwelling should be designed so that it conforms to the natural slope of the land. If dwellings with basements are built, ripping the bedrock can help to overcome the depth to bedrock. The deeper included soils are better sites.

The depth to bedrock and the moderately slow permeability limit the use of this soil as a site for septic tank absorption fields. Better suited soils should be selected.

Low strength and the potential for frost action limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material helps to overcome these limitations.

The capability subclass is IVe.

48D—Sequoia silt loam, 15 to 30 percent slopes. This moderately steep and steep soil is moderately deep and well drained. It is on the side slopes of mountain foothills. Areas are roughly oval or elongated. They range from about 8 to 60 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 2 inches, dark brown silt loam

Subsurface layer:
2 to 6 inches, yellowish brown silt loam

Subsoil:
6 to 13 inches, strong brown channery silty clay
13 to 24 inches, yellowish red channery clay that has red mottles
24 to 30 inches, yellowish red channery clay

Bedrock:
30 inches, brownish yellow, soft shale

Included with this soil in mapping are the moderately deep, well drained Berks and Chilhowie soils and the very deep, well drained Laidig and Tumbling soils. Berks and Chilhowie soils are on the same landscape as the Sequoia soil. Laidig soils are along drainageways. Tumbling soils are on the lower foot slopes. Also included are some areas of soils that have a surface layer of silty clay loam, some areas of very stony soils, and some areas of soils that have slopes of more than 30 percent. Included soils make up about 25 percent of this map unit.

Soil properties—

Permeability: Moderately slow
Available water capacity: Moderate
Depth to bedrock: 20 to 40 inches
Root zone: 20 to 40 inches
Shrink-swell potential: Moderate
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: High
Tilth: Fair
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as woodland. A few areas are used as pasture.

This soil is not suited to cultivated crops. The high potential for erosion is a management concern. The low natural fertility, high acidity, and a moderate rooting depth reduce crop production.

This soil is moderately well suited to hay and pasture. Overgrazing reduces the quantity and quality of forage and increases the runoff rate and the hazard of erosion. Deferring grazing as needed and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for Virginia pine is high. The estimated annual production of wood is 599 board feet per acre on north aspects and 502 board feet per acre on south aspects. Wooded areas of this soil are managed for Virginia pine, eastern white pine, and mixed hardwoods. Seeds and seedlings survive and grow well. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion. The slope hinders the safe operation of heavy harvesting equipment.

The moderate shrink-swell potential, the slope, and the depth to bedrock limit the use of this soil as a site for dwellings. Providing extra reinforcement in the footings helps to prevent the damage caused by shrinking and swelling. The dwelling should be designed so that it conforms to the natural slope of the land. If dwellings with basements are built, ripping the bedrock can help to overcome the depth to bedrock. The deeper included soils are better sites.

The slope, the depth to bedrock, and the moderately slow permeability limit the use of this soil as a site for septic tank absorption fields. Better suited soils should be selected.

Low strength, the potential for frost action, and the slope limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material helps to prevent the damage caused by low strength and frost action. The roads should be built on the contour or designed so that they conform to the natural slope of the land.

The capability subclass is VIe.

49C—Shelocta gravelly silt loam, 7 to 15 percent slopes. This strongly sloping soil is very deep and well drained. It is on foot slopes and colluvial fans below uplands underlain by shale, sandstone, and siltstone. Areas are roughly oval or elongated and range from about 4 to 20 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 1 inch, very dark grayish brown gravelly silt loam

Subsurface layer:
1 to 8 inches, light yellowish brown gravelly silt loam

Subsoil:
8 to 18 inches, yellowish brown channery silty clay loam
18 to 41 inches, strong brown very channery silty clay loam

Substratum:
41 to 65 inches, mottled yellowish brown, yellowish red, and light olive brown very channery silt loam

Included with this soil in mapping are the moderately deep, well drained Berks and Gilpin soils and the very deep, moderately well drained Ernest soils. Berks and Gilpin soils are on uplands or on breaks to steeper slopes. Ernest soils are in depressions. Included soils make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: More than 60 inches
Shrink-swell potential: Low
Organic matter content: Moderate
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: Medium
Tilth: Fair; gravel interferes with tillage.
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as woodland. A few areas are used as pasture.

This soil is moderately well suited to cultivated crops. The gravel in the surface layer damages tillage equipment and interferes with planting. The medium potential for erosion is a management concern. Conservation tillage, cover crops, and a crop rotation that includes grasses and legumes can help to control runoff and erosion, minimize crusting, and conserve moisture.

This soil is moderately well suited to hay and pasture. Overgrazing reduces the quantity and quality of forage and increases the runoff rate and the hazard of erosion. Deferring grazing as needed and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for white oak is moderately high. The estimated annual production of wood is 280 board feet per acre. Wooded areas of this soil are managed for eastern white pine, Virginia pine, and mixed hardwoods. Seeds and seedlings survive and grow well if competing vegetation is controlled.

The slope limits the use of this soil as a site for dwellings. Land shaping and grading and designing the dwelling so that it conforms to the natural slope of the land help to overcome this limitation.

The slope and the moderate permeability limit the use of this soil as a site for septic tank absorption fields. Installing the field lines at the correct grade and on the contour helps to overcome the slope. Enlarging the absorption field and excavating wider and deeper field lines help to overcome the moderate permeability.

The slope limits the use of this soil as a site for local roads and streets. Land shaping and grading are needed. The roads should be built on the contour or designed so that they conform to the natural slope of the land.

The capability subclass is IIIe.

49D—Shelocta gravelly silt loam, 15 to 30 percent slopes. This moderately steep soil is very deep and well drained. It is on foot slopes and colluvial fans below uplands underlain by shale, sandstone, and siltstone. Areas are elongated and range from about 4 to 15 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 1 inch, very dark grayish brown gravelly silt loam

Subsurface layer:
1 to 8 inches, light yellowish brown gravelly silt loam

Subsoil:
8 to 18 inches, yellowish brown channery silty clay loam
18 to 41 inches, strong brown very channery silty clay loam

Substratum:
41 to 65 inches, mottled yellowish brown, yellowish red, and light olive brown very channery silt loam

Included with this soil in mapping are the moderately deep, well drained Berks and Gilpin soils and the very deep, moderately well drained Ernest soils. Berks and Gilpin soils are on the adjacent uplands. Ernest soils are in depressions. Included soils make up about 25 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: More than 60 inches
Shrink-swell potential: Low
Organic matter content: Moderate
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: Medium
Tilth: Fair; gravel interferes with tillage.
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as woodland. A few areas are used as pasture.

This soil is poorly suited to cultivated crops. The gravel in the surface layer damages tillage equipment and interferes with planting. The high potential for erosion is a management concern. Conservation tillage, cover crops, and a crop rotation that includes grasses and legumes can help to control runoff and erosion, minimize crusting, and conserve moisture.

This soil is moderately well suited to hay and pasture. Overgrazing reduces the quantity and quality of forage and increases the runoff rate and the hazard of erosion. Deferring grazing as needed and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for white oak is moderately high on north aspects and moderate on south aspects. The estimated annual production of wood is 280 board feet per acre on north aspects and 253 board feet per acre on south aspects. Wooded areas of this soil are managed for eastern white pine, Virginia pine, and mixed hardwoods. Seeds and seedlings survive and grow well if competing vegetation is controlled. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion. The slope hinders the safe operation of heavy harvesting equipment.

The slope limits the use of this soil as a site for dwellings. Land shaping and grading and designing the dwelling so that it conforms to the natural slope of the land help to overcome this limitation.

The slope and the moderate permeability limit the use of this soil as a site for septic tank absorption fields. Installing the field lines at the correct grade and on the contour helps to overcome the slope. Enlarging the absorption field and excavating wider and deeper field lines help to overcome the moderate permeability.

The slope limits the use of this soil as a site for local roads and streets. Land shaping and grading are needed. The roads should be built on the contour or designed so that they conform to the natural slope of the land.

The capability subclass is IVe.

50B—Shottower loam, 2 to 7 percent slopes. This gently sloping soil is very deep and well drained. It is on narrow to broad, high terraces along the major streams and the James River. Areas are long and winding and range from about 4 to 25 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 10 inches, brown loam

Subsoil:
10 to 17 inches, strong brown clay loam
17 to 34 inches, yellowish red clay
34 to 55 inches, red clay that has strong brown mottles
55 to 65 inches, red clay that has yellowish brown mottles

Included with this soil in mapping are the very deep, well drained Alonzville soils and the very deep, moderately well drained and Moomaw and Zoar soils. Alonzville soils are in the same landscape position as the Shottower soil. Moomaw and Zoar soils are in depressions. Also included are some areas of cobbly soils and severely eroded soils that have a surface layer of clay loam. Included soils make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: More than 60 inches
Shrink-swell potential: Moderate
Organic matter content: Low
Natural fertility: Low
Surface runoff: Medium
Erosion potential: Medium
Tilth: Good

Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used for cultivated crops, hay, or pasture. A few areas are wooded. This soil is classified as prime farmland.

This soil is well suited to cultivated crops. The medium potential for erosion is a management concern. Conservation tillage, cover crops, and a crop rotation that includes grasses and legumes can help to control runoff and erosion and conserve moisture.

This soil is well suited to hay and pasture. Establishing and maintaining a mixture of grasses and legumes, deferring grazing as needed, controlling weeds, using proper stocking rates, and applying lime and fertilizer increase the production of feed and forage and help to control erosion.

The potential productivity for eastern white pine is extremely high. The estimated annual production of wood is 970 board feet per acre. Wooded areas of this soil are managed for eastern white pine, yellow-poplar, and mixed hardwoods. When wet, the soil is soft and cannot support heavy harvesting equipment. Seeds and seedlings survive and grow well if competing vegetation is controlled.

The shrink-swell potential limits the use of this soil as a site for dwellings. Backfilling with sandy material and providing extra reinforcement in footings and foundations help to prevent the structural damage caused by shrinking and swelling.

The moderate permeability limits the use of this soil as a site for septic tank absorption fields. Enlarging the absorption field and excavating wider and deeper field lines help to overcome this limitation.

Low strength and the potential for frost action limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material helps to prevent the damage to pavement caused by low strength and frost action.

The capability subclass is IIe.

50C—Shottower loam, 7 to 15 percent slopes. This strongly sloping soil is very deep and well drained. It is on the narrow to broad side slopes of high terraces along the major streams and the James River. Areas are long and winding and range from about 10 to 40 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 10 inches, brown loam

Subsoil:
10 to 17 inches, strong brown clay loam
17 to 34 inches, yellowish red clay
34 to 55 inches, red clay that has strong brown mottles
55 to 65 inches, red clay that has yellowish brown mottles

Included with this soil in mapping are the very deep, well drained Alonzville soils and the very deep, moderately well drained Moomaw soils. Alonzville soils are in the same landscape position as the Shottower soil. Moomaw soils are in depressions. Also included are some areas of cobbly soils and severely eroded soils that have a surface layer of clay loam. Included soils make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: More than 60 inches
Shrink-swell potential: Moderate
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: Medium
Tilth: Good
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used for cultivated crops, hay, or pasture. A few areas are wooded.

This soil is well moderately suited to cultivated crops. The medium potential for erosion is a management concern. Conservation tillage, cover crops, and a crop rotation that includes grasses and legumes can help to control runoff and erosion and conserve moisture.

This soil is moderately well suited to hay and pasture. Establishing and maintaining a mixture of grasses and legumes, deferring grazing as needed, controlling weeds, using proper stocking rates, and applying lime and fertilizer increase the production of feed and forage and help to control erosion.

The potential productivity for eastern white pine is extremely high. The estimated annual production of wood is 970 board feet per acre. Wooded areas of this soil are managed for eastern white pine, yellow-poplar, and mixed hardwoods. When wet, the soil is soft and cannot support heavy harvesting equipment. Seeds and seedlings survive and grow well if competing vegetation is controlled.

The slope and the shrink-swell potential limit the use of this soil as a site for dwellings. Land shaping and grading and designing the dwelling so that it conforms to the natural slope of the land help to overcome the slope. Backfilling with sandy material and providing

extra reinforcement in footings and foundations help to prevent the structural damage caused by shrinking and swelling.

The slope and the moderate permeability limit the use of this soil as a site for septic tank absorption fields. Installing the field lines on the contour helps to overcome the slope. Enlarging the absorption field and excavating wider and deeper field lines help to overcome the moderate permeability.

The slope, low strength, and the potential for frost action limit the use of this soil as a site for local roads and streets. The roads should be built on the contour or designed so that they conform to the natural slope of the land. Providing suitable subgrade or base material helps to prevent the damage to pavement caused by low strength and frost action.

The capability subclass is IIIe.

51C—Shottower cobbly loam, 7 to 15 percent slopes. This strongly sloping soil is very deep and well drained. It is on narrow to broad, high terraces along the major streams and the James River. Areas are long and winding and range from about 4 to 15 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 10 inches, brown cobbly loam

Subsoil:
10 to 17 inches, strong brown cobbly clay loam
17 to 34 inches, yellowish red cobbly clay
34 to 55 inches, red cobbly clay that has strong brown mottles
55 to 65 inches, red cobbly clay that has yellowish brown mottles

Included with this soil in mapping are the very deep, well drained Alonzville, Frederick, and Groseclose soils and the very deep, moderately well drained Moomaw soils. Moomaw soils are in depressions. Alonzville soils are on the same landscape as the Shottower soil. Frederick and Groseclose soils on upland side slopes adjacent to the Shottower soil. Also included are some areas of very cobbly soils and some areas of very stony, severely eroded soils. Included soils make up about 25 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: More than 60 inches
Shrink-swell potential: Moderate
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: Medium
Tilth: Good
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as pasture. A few areas are wooded.

This soil is poorly suited to cultivated crops because of the slope, the medium potential for erosion, and the cobbles in the surface layer. The cobbles damage tillage equipment and interfere with planting. Conservation tillage, cover crops, and a crop rotation that includes grasses and legumes can help to control runoff and erosion and conserve moisture.

This soil is moderately well suited to hay and pasture. Establishing and maintaining a mixture of grasses and legumes, deferring grazing as needed, controlling weeds, using proper stocking rates, and applying lime and fertilizer increase the production of feed and forage and help to control erosion.

The potential productivity for eastern white pine is extremely high. The estimated annual production of wood is 970 board feet per acre. Wooded areas of this soil are managed for eastern white pine, yellow-poplar, and mixed hardwoods. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion. When wet, the soil is soft and cannot support heavy harvesting equipment.

The slope and the shrink-swell potential limit the use of this soil as a site for dwellings. Backfilling with sandy material and providing extra reinforcement in footings and foundations help to prevent the structural damage caused by shrinking and swelling. Land shaping and grading and designing the dwelling so that it conforms to the natural slope of the land help to overcome the slope.

The slope and the moderate permeability limit the use of this soil as a site for septic tank absorption fields. Installing the field lines on the contour helps to overcome the slope. Enlarging the absorption field and excavating wider and deeper field lines help to overcome the moderate permeability.

The slope, low strength, and the potential for frost action limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material helps to prevent the damage to pavement caused by low strength and frost action. The roads should be built on the contour or designed so that they conform to the natural slope of the land.

The capability subclass is IVs.

51D—Shottower cobbly loam, 15 to 30 percent slopes. This moderately steep soil is very deep and

well drained. It is on the narrow side slopes of high terraces along the major streams and the James River. Areas are long and winding and range from about 4 to 30 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 10 inches, brown cobbly loam

Subsoil:
10 to 17 inches, strong brown cobbly clay loam
17 to 34 inches, yellowish red cobbly clay
34 to 55 inches, red cobbly clay that has strong brown mottles
55 to 65 inches, red cobbly clay that has yellowish brown mottles

Included with this soil in mapping are the very deep, well drained Alonzville, Frederick, and Groseclose soils and the very deep, moderately well drained Moomaw soils. Moomaw soils are in depressions. Alonzville soils are on the same landscape as the Shottower soil. Frederick and Groseclose soils on upland side slopes adjacent to the Shottower soil. Also included are some areas of very cobbly soils and some areas of very stony, severely eroded soils. Included soils make up about 25 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: More than 60 inches
Shrink-swell potential: Moderate
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: Medium
Tilth: Good
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as pasture. A few areas are wooded.

This soil is not suited to cultivated crops because of the slope and the high potential for erosion. The cobbles in the surface layer damage tillage equipment and interfere with planting.

This soil is moderately well suited to hay and pasture. Establishing and maintaining a mixture of grasses and legumes, deferring grazing as needed, controlling weeds, using proper stocking rates, and applying lime and fertilizer increase the production of feed and forage and help to control erosion.

The potential productivity for eastern white pine is extremely high on north aspects and very high on south aspects. The estimated annual production of wood is 970 board feet per acre on north aspects and 865 board feet per acre on south aspects. Wooded areas of this soil are managed for eastern white pine, yellow-poplar, and mixed hardwoods. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion. The slope hinders the safe operation of heavy harvesting equipment.

The slope and the shrink-swell potential limit the use of this soil as a site for dwellings. Backfilling with sandy material and providing extra reinforcement in footings and foundations help to prevent the structural damage caused by shrinking and swelling. Land shaping and grading and designing the dwelling so that it conforms to the natural slope of the land help to overcome the slope.

The slope and the moderate permeability limit the use of this soil as a site for septic tank absorption fields. Installing the field lines on the contour helps to overcome the slope. Enlarging the absorption field and excavating wider and deeper field lines help to overcome the moderate permeability.

The slope, low strength, and the potential for frost action limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material helps to prevent the damage to pavement caused by low strength and frost action. The roads should be built on the contour or designed so that they conform to the natural slope of the land.

The capability subclass is VIs.

52C—Thurmont loam, 2 to 15 percent slopes, very stony. This gently sloping and strongly sloping soil is very deep and well drained. It is on colluvial fans and foot slopes on the Blue Ridge. Stones more than 10 inches in diameter and about 5 to 30 feet apart cover 0.1 to 3.0 percent of the surface. Areas are long and winding or roughly rectangular and range from about 5 to 30 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 3 inches, dark brown loam

Subsurface layer:
3 to 7 inches, yellowish brown loam

Subsoil:
7 to 12 inches, strong brown loam
12 to 34 inches, yellowish red clay loam
34 to 52 inches, strong brown clay loam that has yellowish brown mottles

Substratum:
52 to 65 inches, strong brown sandy clay loam

Included with this soil in mapping are the very deep, well drained Edneytown and Groseclose soils. These soils are on the adjacent uplands or on breaks to steeper slopes. Also included are some areas of soils that have fewer stones on the surface and some areas of wet soils along drainageways. Included soils make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Moderate or high
Depth to bedrock: More than 60 inches
Root zone: More than 60 inches
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low
Surface runoff: Medium or rapid
Erosion potential: Medium
Tilth: Restricted by the stones on the surface
Depth to the water table: 48 to 60 inches in winter and early spring
Potential for frost action: Moderate

Most areas are used as pasture. A small acreage is used as woodland.

This soil is not suited to cultivated crops. Because of the stones on the surface, the use of machinery for seedbed preparation, cultivating, spraying, and harvesting is impractical.

This soil is moderately well suited to pasture. The stones limit the use of machinery. Overgrazing reduces the quantity and quality of forage and increases the runoff rate and the hazard of erosion. Deferring grazing as needed and applying good pasture management increase the production of feed and forage and help to control erosion.

The potential productivity for eastern white pine is very high. The estimated annual production of wood is 900 board feet per acre. Wooded areas of this soil are managed for eastern white pine, yellow-poplar, and mixed hardwoods. Seeds and seedlings survive and grow well if competing vegetation is controlled.

The slope and the seasonal high water table limit the use of this soil as a site for dwellings. Land shaping and grading and designing the dwelling so that it conforms to the natural slope of the land help to overcome the slope. If dwellings with basements are built, installing drains by the footings and adequately sealing the basement walls and foundations can help to overcome the wetness.

The moderate permeability, the slope, and the seasonal wetness limit the use of this soil as a site for septic tank absorption fields. Excavating longer field lines increases the absorption area and thus helps to overcome the moderate permeability. Installing the field lines at the correct grade and on the contour helps to overcome the slope. Installing the absorption field in the higher areas of the map unit can help to overcome the wetness.

The potential for frost action and the slope limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material helps to prevent the damage caused by frost action. The roads should be built on the contour or designed so that they conform to the natural slope of the land.

The capability subclass is VIIs.

52D—Thurmont loam, 15 to 30 percent slopes, very stony. This moderately steep and steep soil is very deep and well drained. It is on colluvial fans and foot slopes on the Blue Ridge. Stones more than 10 inches in diameter and about 5 to 30 feet apart cover 0.1 to 3.0 percent of the surface. Areas are long and winding or roughly rectangular and range from about 5 to 40 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 3 inches, dark brown loam

Subsurface layer:
3 to 7 inches, yellowish brown loam

Subsoil:
7 to 12 inches, strong brown loam
12 to 34 inches, yellowish red clay loam
34 to 52 inches, strong brown clay loam that has yellowish brown mottles

Substratum:
52 to 65 inches, strong brown sandy clay loam

Included with this soil in mapping are the very deep, well drained Edneytown, Groseclose, and Hayesville soils. These soils are on the adjacent uplands or on breaks to steeper slopes. Also included are some areas of soils that have fewer stones on the surface, soils that have boulders on the surface, and wet soils along drainageways. Included soils make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Moderate or high
Depth to bedrock: More than 60 inches
Root zone: More than 60 inches
Shrink-swell potential: Low

Organic matter content: Low
Natural fertility: Low
Surface runoff: Medium or rapid
Erosion potential: Medium
Tilth: Restricted by the stones on the surface
Depth to the water table: 48 to 60 inches in winter and early spring
Potential for frost action: Moderate

Most areas are used as woodland. Some areas are used as pasture.

This soil is not suited to cultivated crops. Because of the stones on the surface and the slope, the use of machinery for seedbed preparation, cultivating, spraying, and harvesting is impractical.

This soil is moderately well suited to pasture. The stones limit the use of machinery. Overgrazing reduces the quantity and quality of forage and increases the runoff rate and the hazard of erosion. Deferring grazing as needed and applying good pasture management increase the production of feed and forage and help to control erosion.

The potential productivity for eastern white pine is very high. The estimated annual production of wood is 900 board feet per acre on north aspects and 800 board feet per acre on south aspects. Wooded areas of this soil are managed for eastern white pine, yellow-poplar, and mixed hardwoods. Seeds and seedlings survive and grow well if competing vegetation is controlled. The slope hinders the safe operation of heavy harvesting equipment. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion.

The slope and the seasonal high water table limit the use of this soil as a site for dwellings. Land shaping and grading and designing the dwelling so that it conforms to the natural slope of the land help to overcome the slope. If dwellings with basements are built, installing drains by the footings and adequately sealing the basement walls and foundations can help to overcome the wetness.

The moderate permeability, the slope, and the seasonal wetness limit the use of this soil as a site for septic tank absorption fields. Excavating longer field lines increases the absorption area and thus helps to overcome the moderate permeability. Installing the field lines at the correct grade and on the contour helps to overcome the slope. Installing the absorption field in the higher areas of the map unit can help to overcome the wetness.

The potential for frost action and the slope limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material helps to prevent the damage caused by frost action. The roads should be built on the contour or designed so that they conform to the natural slope of the land.

The capability subclass is VIIs.

53B—Timberville silt loam, 0 to 7 percent slopes, occasionally flooded. This nearly level and gently sloping soil is very deep and well drained. It is on narrow to moderately broad foot slopes and in upland drainageways in a limestone valley. Areas are long and winding and range from about 4 to 20 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 14 inches, dark yellowish brown silt loam

Subsoil:
14 to 30 inches, dark yellowish brown silt loam that has yellowish brown mottles
30 to 43 inches, yellowish brown silty clay loam
43 to 55 inches, strong brown clay
55 to 65 inches, yellowish brown clay

Included with this soil in mapping are the very deep, well drained Frederick and Groseclose soils and the very deep, moderately well drained Ernest, Massanetta, and Lindside soils. Frederick and Groseclose soils are on the adjacent uplands. Lindside and Massanetta soils are in depressions and concave channels on flood plains. Ernest soils are on the same landscape as the Timberville soil. Also included are some areas of rock outcrop along drainageways. Included areas make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: High
Depth to bedrock: More than 60 inches
Root zone: More than 60 inches
Shrink-swell potential: Low in the upper part of the profile and moderate in the lower part
Organic matter content: Low
Natural fertility: Low
Surface runoff: Medium
Erosion potential: Medium
Tilth: Good
Depth to the water table: More than 72 inches
Potential for frost action: Moderate
Flooding: Occasional, very brief, usually from April through October, caused by runoff from the higher adjacent areas

Most areas are used for cultivated crops, for vegetable gardens, or for hay and pasture. The rest are used as woodland. This soil is classified as prime farmland.

This soil is well suited to cultivated crops, although flooding from the higher adjacent areas sometimes delays the use of equipment. The medium potential for erosion in a management concern. In cultivated areas cover crops, a crop rotation that includes grasses and legumes, and conservation tillage can help to control runoff and erosion.

This soil is well suited to hay and pasture. Overgrazing reduces the quantity and quality of forage and increases the runoff rate and the hazard of erosion. Deferring grazing as needed, seeding legumes and grasses, controlling weeds, using proper stocking rates, and applying lime and fertilizer increase the production of feed and forage and help to control runoff and erosion.

The potential productivity for yellow-poplar is high. The estimated annual production of wood is 500 board feet per acre. Wooded areas of this soil are managed for Virginia pine, yellow-poplar, and mixed hardwoods. Seeds and seedlings survive and grow well if competing vegetation is controlled.

The flooding limits the use of this soil as a site for septic tank absorption fields, dwellings, and local roads and streets. An alternative site should be selected.

The capability subclass is IIe.

54A—Toms silt loam, 0 to 4 percent slopes, rarely flooded. This nearly level and gently sloping soil is very deep and somewhat poorly drained. It is on low terraces along the major streams. Areas are long and winding or oval, paralleling the course of the adjacent streams. They range from about 4 to 40 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 7 inches, dark brown silt loam

Subsoil:
7 to 24 inches, yellowish brown clay that has light brownish gray mottles
24 to 36 inches, grayish brown clay that has yellowish brown mottles
36 to 53 inches, light brownish silty clay loam that has yellowish brown mottles

Substratum:
53 to 65 inches, yellowish brown silty clay loam that has grayish brown mottles

Included with this soil in mapping are the very deep, well drained Wolfgap and very deep, moderately well drained Botetourt soils. These soils are in the slightly higher areas. Also included are some areas of soils that have a surface layer of silty clay loam or silty clay. Included soils make up about 15 percent of this map unit.

Soil properties—

Permeability: Slow
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: More than 60 inches
Shrink-swell potential: Moderate
Organic matter content: Moderate
Natural fertility: High
Surface runoff: Slow or medium
Erosion potential: Low
Tilth: Good at optimum soil moisture content
Depth to the water table: 6 to 18 inches in winter and early spring
Potential for frost action: High
Flooding: Rare, during periods of abnormally high rainfall

Most areas are used as pasture. A few areas are used for cultivated crops or hay.

This soil is moderately well suited to cultivated crops. The seasonal high water table is a limitation. The soil is soft when wet. As a result, the use of heavy equipment is restricted to dry periods. Alfalfa commonly is short lived because of seasonal wetness. In cultivated areas conservation tillage and a crop rotation that includes grasses and legumes help to control runoff and erosion and conserve moisture.

This soil is moderately well suited to pasture. Establishing and maintaining a mixture of grasses and legumes, deferring grazing as needed, controlling weeds, using proper stocking rates, and applying fertilizer increase the production of feed and forage and help to control erosion. Grazing during wet periods often cuts up the sod and compacts the surface layer and thereby reduces yields and increases the hazard of erosion.

The potential productivity for yellow-poplar is high. The estimated annual production of wood is 500 board feet per acre. Wooded areas of this soil are managed for eastern white pine, Virginia pine, and yellow-poplar. Seeds and seedlings survive and grow fairly well if competing vegetation is controlled. The soil is soft when wet. As a result, the use of heavy timber equipment is restricted to dry periods. The rooting depth is restricted by the seasonal high water table. Some trees are uprooted during windy periods. Thinning that does not leave the remaining trees widely spaced helps to prevent uprooting.

The seasonal high water table and the flooding limit the use of this soil as a site for dwellings. Included areas of the well drained Wolfgap soils are better sites.

The seasonal high water table, the flooding, and the

slow permeability in the subsoil limit the use of this soil as a site for septic tank absorption fields. Better suited soils, such as the included Wolfgap soils, should be selected.

Low strength, the potential for frost action, the flooding, and the seasonal high water table limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material helps to prevent the damage to pavement caused by low strength, frost action, and the seasonal high water table. Installing a drainage system helps to prevent the damage caused by the seasonal high water table and frost action. Routing the roads away from the areas that are subject to flooding and protecting the roadbanks with riprap can minimize the damage caused by flooding.

The capability subclass is IVw.

55B—Tumbling loam, 2 to 7 percent slopes. This gently sloping soil is very deep and well drained. It is on colluvial fans at the foot of the Blue Ridge and Appalachian Mountains. Areas are long and winding or roughly rectangular and range from about 4 to 25 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 1 inch, very dark grayish brown loam

Subsurface layer:
1 to 9 inches, yellowish brown loam

Subsoil:
9 to 14 inches, yellowish red clay loam
14 to 30 inches, red clay
30 to 44 inches, red very cobbly clay
44 to 65 inches, red clay

Included with this soil in mapping are the very deep, well drained Frederick, Groseclose, and Laidig soils. Frederick and Groseclose soils are on the adjacent uplands or on breaks to steeper slopes. Laidig soils are in depressions. Also included are some areas of soils that have a gravelly or cobbly surface layer. Included soils make up about 15 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: More than 60 inches
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low
Surface runoff: Medium
Erosion potential: Medium
Tilth: Good
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as pasture or hayland. A small acreage is used for cultivated crops or woodland.

This soil is well suited to cultivated crops. The medium potential for erosion is a management concern. In cultivated areas conservation tillage, cover crops, and a crop rotation that includes grasses and legumes can help to control runoff and erosion and conserve moisture.

This soil is well suited to hay and pasture. Overgrazing reduces the quantity and quality of forage and increases the runoff rate and the hazard of erosion. Deferring grazing as needed and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for northern red oak is moderately high. The estimated annual production of wood is 279 board feet per acre. Wooded areas of this soil are managed for Virginia pine, eastern white pine, and mixed hardwoods. Few limitations affect woodland management. Seeds and seedlings survive and grow well if competing vegetation is controlled.

Few limitations affect the use of this soil as a site for dwellings.

The moderate permeability limits the use of this soil as a site for septic tank absorption fields. Excavating deeper and longer field lines increases the absorption area and thus helps to overcome this limitation.

Low strength and the potential for frost action limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material helps to prevent the damage caused by low strength and frost action.

The capability subclass is IIe.

55C—Tumbling loam, 7 to 15 percent slopes. This strongly sloping soil is very deep and well drained. It is on colluvial fans and foot slopes in the Blue Ridge and Appalachian Mountains. Areas are long and winding or roughly rectangular and range from about 4 to 50 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 1 inch, very dark grayish brown loam

Subsurface layer:
1 to 9 inches, yellowish brown loam

Subsoil:
9 to 14 inches, yellowish red clay loam

14 to 30 inches, red clay
30 to 44 inches, red very cobbly clay
44 to 65 inches, red clay

Included with this soil in mapping are the moderately deep, well drained Carbo and Litz soils and the very deep, well drained Frederick, Groseclose, and Laidig soils. Carbo, Frederick, Groseclose, and Litz soils are on the adjacent uplands or on breaks to steeper slopes. Laidig soils are in depressions. Also included are some areas of soils that have a gravelly or cobbly surface layer and severely eroded soils that have a surface layer of clay loam. Included soils make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: More than 60 inches
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: Medium
Tilth: Good
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as pasture or hayland. A small acreage is used for cultivated crops or woodland.

This soil is moderately well suited to cultivated crops. The medium potential for erosion is a management concern. In cultivated areas conservation tillage, cover crops, and a crop rotation that includes grasses and legumes can help to control runoff and erosion and conserve moisture.

This soil is moderately well suited to hay and pasture. Overgrazing reduces the quantity and quality of forage and increases the runoff rate and the hazard of erosion. Deferring grazing as needed and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for northern red oak is moderately high. The estimated annual production of wood is 279 board feet per acre. Wooded areas of this soil are managed for Virginia pine, eastern white pine, and mixed hardwoods. Few limitations affect woodland management. Seeds and seedlings survive and grow well if competing vegetation is controlled.

The slope limits the use of this soil as a site for dwellings. Land shaping and grading and designing the dwelling so that it conforms to the natural slope of the land help to overcome this limitation.

The moderate permeability and the slope limit the use of this soil as a site for septic tank absorption fields. Excavating deeper and longer field lines increases the absorption area and thus helps to overcome the moderate permeability. Installing the field lines at the correct grade and on the contour helps to overcome the slope.

Low strength, the potential for frost action, and the slope limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material helps to prevent the damage caused by low strength and frost action. The roads should be built on the contour or designed so that they conform to the natural slope of the land.

The capability subclass is IIIe.

55D—Tumbling loam, 15 to 30 percent slopes. This moderately steep and steep soil is very deep and well drained. It is on colluvial fans and side slopes in the foothills of the Blue Ridge and Appalachian Mountains. Areas are long and winding and range from about 4 to 45 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 1 inch, very dark grayish brown loam

Subsurface layer:
1 to 9 inches, yellowish brown loam

Subsoil:
9 to 14 inches, yellowish red clay loam
14 to 30 inches, red clay
30 to 44 inches, red very cobbly clay
44 to 65 inches, red clay

Included with this soil in mapping are the moderately deep, well drained Carbo and Litz soils and the very deep, well drained Frederick, Groseclose, and Laidig soils. Carbo, Frederick, Groseclose, and Litz soils are on the adjacent uplands or on breaks to steeper slopes. Laidig soils are on foot slopes and in depressions. Also included are some areas of soils that have a gravelly or cobbly surface layer and severely eroded soils that have a surface layer of clay loam. Included soils make up about 25 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: More than 60 inches
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low

Surface runoff: Rapid
Erosion potential: High
Tilth: Good
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as woodland. A small acreage is used as pasture or hayland.

This soil is poorly suited to cultivated crops. The main limitations are the slope and the high potential for erosion. In cultivated areas conservation tillage, cover crops, and a crop rotation that includes grasses and legumes can help to control runoff and erosion and conserve moisture.

This soil is moderately well suited to hay and pasture. Overgrazing reduces the quantity and quality of forage and increases the runoff rate and the hazard of erosion. Deferring grazing as needed and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for northern red oak is moderately high on north aspects and moderate on south aspects. The estimated annual production of wood is 279 board feet per acre on north aspects and 238 board feet per acre on south aspects. Wooded areas of this soil are managed for Virginia pine, eastern white pine, and mixed hardwoods. Seeds and seedlings survive and grow well if competing vegetation is controlled. The slope hinders the safe operation of heavy harvesting equipment.

The slope limits the use of this soil as a site for dwellings. Land shaping and grading and designing the dwelling so that it conforms to the natural slope of the land help to overcome this limitation.

The moderate permeability and the slope limit the use of this soil as a site for septic tank absorption fields. Excavating deeper and longer field lines increases the absorption area and thus helps to overcome the moderate permeability. Installing the field lines at the correct grade and on the contour helps to overcome the slope.

Low strength, the potential for frost action, and the slope limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material helps to prevent the damage caused by low strength and frost action. The roads should be built on the contour or designed so that they conform to the natural slope of the land.

The capability subclass is IVe.

56C—Tumbling cobbly loam, 7 to 15 percent slopes. This strongly sloping soil is very deep and well drained. It is on colluvial fans and foot slopes in the Blue Ridge and Appalachian Mountains. Areas are long and winding or roughly rectangular and range from about 4 to 50 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 1 inch, very dark grayish brown cobbly loam

Subsurface layer:
1 to 9 inches, yellowish brown cobbly loam

Subsoil:
9 to 14 inches, yellowish red clay loam
14 to 30 inches, red clay
30 to 44 inches, red very cobbly clay
44 to 65 inches, red clay

Included with this soil in mapping are the moderately deep, well drained Carbo and Litz soils and the very deep, well drained Frederick, Groseclose, and Laidig soils. Carbo, Frederick, Groseclose, and Litz soils are on the adjacent uplands or on breaks to steeper slopes. Laidig soils are in depressions. Also included are some areas of soils that have slopes of less than 7 percent. Included soils make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: More than 60 inches
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: Medium
Tilth: Good, but cobbles interfere with tillage.
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as woodland. A small acreage is used as pasture or hayland.

This soil is poorly suited to cultivated crops. The main limitations are the slope and the medium potential for erosion. The cobbles in the surface layer damage tillage equipment and interfere with planting. Conservation tillage, cover crops, and a crop rotation that includes grasses and legumes can help to control runoff and erosion and conserve moisture.

This soil is moderately well suited to hay and pasture. Overgrazing reduces the quantity and quality of forage and increases the runoff rate and the hazard of erosion. Deferring grazing as needed and applying good pasture and hayland management increase the

production of feed and forage and help to control erosion.

The potential productivity for northern red oak is moderately high. The estimated annual production of wood is 279 board feet per acre. Wooded areas of this soil are managed for Virginia pine, eastern white pine, and mixed hardwoods. Few limitations affect woodland management. Seeds and seedlings survive and grow well if competing vegetation is controlled.

The slope limits the use of this soil as a site for dwellings. Land shaping and grading and designing the dwelling so that it conforms to the natural slope of the land help to overcome this limitation.

The moderate permeability and the slope limit the use of this soil as a site for septic tank absorption fields. Excavating deeper and longer field lines increases the absorption area and thus helps to overcome the moderate permeability. Installing the field lines at the correct grade and on the contour helps to overcome the slope.

Low strength, the potential for frost action, and the slope limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material helps to prevent the damage caused by low strength and frost action. The roads should be built on the contour or designed so that they conform to the natural slope of the land.

The capability subclass is IVs.

56D—Tumbling cobbly loam, 15 to 30 percent slopes. This moderately steep and steep soil is very deep and well drained. It is on colluvial fans and foot slopes in the Blue Ridge and Appalachian Mountains. Areas are long and winding or roughly rectangular and range from about 4 to 50 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 1 inch, very dark grayish brown cobbly loam

Subsurface layer:
1 to 9 inches, yellowish brown cobbly loam

Subsoil:
9 to 14 inches, yellowish red clay loam
14 to 30 inches, red clay
30 to 44 inches, red very cobbly clay
44 to 65 inches, red clay

Included with this soil in mapping are the moderately deep, well drained Carbo and Litz soils and the very deep, well drained Frederick, Groseclose, and Laidig soils. Carbo, Frederick, Groseclose, and Litz soils are on the adjacent uplands or on breaks to steeper slopes. Laidig soils on foot slopes and in depressions. Also included are some areas of soils that have a very stony surface and soils that have slopes of more than 30 percent. Included soils make up about 25 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: More than 60 inches
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: Medium
Tilth: Good, but cobbles interfere with tillage.
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as woodland. A small acreage is used as pasture or hayland.

This soil is not suited to cultivated crops because of the slope and the high potential for erosion. The cobbles in the surface layer damage tillage equipment and interfere with planting.

This soil is moderately well suited to hay and pasture. Overgrazing reduces the quantity and quality of forage and increases the runoff rate and the hazard of erosion. Deferring grazing as needed and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for northern red oak is moderately high on north aspects and moderate on south aspects. The estimated annual production of wood is 279 board feet per acre on north aspects and 238 board feet per acre on south aspects. Wooded areas of this soil are managed for Virginia pine, eastern white pine, and mixed hardwoods. Seeds and seedlings survive and grow well if competing vegetation is controlled. The slope hinders the safe operation of heavy harvesting equipment.

The slope limits the use of this soil as a site for dwellings. Land shaping and grading and designing the dwelling so that it conforms to the natural slope of the land help to overcome this limitation.

The moderate permeability and the slope limit the use of this soil as a site for septic tank absorption fields. Excavating deeper and longer field lines increases the absorption area and thus helps to overcome the moderate permeability. Installing the field lines at the correct grade and on the contour helps to overcome the slope.

Low strength, the potential for frost action, and the slope limit the use of this soil as a site for local roads

and streets. Providing suitable subgrade or base material helps to prevent the damage caused by low strength and frost action. The roads should be built on the contour or designed so that they conform to the natural slope of the land.

The capability subclass is VIs.

57C—Tumbling cobbly loam, 2 to 15 percent slopes, very stony. This gently sloping and strongly sloping soil is very deep and well drained. It is on colluvial fans and foot slopes in the Blue Ridge and Appalachian Mountains. Stones more than 10 inches in diameter and about 5 to 30 feet apart cover 0.1 to 3.0 percent of the surface. Areas are long and winding or roughly rectangular and range from about 4 to 25 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 1 inch, very dark grayish brown cobbly loam

Subsurface layer:
1 to 9 inches, yellowish brown cobbly loam

Subsoil:
9 to 14 inches, yellowish red clay loam
14 to 30 inches, red clay
30 to 44 inches, red very cobbly clay
44 to 65 inches, red clay

Included with this soil in mapping are the moderately deep, well drained Carbo, Litz, and Sequoia soils and the very deep, well drained Frederick, Groseclose, and Laidig soils. Carbo, Frederick, Groseclose, Litz, and Sequoia soils are on the adjacent uplands or on breaks to steeper slopes. Laidig soils are in depressions. Included soils make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: More than 60 inches
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: Medium
Tilth: Restricted by the stones on the surface
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as woodland. A small acreage is used as pasture.

This soil is not suited to cultivated crops. Because of the stones on the surface, the use of machinery for seedbed preparation, cultivating, spraying, and harvesting is impractical.

This soil is moderately well suited to hay and pasture. The stones limit the use of machinery. Overgrazing reduces the quantity and quality of forage and increases the runoff rate and the hazard of erosion. Deferring grazing as needed and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for northern red oak is moderately high. The estimated annual production of wood is 279 board feet per acre. Wooded areas of this soil are managed for Virginia pine, eastern white pine, and mixed hardwoods. Few limitations affect woodland management. Seeds and seedlings survive and grow well if competing vegetation is controlled.

The slope limits the use of this soil as a site for dwellings. Land shaping and grading and designing the dwelling so that it conforms to the natural slope of the land help to overcome this limitation.

The moderate permeability and the slope limit the use of this soil as a site for septic tank absorption fields. Excavating deeper and longer field lines increases the absorption area and thus helps to overcome the moderate permeability. Installing the field lines at the correct grade and on the contour helps to overcome the slope.

Low strength, the potential for frost action, and the slope limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material helps to prevent the damage caused by low strength and frost action. The roads should be built on the contour or designed so that they conform to the natural slope of the land.

The capability subclass is VIIs.

57D—Tumbling cobbly loam, 15 to 30 percent slopes, very stony. This moderately steep and steep soil is very deep and well drained. It is on colluvial fans and foot slopes in the Blue Ridge and Appalachian Mountains. Stones more than 10 inches in diameter and about 5 to 30 feet apart cover 0.1 to 3.0 percent of the surface. Areas are long and winding or roughly rectangular and range from about 4 to 35 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 1 inch, very dark grayish brown cobbly loam

Subsurface layer:
1 to 9 inches, yellowish brown cobbly loam

Subsoil:
9 to 14 inches, yellowish red clay loam
14 to 30 inches, red clay
30 to 44 inches, red very cobbly clay
44 to 65 inches, red clay

Included with this soil in mapping are the moderately deep, well drained Carbo, Litz, and Sequoia soils and the very deep, well drained Frederick, Groseclose, and Laidig soils. Carbo, Frederick, Groseclose, Litz, and Sequoia soils are on the adjacent uplands or on breaks to steeper slopes. Laidig soils on foot slopes. Also included are some areas of soils that have slopes of more than 30 percent. Included soils make up about 25 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: More than 60 inches
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low
Surface runoff: Rapid
Erosion potential: Medium
Tilth: Restricted by the stones on the surface
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as woodland. A small acreage is used as pasture.

This soil is not suited to cultivated crops. Because of the slope and the stones on the surface, the use of machinery for seedbed preparation, cultivating, spraying, and harvesting is impractical.

This soil is moderately well suited to hay and pasture. Overgrazing reduces the quantity and quality of forage and increases the runoff rate and the hazard of erosion. Deferring grazing as needed and applying good pasture and hayland management increase the production of feed and forage and help to control erosion.

The potential productivity for northern red oak is moderately high on north aspects and moderate on south aspects. The estimated annual production of wood is 279 board feet per acre on north aspects and 238 board feet per acre on south aspects. Wooded areas of this soil are managed for Virginia pine, eastern white pine, and mixed hardwoods. Seeds and seedlings survive and grow well if competing vegetation is controlled. Building logging roads and skid trails on the contour minimizes the concentration of runoff and helps to control erosion. The slope hinders the safe operation of heavy harvesting equipment.

The slope limits the use of this soil as a site for dwellings. Land shaping and grading and designing the dwelling so that it conforms to the natural slope of the land help to overcome this limitation.

The moderate permeability and the slope limit the use of this soil as a site for septic tank absorption fields. Excavating deeper and longer field lines increases the absorption area and thus helps to overcome the moderate permeability. Installing the field lines at the correct grade and on the contour helps to overcome the slope.

Low strength, the potential for frost action, and the slope limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material helps to prevent the damage caused by low strength and frost action. The roads should be built on the contour or designed so that they conform to the natural slope of the land.

The capability subclass is VIIs.

58C—Tumbling-Urban land complex, 2 to 15 percent slopes. This map unit consists of gently sloping and strongly sloping, very deep, well drained Tumbling soils intermingled with Urban land. It is on colluvial fans and foot slopes in the Blue Ridge and Appalachian Mountains. The Tumbling soils and Urban land occur as areas so intermingled that mapping them separately is not practical. The unit is about 25 percent Urban land, 25 percent relatively undisturbed Tumbling soil, 30 percent disturbed Tumbling soil, and 20 percent other soils. Areas range from about 4 to 25 acres in size.

The typical sequence, depth, and composition of the layers in the undisturbed Tumbling soil are as follows—

Surface layer:
0 to 1 inch, very dark grayish brown loam

Subsurface layer:
1 to 9 inches, yellowish brown loam

Subsoil:
9 to 14 inches, yellowish red clay loam
14 to 30 inches, red clay
30 to 44 inches, red very cobbly clay
44 to 65 inches, red clay

The disturbed Tumbling soil has been graded, cut, filled, or otherwise altered during urbanization. In some areas as much as 5 feet of fill material has been added, and in other areas as much as three-quarters of the profile has been removed. The fill material commonly is from adjacent areas that have been cut or graded.

The Urban land generally is covered by asphalt, concrete, buildings, or other structures. In open areas

most or all the soil profile has been removed.

Included in this map unit are the very deep, well drained Frederick, Groseclose, and Laidig soils. Frederick and Groseclose soils are on the adjacent uplands or on breaks to steeper slopes. Laidig soils are in depressions. Also included are some areas of soils that have a cobbly surface layer.

Properties of the undisturbed Tumbling soil—

Permeability: Moderate
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: More than 60 inches
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low
Surface runoff: Medium or rapid
Erosion potential: Medium
Tilth: Good
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

The slope limits the use of undisturbed areas as sites for dwellings. Land shaping and grading and designing the dwelling so that it conforms to the natural slope of the land help to overcome this limitation.

The moderate permeability and the slope limit the use of undisturbed areas as sites for septic tank absorption fields. Excavating deeper and longer field lines increases the absorption area and thus helps to overcome the moderate permeability. Installing the field lines at the correct grade and on the contour helps to overcome the slope.

Low strength, the potential for frost action, and the slope limit the use of undisturbed areas as sites for local roads and streets. Providing suitable subgrade or base material helps to prevent the damage caused by low strength and frost action. The roads should be built on the contour or designed so that they conform to the natural slope of the land.

No capability classification is assigned.

59B—Tygart silt loam, 2 to 7 percent slopes. This gently sloping soil is very deep and somewhat poorly drained. It is on slightly concave terraces along the major streams and rivers. Areas are long and winding or oval, paralleling the course of the adjacent streams. They range from about 4 to 25 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 7 inches, brown silt loam

Subsoil:
7 to 12 inches, brown silty clay loam that has yellowish brown mottles
12 to 17 inches, mottled gray and yellowish brown silty clay
17 to 24 inches, grayish brown clay that has brownish yellow mottles
24 to 34 inches, gray clay that has yellowish brown and dark gray mottles
34 to 49 inches, mottled gray, red, light gray, and yellowish brown clay

Substratum:
49 to 65 inches, mottled light gray, yellowish brown, and gray silty clay loam

Included with this soil in mapping are the very deep, well drained Alonzville soils; the very deep, moderately well drained Moomaw and Zoar soils; and the very deep, poorly drained Purdy soils. Alonzville and Moomaw soils are in the slightly higher areas. Zoar soils are on the same landscape as the Tygart soil. Purdy soils are in depressions and along seeps on hillsides. Included soils make up about 15 percent of this map unit.

Soil properties—

Permeability: Slow
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: Restricted by the water table
Shrink-swell potential: Moderate
Organic matter content: Moderate
Natural fertility: Low
Surface runoff: Medium
Erosion potential: Medium
Tilth: Good at optimum soil moisture content
Depth to the water table: 6 to 18 inches in winter and early spring
Potential for frost action: Moderate

Most areas are used as pasture. A few areas are used for cultivated crops or woodland.

This soil is moderately well suited to cultivated crops. The seasonal high water table is the main limitation. The soil is soft when wet. As a result, the use of heavy equipment is restricted to dry periods. Alfalfa commonly is short lived because of seasonal wetness. The medium potential for erosion is a management concern. Conservation tillage and a crop rotation that includes grasses and legumes help to control runoff and erosion and conserve moisture.

This soil is moderately well suited to pasture. Establishing and maintaining a mixture of grasses and legumes, deferring grazing as needed, controlling weeds, using proper stocking rates, and applying lime

and fertilizer increase the production of feed and forage and help to control erosion. Grazing during wet periods often cuts up the sod and compacts the surface layer and thereby reduces yields and increases the hazard of erosion.

The potential productivity for northern red oak is moderately high. The estimated annual production of wood is 288 board feet per acre. Wooded areas of this soil are managed for eastern white pine, Virginia pine, and yellow-poplar. Seeds and seedlings survive and grow well if competing vegetation is controlled. The soil is soft when wet. As a result, the use of heavy timber equipment is restricted to dry periods. The rooting depth is restricted by the seasonal high water table. Some trees are uprooted during windy periods. Thinning that does not leave the remaining trees widely spaced helps to prevent uprooting.

The seasonal high water table limits the use of this soil as a site for dwellings. Better suited soils, such as the included well drained Alonzville soils, should be considered.

The seasonal high water table and the slow permeability in the subsoil limit the use of this soil as a site for septic tank absorption fields. Better suited soils, such as the included well drained Alonzville soils, should be considered.

Low strength, the potential for frost action, and the seasonal high water table limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material helps to prevent the damage to pavement caused by low strength, frost action, and the seasonal high water table. Installing a drainage system helps to prevent the damage caused by the seasonal high water table and frost action.

The capability subclass is IVw.

60—Udorthents. These very deep, well drained or somewhat excessively drained soils are in areas that have been disturbed during excavation, grading, and quarrying. They are in the southern part of the survey area. They consist mainly of soil material and waste rock from limestone and shale quarries. A few areas consist of material that was removed during the mining of iron ore. Areas of this map unit range from about 4 to 80 acres in size. Slope is mainly 2 to 30 percent but ranges from 0 to 45 percent.

Included with these soils in mapping are Carbo, Chilhowie, Groseclose, Frederick, Laidig, and Tumbling soils. These included soils make up about 25 percent of this map unit.

The properties and characteristics of the Udorthents vary so considerably that onsite investigation is needed to determine the suitability for most uses.

No capability classification is assigned.

61—Udorthents-Urban land complex. This map unit consists of very shallow to very deep soils intermingled with Urban land. It is along the major highways. The Udorthents and Urban land occur as areas so intermingled that mapping them separately is not practical. The unit is about 25 percent Urban land, 60 percent Udorthents, and 15 percent other soils. Areas are long and narrow or slightly rectangular. They range from about 5 to more than 200 acres in size. Slopes are mainly 0 to 30 percent but range from 0 to 45 percent.

The Udorthents consist of material that has been graded, cut, filled, or otherwise disturbed during urbanization and highway construction. The material exposed in cuts generally is loamy or clayey. It commonly is shallow over limestone or shale bedrock. The loamy or clayey material reflects the soils in the adjacent areas.

The Urban land generally is covered by asphalt, concrete, buildings, or other structures. Examples are highways, shopping centers, and industrial parks.

Included in this map unit are undisturbed soils, commonly the very deep, well drained Frederick, Groseclose, Laidig, and Tumbling soils and the moderately deep, well drained Berks, Carbo, Chilhowie, and Litz soils. These soils are between highways and buildings.

The properties and characteristics of the soils in this map unit vary so considerably that onsite investigation is needed to determine the suitability for most uses.

No capability classification is assigned.

62F—Weikert-Rock outcrop complex, 45 to 80 percent slopes. This map unit consists of a very steep, somewhat excessively drained Weikert soil intermingled with outcrops of bedrock. It is on side slopes along drainageways, streams, and rivers. The Weikert soil and Rock outcrop occur as areas so intermingled that mapping them separately is not practical. The unit is about 20 percent Rock outcrop, 60 shallow Weikert soil, and 20 percent other soils. Areas are long and winding and range from about 10 to more than 200 acres in size.

The typical sequence, depth, and composition of the layers in the Weikert soil are as follows—

Surface layer:
0 to 4 inches, yellowish brown channery silt loam

Subsoil:
4 to 10 inches, brownish yellow very channery silt loam

Substratum:
10 to 16 inches, light yellowish brown extremely channery silt loam

Bedrock:
16 inches, shale

Included in this unit in mapping are the moderately deep, well drained Berks soils; the very deep, moderately well drained Ernest soils; and the very deep, excessively drained Rushtown soils. Berks soils are on the same landscape as the Weikert soil. Ernest and Rushtown soils are on concave foot slopes and toe slopes.

Properties of the Weikert soil—

Permeability: Moderately rapid
Available water capacity: Very low
Depth to bedrock: 10 to 20 inches
Root zone: Same as the depth to bedrock
Shrink-swell potential: Low
Organic matter content: Low
Natural fertility: Low
Surface runoff: Very rapid
Erosion potential: High
Tilth: Fair; shale channers interfere with tillage.
Depth to the water table: More than 72 inches
Potential for frost action: Moderate

Most areas are used as woodland.

This map unit is not suited to cultivated crops. The slope, the Rock outcrop, the very low available water capacity, a shallow rooting depth, and a high content of coarse fragments reduce crop production. The slope and the Rock outcrop hinder the safe operation of machinery.

This map unit is not suited to pasture and hay. The slope and the Rock outcrop hinder the safe operation of machinery. The slope, the very low available water capacity, and a shallow rooting depth reduce the production of forage and feed.

The potential productivity of the Weikert soil for northern red oak is moderate. The estimated annual production of wood is 268 board feet per acre on north aspects and 260 board feet per acre on south aspects. Wooded areas of this map unit are managed for eastern white pine, Virginia pine, and mixed hardwoods. The survival of seeds and seedlings is affected by droughtiness during the growing season. Windthrow is a hazard. The slope and the Rock outcrop hinder the safe operation of heavy timber equipment. As a result, a cable system or other alternatives are needed for harvesting.

The slope, the Rock outcrop, and the depth to bedrock limit the use of this map unit as a site for dwellings, septic tank absorption fields, and local roads and streets. Overcoming these limitations is difficult and expensive. Alternative soils that are deeper and not so steep should be considered.

The capability subclass is VIIs.

63A—Wolfgap loam, 0 to 2 percent slopes, occasionally flooded. This soil is very deep, nearly level, and well drained. It is on flood plains along the major streams and rivers. Areas are long and winding and range from about 5 to 60 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 10 inches, dark brown loam

Subsoil:
10 to 31 inches, dark yellowish brown loam
31 to 42 inches, dark yellowish brown sandy clay loam

Substratum:
42 to 51 inches, dark yellowish brown gravelly sandy clay loam
51 to 65 inches, dark yellowish brown gravelly sandy loam

Included with this soil in mapping are the very deep, well drained Derroc and Gladehill soils and the very deep, moderately well drained Irongate and Lindside soils. Derroc, Irongate, and Lindside soils are in slight depressions and in channel scours. Gladehill soils are on the same landscape as the Wolfgap soil. Included soils make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderate in subsoil and rapid in the substratum
Available water capacity: High
Depth to bedrock: More than 60 inches
Root zone: More than 60 inches
Shrink-swell potential: Low
Organic matter content: Moderate
Natural fertility: High
Surface runoff: Slow
Erosion potential: Low
Tilth: Good
Depth to the water table: More than 72 inches
Potential for frost action: Moderate
Flooding: Occasional, from November through May (usually during winter)

Most areas are used for cultivated crops or hay. Some areas are used as woodland or pasture. This soil is classified as prime farmland.

This soil is well suited to cultivated crops. Flooding occasionally damages crops and limits the use of machinery. In cultivated areas conservation tillage conserves moisture and helps to control erosion.

This soil is well suited to pasture and hay. Establishing and maintaining a mixture of grasses and legumes, deferring grazing as needed, controlling weeds, using proper stocking rates, and applying fertilizer increase the productivity and carrying capacity of the pasture.

The potential productivity for yellow-poplar is very high. The estimated annual production of wood is 825 board feet per acre. Wooded areas of this soil is managed for eastern white pine, yellow-poplar, and black walnut. Plant competition is the main management concern. Seeds and seedlings survive and grow well if competing vegetation is controlled.

The occasional flooding limits the use of this soil as a site for dwellings. An alternative site should be selected.

The flooding and the seasonal high water table limit the use of this soil as a site for septic tank absorption fields. An alternative site should be selected.

The flooding and the potential for frost action limit the use of this soil as a site for local roads and streets. Providing coarser grained subgrade or base material helps to prevent the damage to road surfaces caused by frost action. Raising the surface by land shaping reduces the hazard of flooding.

The capability class is I.

64A—Wolfgap loam, 0 to 2 percent slopes, rarely flooded. This soil is very deep, nearly level, and well drained. It is on low terraces and second bottoms adjacent to streams and flood plains. Areas are long and narrow and from 4 to 25 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 10 inches, dark brown loam

Subsoil:
10 to 31 inches, dark yellowish brown loam
31 to 42 inches, dark yellowish brown sandy clay loam

Substratum:
42 to 51 inches, dark yellowish brown gravelly sandy clay loam
51 to 65 inches, dark yellowish brown gravelly sandy loam

Included with this soil in mapping are the very deep, well drained Gladehill soils and the very deep, moderately well drained Botetourt, Irongate, and Lindside soils. Gladehill, Irongate, and Lindside soils are on the adjacent flood plains. Botetourt soils are in shallow depressions and near the adjacent uplands. Included soils make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderate in subsoil and rapid in the substratum
Available water capacity: Moderate or high
Depth to bedrock: More than 60 inches
Root zone: More than 60 inches
Shrink-swell potential: Low
Organic matter content: Moderate
Natural fertility: High
Surface runoff: Slow
Erosion potential: Low
Tilth: Good
Depth to the water table: More than 72 inches
Potential for frost action: Moderate
Flooding: Rare, during periods of abnormally high rainfall

Most areas are used as cropland. Some areas are used as pasture, hayland, or woodland. This soil is classified as prime farmland.

This soil is well suited to cultivated crops. The rare flooding damages crops and limits the use of machinery. In cultivated areas cover crops, a crop rotation that includes grasses and legumes, and conservation tillage reduce the runoff rate and conserve moisture.

This soil is well suited to pasture and hay. Deferring grazing as needed, applying fertilizer, and controlling weeds and brush increase the production of feed and forage and help to control erosion.

The potential productivity for yellow-poplar is very high. The estimated annual production of wood is 825 board feet per acre. Wooded areas of this soil are managed for eastern white pine, yellow-poplar, and black walnut. Plant competition is the main management concern. Seeds and seedlings survive and grow well if competing vegetation is controlled.

The rare flooding limits the use of this soil as a site for dwellings. Soils that are not subject to flooding are better sites.

The moderate permeability and the rare flooding limit the use of this soil as a site for septic tank absorption fields. Excavating deeper and longer field lines increases the absorption area and thus helps to overcome the moderate permeability. Soils that are not subject to flooding are better sites.

The flooding and the potential for frost action limit the use of this soil as a site for local roads and streets. Routing the roads away from the areas that are subject to flooding and protecting the roadbanks with riprap can minimize the damage caused by flooding. Providing suitable subgrade or base material helps to prevent the damage caused by frost action.

The capability class is I.

64B—Wolfgap loam, 2 to 5 percent slopes, rarely flooded. This soil is very deep, gently sloping, and well drained. It is on low terraces adjacent to streams and flood plains. Areas are long and narrow and range from 4 to 35 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 10 inches, dark brown loam

Subsoil:
10 to 31 inches, dark yellowish brown loam
31 to 42 inches, dark yellowish brown sandy clay loam

Substratum:
42 to 51 inches, dark yellowish brown gravelly sandy clay loam
51 to 65 inches, dark yellowish brown gravelly sandy loam

Included with this soil in mapping are the very deep, well drained Gladehill soils and the very deep, moderately well drained Botetourt and Lindside soils. Gladehill and Lindside soils are on the adjacent flood plains. Botetourt soils are in shallow depressions and near the adjacent uplands. Also included are some areas of soils that are not subject to flooding. Included soils make up about 20 percent of this map unit.

Soil properties—

Permeability: Moderate
Available water capacity: Moderate or high
Depth to bedrock: More than 60 inches
Root zone: More than 60 inches
Shrink-swell potential: Low
Organic matter content: Moderate
Natural fertility: High
Surface runoff: Slow or medium
Erosion potential: Medium
Tilth: Good
Depth to the water table: More than 72 inches
Potential for frost action: Moderate
Flooding: Rare, during periods of abnormally high rainfall

Most areas are used as cropland. Some areas are used as pasture, hayland, or woodland. This soil is classified as prime farmland.

This soil is well suited to cultivated crops. The rare flooding damages crops and limits the use of machinery. The medium potential for erosion is a management concern. In cultivated areas cover crops, a crop rotation that includes grasses and legumes, and conservation tillage help to control runoff and erosion.

This soil is well suited to pasture and hay. Deferring grazing as needed, applying fertilizer, preventing overgrazing, and controlling weeds and brush increase the production of feed and forage and help to control erosion.

The potential productivity for yellow-poplar is high. The estimated annual production of wood is 585 board feet per acre. Wooded areas of this soil are managed for eastern white pine, yellow-poplar, and black walnut. Plant competition is the main management concern. Seeds and seedlings survive and grow well if competing vegetation is controlled.

The rare flooding limits the use of this soil as a site for dwellings. Included soils that are not subject to flooding are better sites.

The moderate permeability and the rare flooding limit the use of this soil as a site for septic tank absorption fields. Excavating deeper and longer field lines increases the absorption area and thus helps to overcome the moderate permeability. Soils that are not subject to flooding are better sites.

The rare flooding and the potential for frost action limit the use of this soil as a site for local roads and streets. Routing the roads away from the areas that are subject to flooding and protecting the roadbanks with riprap can minimize the damage caused by flooding. Providing suitable subgrade or base material helps to prevent the damage caused by frost action.

The capability subclass is IIe.

65B—Zoar silt loam, 2 to 7 percent slopes. This gently sloping soil is very deep and moderately well drained. It is on slightly concave terraces along the major streams and the James River. Areas are long and winding or oval, paralleling the course of the adjacent streams. They range from about 4 to 25 acres in size.

The typical sequence, depth, and composition of the layers in this soil are as follows—

Surface layer:
0 to 8 inches, dark yellowish brown silt loam

Subsoil:
8 to 19 inches, yellowish brown silty clay loam that has light yellowish brown mottles
19 to 28 inches, yellowish brown silty clay that has light brownish gray and strong brown mottles
28 to 48 inches, strong brown silty clay that has light gray and pale brown mottles

Substratum:
48 to 65 inches, mottled yellowish brown, light gray, and yellowish red silty clay

Included with this soil in mapping are the very deep, well drained Alonzville soils and the very deep,

somewhat poorly drained Tygart soils. Alonzville soils are in the slightly higher areas. Tygart soils are in depressions. Included soils make up about 15 percent of this map unit.

Soil properties—

Permeability: Slow
Available water capacity: Moderate
Depth to bedrock: More than 60 inches
Root zone: More than 60 inches
Shrink-swell potential: Moderate
Organic matter content: Moderate
Natural fertility: Low
Surface runoff: Medium
Erosion potential: Medium
Tilth: Good at optimum soil moisture content
Depth to the water table: 18 to 30 inches in winter and early spring
Potential for frost action: Moderate

Most areas are used as pasture or hayland. Some areas are used for cultivated crops or woodland.

This soil is well suited to cultivated crops. The seasonal high water table is the main limitation. The soil is soft when wet. As a result, the use of heavy equipment is restricted to dry periods. Alfalfa commonly is short lived because of seasonal wetness. The medium potential for erosion is a management concerns. In cultivated areas conservation tillage and a crop rotation that includes grasses and legumes help to control runoff and erosion and conserve moisture.

This soil is well suited to pasture. Establishing and maintaining a mixture of grasses and legumes, deferring grazing as needed, controlling weeds, using proper stocking rates, and applying lime and fertilizer increase the production of feed and forage and help to control erosion. Grazing during wet periods often cuts up the sod and compacts the surface layer and thereby reduces yields and increases the hazard of erosion.

The potential productivity for eastern white pine is very high. The estimated annual production of wood is 825 board feet per acre. Wooded areas of this soil are managed for eastern white pine, Virginia pine, and yellow-poplar. Seeds and seedlings survive and grow well if competing vegetation is controlled. The soil is soft when wet. As a result, the use of heavy timber equipment is restricted to dry periods.

The seasonal high water table limits the use of this soil as a site for dwellings. The shrink-well potential is an additional limitation on sites for dwellings with basements. The included Alonzville soils are better sites.

The seasonal high water table and the slow permeability in the subsoil limit the use of this soil as a site for septic tank absorption fields. Better suited soils, such as the included Alonzville soils, should be selected.

Low strength and the potential for frost action limit the use of this soil as a site for local roads and streets. Providing suitable subgrade or base material helps to prevent the damage to pavement caused by low strength and frost action.

The capability subclass is IIe.

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 the land that is best suited to food, feed, forage, fiber, and oilseed crops. It may be cultivated land, pasture, woodland, or other land, but it is not urban or built-up land or water areas. It either is used for food or fiber crops or is available for those crops. The soil qualities, growing season, and moisture supply are those needed for a well managed soil to produce a sustained high yield of crops in an economic manner. Prime farmland produces the highest yields with minimal expenditure of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The level of acidity or alkalinity is acceptable. Prime farmland has few or no rocks and is permeable to water and air. It is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 7 percent. More detailed information about the criteria for prime farmland is available at the local office of the Soil Conservation Service.

A total of 21,695 acres in Botetourt County, or about 8 percent of the total acreage, meets the soil requirements for prime farmland. Scattered areas of this land are on uplands throughout the county, but most of the land is on terraces and flood plains along the James River and its major tributaries.

A recent trend in land use in the southern part of the county has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which

generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in the survey area that are considered prime farmland are listed in table 5. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. 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."

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

In this section, the estimated yields of the main crops and hay and pasture plants are listed for each soil and the system of land capability classification used by the Soil Conservation Service is explained.

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 Soil 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 6. 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 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 compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for 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 rangeland, for woodland, and for engineering purposes.

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

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

Class I soils have few limitations that restrict their use.

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

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

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

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

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

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

Class VIII soils and 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 each map unit is given in the section "Detailed Soil Map Units" and in the yields table.

Woodland Management and Productivity

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination 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 cubic meters per hectare per year, which the indicator species can produce. The number 1 indicates low potential productivity; 2 and 3, moderate; 4 and 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; and *F*, a high content of rock fragments in the soil. 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, and F.

In table 7, *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.

Windthrow hazard is the likelihood that trees will be uprooted by the wind because the soil is not deep enough for adequate root anchorage. The main restrictions that affect rooting are a seasonal high water table and the depth to bedrock, a fragipan, or other limiting layers. A rating of *slight* indicates that under normal conditions no trees are blown down by the wind. Strong winds may damage trees, but they do not uproot them. A rating of *moderate* indicates that some trees can be blown down during periods when the soil is wet and winds are moderate or strong. A rating of *severe* indicates that many trees can be blown down during these periods.

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 class*. 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 cubic meters per hectare 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 the one that determines the ordination class.

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

Recreation

The soils of the survey area are rated in table 8 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public 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 table 8, the degree of soil limitation is expressed

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

The information in table 8 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 11 and interpretations for dwellings without basements and for local roads and streets in table 10.

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

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

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and 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, broom sedge, and ragweed.

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.

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

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. 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 kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

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

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and 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 ills 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 11 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.

Table 11 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.

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

Excessive seepage 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 table 11 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, 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 soil blowing.

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

Construction Materials

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

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

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help 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 table 12, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

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

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

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

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

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

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

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal 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 13 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. 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, irrigation, 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.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

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, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

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 soil blowing 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 soil blowing, low available water capacity, restricted rooting depth, toxic substances such as salts or 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 14 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

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

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If 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 larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3

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

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

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, 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 ⅓-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 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; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet

and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

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

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 15, the estimated content of organic matter 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 16 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the infiltration of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in table 16, the first letter is for drained areas and the second is for undrained areas.

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, nor is water in swamps and marshes.

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

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, 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 infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs often under normal weather conditions (the chance of flooding is more than 50 percent in any year). 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 the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 16 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 16.

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.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

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 *(3)*. 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 17 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 Ultisol.

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

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Ochraquults (*Ochr*, meaning light colored surface layer, plus *aquult*, the suborder of the Ultisols that has an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Ochraquults.

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 class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is clayey, mixed, mesic Typic Ochraquults.

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

Soil Series and Their Morphology

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

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

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

Alonzville Series

Soils of the Alonzville series are very deep and well drained. They formed in old alluvial material derived from sandstone, shale, and limestone. They are on

stream terraces throughout the survey area. Slope ranges from 2 to 15 percent.

Alonzville soils are near Botetourt, Derroc, and Moomaw soils. Alonzville soils are better drained than Botetourt and Moomaw soils. Their subsoil has fewer rock fragments and is more strongly developed than that of Derroc soils.

Typical pedon of Alonzville loam, 2 to 7 percent slopes, about 2.5 miles northeast of Troutville, ¼ mile south of the intersection of U.S. Highway 220 and Virginia Highway 651, and 200 feet north of Troutville Elementary School, at an elevation of 1,270 feet:

Ap—0 to 10 inches; brown (7.5YR 4/4) loam; moderate fine and medium granular structure; friable, slightly sticky and slightly plastic; common fine, medium, and coarse roots; slightly acid; clear smooth boundary.

Bt1—10 to 29 inches; strong brown (7.5YR 4/6) clay loam; moderate fine and medium subangular blocky structure; friable, slightly sticky and slightly plastic; common fine and medium and few coarse roots; common faint clay films on faces of peds; common fine manganese stains on faces of peds; common fine manganese concretions; moderately acid; clear smooth boundary.

Bt2—29 to 36 inches; strong brown (7.5YR 5/6) clay loam; moderate medium subangular blocky structure; firm, sticky and slightly plastic; few fine roots; common faint clay films on faces of peds; few prominent manganese stains on faces of peds; common fine manganese concretions; about 2 percent rounded gravel; moderately acid; clear wavy boundary.

Bt3—36 to 65 inches; strong brown (7.5YR 5/6) loam; few fine faint yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm, sticky and slightly plastic; few fine roots; common faint clay films on faces of peds; few prominent manganese stains on faces of peds; common fine manganese concretions; about 10 percent rounded gravel; strongly acid.

The thickness of the solum ranges from 30 to more than 60 inches. The depth to bedrock is more than 60 inches. The content of rounded gravel ranges from 0 to 15 percent in the A and Bt horizons. The content of rounded gravel and cobblestones ranges from 0 to 35 percent in the C horizon. Reaction ranges from extremely acid to strongly acid throughout the profile in unlimed areas.

The Ap horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 3 or 4.

The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 8. It is loam, clay loam, sandy clay loam, or silty clay loam.

The C horizon, if it occurs, has hue of 7.5YR to 2.5Y, value of 4 or 5, and chroma of 3 to 8 and is mottled. It is fine sandy loam, sandy clay loam, or clay loam in the fine-earth fraction.

Bailegap Series

Soils of the Bailegap series are deep and well drained. They formed in material weathered from sandstone and small amounts of shale and siltstone. They are on uplands in the Appalachian Mountains. Slope ranges from 7 to 60 percent.

Bailegap soils are near Laidig, Lehew, Lily, and Tumbling soils. Bailegap soils are deeper over bedrock than Lehew and Lily soils. Unlike Laidig soils, they do not have a fragipan. They have less clay in the subsoil than Tumbling soils.

Typical pedon of Bailegap cobbly fine sandy loam, 15 to 30 percent slopes, about 3.5 miles northeast of Oriskany and 3,000 feet north of the intersection of Virginia Highways 615 and 683, at an elevation of 1,600 feet:

Oi—1 to 0.5 inch; undecomposed mat of pine needles and twigs and of hardwood leaves.

Oe—0.5 inch to 0; highly decomposed pine needles and hardwood leaves and many fine roots.

A—0 to 2 inches; dark brown (10YR 3/3) cobbly fine sandy loam; weak very fine granular structure; very friable, nonsticky and nonplastic; many very fine, fine, and medium roots; about 20 percent sandstone cobbles and gravel; very strongly acid; abrupt smooth boundary.

E—2 to 10 inches; yellowish brown (10YR 5/6) cobbly fine sandy loam; weak medium granular structure; very friable, nonsticky and nonplastic; common fine, medium, and coarse roots; about 15 percent sandstone cobbles and gravel; strongly acid; clear smooth boundary.

BE—10 to 17 inches; strong brown (7.5YR 5/6) fine sandy loam; weak fine subangular blocky structure; friable, nonsticky and nonplastic; common fine, medium, and coarse roots; about 5 percent angular sandstone gravel; strongly acid; gradual wavy boundary.

Bt1—17 to 28 inches; strong brown (7.5YR 5/8) sandy clay loam; moderate fine and medium subangular blocky structure; friable, slightly sticky and slightly plastic; few fine and medium roots; common distinct clay films on faces of peds; about 5 percent angular sandstone gravel; very strongly acid; clear wavy boundary.

Bt2—28 to 42 inches; yellowish red (5YR 5/8) clay

loam; moderate medium subangular blocky structure; friable, slightly sticky and slightly plastic; few fine and medium roots; common distinct clay films on faces of peds; about 5 percent sandstone channers; very strongly acid; clear wavy boundary.

Bt3—42 to 51 inches; mottled yellowish red (5YR 5/8), red (2.5YR 5/6), and yellowish brown (10YR 5/6) channery clay loam; moderate fine and medium subangular blocky structure; friable, slightly sticky and slightly plastic; few fine roots; common distinct clay films on faces of peds; about 25 percent sandstone and siltstone channers; very strongly acid; abrupt wavy boundary.

R—51 inches; sandstone bedrock that has thin beds of siltstone.

The thickness of the solum and the depth to bedrock range from 40 to 60 inches. The content of rock fragments ranges from 5 to 35 percent in the A and E horizons and in the upper part of the Bt horizon and from 15 to 80 percent in the lower part of the Bt horizon and in the C horizon. Reaction is very strongly acid or strongly acid throughout the profile in unlimed areas.

The A horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 or 3. The E horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6.

The Bt horizon has hue of 2.5YR to 7.5YR, value of 4 to 6, and chroma of 4 to 8. It is fine sandy loam, loam, sandy clay loam, or clay loam in the fine-earth fraction.

The C horizon, if it occurs, has hue of 2.5YR or 5YR, value of 4 to 6, and chroma of 3 or 4. It is sandy loam or loam in the fine-earth fraction.

The bedrock is fractured sandstone and siltstone.

Berks Series

Soils of the Berks series are moderately deep and well drained. They formed in material weathered from shale, siltstone, and fine grained sandstone. They are on uplands. Slope ranges from 7 to 60 percent.

Berks soils are near Flatwoods, Sequoia, and Weikert soils. Berks soils have less clay in the subsoil than Flatwoods and Sequoia soils and are deeper over bedrock than Weikert soils. Also, they are better drained than Flatwoods soils.

Typical pedon of Berks channery silt loam, in an area of Berks-Weikert complex, 30 to 60 percent slopes, about 3 miles east of Glen Wilton, 1.5 miles east of the junction of U.S. Highway 220 and Virginia Highway 696, and 30 feet north of a private logging road, at an elevation of 1,380 feet:

Oi—2.5 to 1.5 inches; loose leaves, twigs, and pine needles.

Oe—1.5 inches to 0; decayed organic matter.

A—0 to 1 inch; very dark grayish brown (10YR 3/2) channery silt loam; weak very fine granular structure; very friable, nonsticky and nonplastic; many fine and medium roots; about 15 percent shale channers; very strongly acid; abrupt smooth boundary.

E—1 to 6 inches; light yellowish brown (10YR 6/4) channery silt loam; moderate fine granular structure; very friable, slightly sticky and nonplastic; common fine, medium, and coarse roots; about 15 percent shale channers; very strongly acid; clear smooth boundary.

Bw1—6 to 13 inches; yellowish brown (10YR 5/6) channery silt loam; weak fine subangular blocky structure; friable, slightly sticky and slightly plastic; common fine, medium, and coarse roots; about 30 percent shale channers; very strongly acid; clear smooth boundary.

Bw2—13 to 24 inches; yellowish brown (10YR 5/8) very channery silty clay loam; moderate medium subangular blocky structure; firm, slightly sticky and slightly plastic; few fine and medium roots; few faint brownish yellowish (10YR 6/6) silt coatings on faces of peds; about 45 percent shale channers; very strongly acid; clear wavy boundary.

C—24 to 31 inches; reddish yellow (7.5YR 6/6) extremely channery silt loam; massive; friable, slightly sticky and slightly plastic; few fine roots; about 80 percent shale channers; strongly acid; clear smooth boundary.

R—31 inches; shale bedrock.

The thickness of the solum ranges from 18 to 40 inches. The depth to bedrock ranges from 20 to 40 inches. The content of shale, fine grained sandstone, or siltstone fragments ranges from 10 to 35 percent in the A and E horizons, from 15 to 60 percent in individual subhorizons of the B horizon, and from 35 to 90 percent in the C horizon. Reaction ranges from extremely acid to slightly acid throughout the profile in unlimed areas.

The A horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4. The E horizon has hue of 10YR, value of 4 to 6, and chroma of 3 or 4. It is silt loam or loam in the fine-earth fraction.

The Bw horizon has hue of 5YR to 10YR, value of 5 or 6, and chroma of 4 to 8. It is silt loam, loam, or silty clay loam in the fine-earth fraction.

The C horizon has hue of 5YR to 10YR, value of 5 or 6, and chroma of 3 to 6. It is silt loam or loam in the fine-earth fraction.

The bedrock is fractured shale, siltstone, or fine grained sandstone. It is characterized by little or no displacement.

Botetourt Series

Soils of the Botetourt series are very deep and moderately well drained. They formed in alluvium derived from sandstone, shale, and limestone. They are on low stream terraces, benches, and foot slopes throughout the survey area. Slope ranges from 2 to 15 percent.

Botetourt soils are near Derroc, Gladehill, Irongate, Purdy, and Wolfgap soils. Botetourt soils have a subsoil that is more strongly developed than that of Derroc, Gladehill, Irongate, and Wolfgap soils. Also, they are more poorly drained than Derroc, Gladehill, and Wolfgap soils and are better drained than Purdy soils.

Typical pedon of Botetourt loam, 2 to 7 percent slopes, rarely flooded, about 3 miles northwest of Fincastle, 0.5 mile southeast of the intersection of Virginia Highways 606 and 666, and 500 feet west of North Fork, at an elevation of 1,180 feet:

Ap—0 to 7 inches; brown (10YR 5/3) loam; moderate medium granular structure; very friable, nonsticky and nonplastic; many very fine and fine roots; about 5 percent rounded gravel; slightly acid; abrupt smooth boundary.

Bt1—7 to 14 inches; brownish yellow (10YR 6/6) clay loam; few fine prominent strong brown (7.5YR 5/8) mottles; moderate fine subangular blocky structure; friable, slightly sticky and slightly plastic; common very fine roots; common distinct clay films on faces of peds; about 2 percent rounded gravel; moderately acid; clear smooth boundary.

Bt2—14 to 24 inches; yellowish brown (10YR 5/6) clay loam; common medium distinct very pale brown (10YR 7/3) and common medium prominent strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; firm, slightly sticky and slightly plastic; few very fine roots; common faint clay films on faces of peds; strongly acid; gradual smooth boundary.

Bt3—24 to 44 inches; brownish yellow (10YR 6/8) clay loam; many coarse prominent light gray (N 7/0) mottles; moderate medium and coarse subangular blocky structure; firm, slightly sticky and slightly plastic; few very fine roots; many faint clay films on faces of peds; strongly acid; clear wavy boundary.

BC—44 to 53 inches; mottled reddish yellow (7.5YR 6/8) and light gray (N 7/0) loam; weak coarse subangular blocky structure; friable, slightly sticky and slightly plastic; about 2 percent rounded gravel; strongly acid; clear wavy boundary.

C—53 to 65 inches; mottled yellowish brown (10YR 5/8), gray (10YR 6/1), and light gray (N 7/0) gravelly sandy clay loam; massive; friable, slightly sticky and slightly plastic; about 15 percent rounded gravel and 3 percent cobbles; strongly acid.

The thickness of the solum ranges from 40 to more than 60 inches. The depth to bedrock is more than 60 inches. The content of rounded pebbles and cobblestones ranges from 0 to 15 percent in the A horizon, from 0 to 35 percent in the Bt horizon, and from 5 to 50 percent in the C horizon. Reaction ranges from strongly acid to neutral in the A horizon and from strongly acid to slightly acid in the B and C horizons.

The Ap horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 4.

The Bt horizon has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 3 to 8. It is mottled in the lower part. This horizon is loam, clay loam, or sandy clay loam in the fine-earth fraction.

The BC and C horizons are mottled with hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 1 to 8. The BC horizon is loam, clay loam, or sandy clay loam in the fine-earth fraction. The C horizon is sandy loam, fine sandy loam, loam, sandy clay loam, or clay loam in the fine-earth fraction.

Carbo Series

Soils of the Carbo series are moderately deep and well drained. They formed in material weathered from limestone interbedded with some shale. They are on uplands in a limestone valley. Slope ranges from 2 to 45 percent.

Carbo soils are near Frederick, Groseclose, and Opequon soils. Carbo soils are not so deep over bedrock as Frederick and Groseclose soils and are deeper than Opequon soils.

Typical pedon of Carbo silty clay loam, in an area of Carbo-Opequon-Rock outcrop complex, 15 to 45 percent slopes, about 3.5 miles northwest of Fincastle, ¾ mile southeast of Virginia Highway 666, and 400 feet north of Crooked Creek, at an elevation of 1,320 feet:

Oi—2 inches to 1 inch; loose hardwood leaves and twigs.

Oe—1 inch to 0; highly decomposed and partially decomposed organic matter.

A—0 to 5 inches; dark brown (10YR 4/3) silty clay loam; strong fine and medium granular structure; friable, sticky and slightly plastic; common fine and medium and few coarse roots; about 5 percent limestone channers and 2 percent chert gravel; neutral; clear smooth boundary.

Bt1—5 to 9 inches; dark yellowish brown (10YR 4/6) clay; moderate medium subangular blocky structure; firm, very sticky and very plastic; common fine and medium and few coarse roots; many faint dark

yellowish brown (10YR 4/4) clay films on faces of peds; about 2 percent chert gravel; neutral; clear wavy boundary.

Bt2—9 to 21 inches; yellowish brown (10YR 5/8) clay; moderate fine and medium subangular blocky structure; very firm, sticky and very plastic; few fine and medium roots; many distinct dark yellowish brown (10YR 4/6) clay films on faces of peds; few fine rounded concretions of manganese oxide; few medium rounded concretions of secondary lime; slightly acid; clear wavy boundary.

Bt3—21 to 27 inches; yellowish brown (10YR 5/8) clay; many fine prominent yellowish red (5YR 5/8) mottles; moderate medium and coarse subangular blocky structure; firm, sticky and very plastic; few fine roots; many faint yellowish brown (10YR 5/6) clay films on faces of peds; few fine rounded concretions of manganese oxide; few medium rounded concretions of secondary lime; slightly alkaline; abrupt wavy boundary.

R—27 inches; limestone bedrock.

The thickness of the solum and the depth to bedrock range from 20 to 40 inches. The content of rock fragments, mainly limestone, shale, and chert, ranges from 0 to 10 percent in the A horizon and from 0 to 15 percent in the Bt horizon. The content of manganese concretions ranges from 0 to 10 percent in the solum. Some pedons have concretions of secondary carbonate in the lower part of the Bt horizon and in the C horizon. Reaction ranges from very strongly acid to neutral in the A horizon and in the upper part of the Bt horizon and from moderately acid to slightly alkaline in the lower part of the Bt horizon and in the C horizon.

The A horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 3 to 6. It has value of 3 only where it is less than 6 inches thick.

The Bt horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 4 to 8.

The BC and C horizons, if they occur, have hue of 7.5YR to 2.5Y, value of 4 or 5, and chroma of 4 to 8. They are clay or silty clay.

The bedrock is hard, dark gray or black limestone or limestone interbedded with shale and thin strata of clay.

Chilhowie Series

Soils of the Chilhowie series are moderately deep and well drained. They formed in material weathered from interbedded limestone and calcareous shale. They are on uplands in a limestone valley. Slope ranges from 7 to 60 percent.

Chilhowie soils are near Berks, Frederick, Groseclose, and Weikert soils. Chilhowie soils are not so deep over bedrock as Frederick and Groseclose soils. They have more clay in the subsoil than Berks and Weikert soils.

Typical pedon of Chilhowie silty clay loam, 7 to 15 percent slopes, rocky, about 2.5 miles south of Fincastle and 1,200 feet northeast of intersection of U.S. Highway 220 and Virginia Highway 676, at an elevation of 1,430 feet:

Ap—0 to 6 inches; dark brown (10YR 4/3) silty clay loam; moderate medium granular structure; firm, slightly sticky and plastic; common fine and very fine roots; about 10 percent limestone, shale, and chert channers; slightly alkaline; abrupt smooth boundary.

Bt—6 to 17 inches; yellowish brown (10YR 5/6) clay; moderate medium subangular blocky structure; firm, sticky and very plastic; few very fine roots; few prominent manganese stains on faces of peds; many distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; about 2 percent limestone and shale channers; slightly alkaline; clear wavy boundary.

C—17 to 27 inches; yellowish brown (10YR 5/6) extremely channery clay; massive; firm, sticky and plastic; about 70 percent shale and limestone channers and flagstones; slightly alkaline; clear wavy boundary.

R—27 inches; interbedded limestone and calcareous shale bedrock.

The thickness of the solum ranges from 10 to 25 inches. The depth to bedrock ranges from 20 to 40 inches. The content of limestone and shale fragments ranges from 0 to 35 percent in the A and Bt horizons and from 25 to 80 percent in the C horizon. Reaction ranges from slightly acid to moderately alkaline in the solum and from neutral to moderately alkaline in the substratum.

The A horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 to 4. The Bt and C horizons are silty clay or clay in the fine-earth fraction. The Bt horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 4 to 8. The C horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 4 to 8.

Chiswell Series

Soils of the Chiswell series are shallow and well drained. They formed in material weathered from interbedded shale and siltstone. They are on uplands in a limestone valley. Slope ranges from 7 to 60 percent.

Chiswell soils are near Groseclose and Litz soils. Chiswell soils are not so deep as the nearby soils. Also, they have less clay in the subsoil than Groseclose soils.

Typical pedon of Chiswell channery silt loam, in an

area of Chiswell-Groseclose complex, 15 to 30 percent slopes, about ¾ mile east of Bonsack, 0.5 mile south of the intersection of Virginia Highways 738 and 658, and 2,000 feet east of the Blue Ridge Parkway, at an elevation of 1,190 feet:

Ap—0 to 4 inches; dark yellowish brown (10YR 4/4) channery silt loam; moderate very fine and fine granular structure; friable, slightly sticky and nonplastic; common very fine, fine, and medium roots; about 20 percent shale channers; moderately acid; clear smooth boundary.

BA—4 to 9 inches; light yellowish brown (10YR 6/4) channery silt loam; weak fine granular structure; friable, slightly sticky and nonplastic; common very fine and fine roots; about 20 percent shale channers; moderately acid; clear smooth boundary.

Bw—9 to 13 inches; yellowish brown (10YR 5/4) very channery silt loam; weak fine subangular blocky structure; friable, slightly sticky and nonplastic; few very fine and fine roots; about 55 percent shale channers; very strongly acid; abrupt wavy boundary.

Cr—13 to 65 inches; shale bedrock.

The thickness of the solum ranges from 8 to 18 inches. The depth to bedrock ranges from 10 to 20 inches. The content of shale or siltstone fragments ranges from 15 to 50 percent in the A horizon, from 30 to 80 percent in the B horizon, and from 60 to 90 percent in the C horizon. Reaction is very strongly acid to moderately acid throughout the profile in unlimed areas.

The A horizon has hue of 5YR to 10YR, value of 3 or 4, and chroma of 2 to 5. The Bw horizon and the C horizon, if it occurs, are silt loam or loam in the fine-earth fraction. The Bw horizon has hue of 5YR to 10YR, value of 5 or 6, and chroma of 4 to 6. The C horizon has hue of 2.5YR to 10YR, value of 5 or 6, and chroma of 3 to 8.

The bedrock is shale or interbedded shale and siltstone. It is characterized by little or no displacement.

Dekalb Series

Soils of the Dekalb series are moderately deep and well drained. They formed material weathered from sandstone, quartzite, and shale. They are on uplands in the Blue Ridge and Appalachian Mountains. Slope ranges from 2 to 80 percent.

Dekalb soils commonly are near Berks, Laidig, Lehew, and Weikert soils. Dekalb soils have more sand and less silt than Berks and Weikert soils. They are not so deep over bedrock as Laidig soils and do not have a fragipan, which is characteristic of Laidig soils. They are not so red in the subsoil as Lehew soils.

Typical pedon of Dekalb channery fine sandy loam, 30 to 60 percent slopes, very stony, 2.5 miles north of Oriskany and 1,500 feet west of Furnace Branch, at an elevation of 2,040 feet:

Oi—0.5 inch to 0; loose hardwood leaves, pine needles, and twigs.

A—0 to 1 inch; very dark grayish brown (10YR 3/2) channery fine sandy loam; weak very fine granular structure; very friable, nonsticky and nonplastic; many very fine, fine, and medium roots; about 30 percent sandstone channers; very strongly acid; abrupt smooth boundary.

E—1 to 6 inches; yellowish brown (10YR 5/4) channery fine sandy loam; weak medium granular structure; very friable, nonsticky and nonplastic; common very fine, fine, and medium roots; about 25 percent sandstone channers; strongly acid; clear smooth boundary.

Bw1—6 to 21 inches; brownish yellow (10YR 6/6) very channery fine sandy loam; weak fine subangular blocky structure; friable, nonsticky and nonplastic; few fine, medium, and coarse roots; about 40 percent sandstone channers; strongly acid; clear smooth boundary.

Bw2—21 to 32 inches; yellowish brown (10YR 5/6) very channery fine sandy loam; weak fine subangular blocky structure; friable, slightly sticky and nonplastic; few fine, medium, and coarse roots; about 55 percent sandstone channers; very strongly acid; clear wavy boundary.

C—32 to 34 inches; yellowish brown (10YR 5/6) extremely flaggy sandy loam; massive; very friable, nonsticky and nonplastic; few fine roots; about 75 percent flagstones and channers; very strongly acid; abrupt wavy boundary.

R—34 inches; fractured sandstone bedrock.

The thickness of the solum and the depth to sandstone or quartzite bedrock range from 20 to 40 inches. The content of sandstone and quartzite fragments as much as 10 inches across ranges from 15 to 60 percent in the A and Bw horizons and from 50 to more than 90 percent in the C horizon. Reaction is extremely acid to slightly acid in the A and E horizons and extremely acid to strongly acid in the B and C horizons.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 to 3. The E horizon has hue of 10YR, value of 5 or 6, and chroma of 4.

The Bw and C horizons have hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 4 to 6. The Bw horizon is fine sandy loam or loam in the fine-earth fraction. The C horizon is loamy sand or sandy loam in the fine-earth fraction.

The bedrock is fractured sandstone or quartzite that has thin beds of siltstone and shale.

Derroc Series

Soils of the Derroc series are very deep and well drained. They formed in alluvium derived from sandstone, quartzite, shale, and limestone. They are on flood plains along streams and rivers. Slope ranges from 0 to 4 percent.

Derroc soils are near Gladehill, Irongate, and Wolfgap soils. Derroc soils have more rock fragments in the subsoil than the nearby soils.

Typical pedon of Derroc cobbly loam, 0 to 4 percent slopes, occasionally flooded, about 1.5 miles east of Troutville, 1,500 feet south of the intersection of Virginia Highways 716 and 651, and 100 feet east of Stony Battle Creek, at an elevation of 1,420 feet:

Ap—0 to 7 inches; dark yellowish brown (10YR 4/4) cobbly loam; moderate fine and medium granular structure; friable, nonsticky and nonplastic; common very fine and fine and few medium roots; about 20 percent cobbles and 5 percent gravel; slightly acid; abrupt smooth boundary.

Bw—7 to 21 inches; yellowish brown (10YR 5/6) very cobbly sandy loam; moderate very fine subangular blocky structure; very friable, nonsticky and nonplastic; common very fine and fine roots; about 35 percent cobbles and 20 percent gravel; moderately acid; abrupt wavy boundary.

C1—21 to 42 inches; dark yellowish brown (10YR 4/6) extremely cobbly sandy loam; single grain; very friable, nonsticky and nonplastic; few very fine roots; about 45 percent cobbles and 30 percent gravel; moderately acid; abrupt wavy boundary.

C2—42 to 72 inches; dark yellowish brown (10YR 4/4) extremely cobbly sandy loam; single grain; very friable, nonsticky and nonplastic; about 45 percent cobbles, 15 percent stones, and 20 percent gravel; moderately acid.

The thickness of the solum ranges from 20 to 40 inches. The depth to bedrock is more than 60 inches. The content of rounded rock fragments, mainly cobbles and gravel, ranges from 15 to 60 percent in the A horizon and from 30 to 80 percent in the Bw and C horizons. Reaction is moderately acid to neutral throughout the profile.

The Ap horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 to 6.

The Bw horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. It is sandy loam or loam in the fine-earth fraction.

The C horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. It is loamy sand or sandy loam in the fine-earth fraction.

Edneytown Series

Soils of the Edneytown series are very deep and well drained. They formed in material weathered from granite and granite gneiss. They are on uplands on the Blue Ridge. Slope ranges from 2 to 60 percent.

Edneytown soils commonly are near Hayesville, Peaks, and Thurmont soils. Edneytown soils have more clay in the subsoil than Peaks soils. Also, they are deeper over bedrock. They are not so red as Hayesville soils. Also, they have less clay in the subsoil. They have a solum that is thinner than that of Thurmont soils.

Typical pedon of Edneytown loam, 30 to 60 percent slopes, very stony, 1¾ miles east of Webster, 1 mile east of the intersection of Virginia Highways 603 and 607, and 200 feet north of the Bedford County line, at an elevation of 1,800 feet:

A—0 to 7 inches; dark brown (10YR 4/3) loam; moderate fine granular structure; friable, nonsticky and nonplastic; many fine, common very fine, and few coarse roots; about 5 percent cobbles; moderately acid; abrupt smooth boundary.

Bt1—7 to 21 inches; strong brown (7.5YR 5/6) clay loam; moderate fine subangular blocky structure; friable, slightly sticky and slightly plastic; common fine and few very fine roots; common distinct clay films on faces of peds; few fine flakes of mica; about 2 percent cobbles and 2 percent gravel; strongly acid; clear smooth boundary.

Bt2—21 to 29 inches; strong brown (7.5YR 5/6) clay loam; moderate very fine and fine subangular blocky structure; friable, slightly sticky and slightly plastic; few very fine and fine roots; common distinct clay films on faces of peds; few fine flakes of mica; strongly acid; gradual smooth boundary.

Bt3—29 to 37 inches; strong brown (7.5YR 5/8) sandy clay loam; weak medium subangular blocky structure; friable, slightly sticky and slightly plastic; few fine roots; few distinct clay films on faces of peds; few fine flakes of mica; common medium weathered fragments of granite; strongly acid; clear wavy boundary.

C1—37 to 50 inches; variegated brownish yellow (10YR 6/8), white (10YR 8/2), and yellowish brown (10YR 5/3) sandy loam; friable, slightly sticky and nonplastic; few distinct strong brown (7.5YR 5/8) clay coatings and flows in fracture planes; common fine flakes of mica; very strongly acid; gradual wavy boundary.

C2—50 to 65 inches; variegated brownish yellow (10YR 6/8), white (10YR 8/2), and black (10YR 2/1) sandy

loam; massive; firm, nonsticky and nonplastic; common fine flakes of mica; very strongly acid.

The thickness of the solum ranges from 20 to 40 inches. The depth to bedrock is more than 60 inches. The content of rock fragments ranges from 0 to 15 percent in the A horizon and from 0 to 5 percent in the Bt and C horizons. In unlimed areas reaction is very strongly acid to moderately acid in the A horizon and very strongly acid or strongly acid in the B and C horizons.

The A horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4. The E horizon, if it occurs, has hue of 10YR, value of 4 to 7, and chroma of 3 to 6. It is sandy loam, fine sandy loam, or loam.

The Bt horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 6 to 8. It is sandy clay loam or clay loam.

The BC horizon, if it occurs, has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 6 to 8. It is sandy loam or sandy clay loam.

The C horizon has hue of 7.5YR or 10YR, value of 5 to 8, and chroma of 3 to 8.

The Cr horizon, if it occurs, is yellow, black, brown, or white granite or gneiss saprolite. It is sandy loam.

Ernest Series

Soils of the Ernest series are very deep and moderately well drained. They formed in colluvium derived from shale, siltstone, and sandstone. They are on foot slopes and colluvial fans at the foot of shale uplands. Slope ranges from 0 to 15 percent.

Ernest soils commonly are near Berks, Gilpin, Laidig, Rushtown, and Weikert soils. Ernest soils are more poorly drained than Berks, Gilpin, Laidig, Rushtown, and Weikert soils. They are deeper over bedrock than Berks, Gilpin, and Weikert soils and have fewer rock fragments in the subsoil than Berks, Rushtown, and Weikert soils.

Typical pedon of Ernest silt loam, 0 to 7 percent slopes, about 2 miles east of Glen Wilton and 0.5 mile southeast of the intersection of U.S. Highway 220 and Virginia Highway 696, at an elevation of 1,100 feet:

Ap—0 to 11 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium granular structure; friable, slightly sticky and slightly plastic; common very fine and fine and few coarse roots; few medium vesicular pores; about 10 percent semirounded shale channers; strongly acid; clear smooth boundary.

Bt1—11 to 20 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm, sticky and plastic; common very fine and fine and few coarse roots; few medium vesicular pores; many faint strong brown (7.5YR 4/6) clay films on faces of peds; about 10 percent semirounded shale channers; strongly acid; clear wavy boundary.

Bt2—20 to 27 inches; strong brown (7.5YR 5/6) silty clay loam; few prominent light gray (10YR 7/2) and few fine faint reddish yellow (7.5YR 6/8) mottles; firm, sticky and plastic; few very fine and fine roots; many fine vesicular pores; common faint strong brown (7.5YR 4/6) clay films on faces of peds; few distinct manganese stains; about 5 percent semirounded shale channers; strongly acid; clear smooth boundary.

Btx1—27 to 35 inches; yellowish brown (10YR 5/6) silty clay loam; many medium distinct light gray (10YR 7/2) and common medium distinct reddish yellow (7.5YR 6/8) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm, slightly sticky and plastic; brittle; few fine vesicular pores; common distinct strong brown (7.5YR 5/6) clay films on faces of prisms; common distinct manganese stains; about 10 percent semirounded shale and siltstone channers; strongly acid; clear wavy boundary.

Btx2—35 to 43 inches; yellowish brown (10YR 5/6) very channery silty clay loam; many medium distinct light gray (10YR 7/2) and common medium distinct reddish yellow (7.5YR 6/8) mottles; moderate fine and medium subangular blocky structure; firm, slightly sticky and slightly plastic; brittle; common fine and medium vesicular pores; few distinct strong brown (7.5YR 5/6) clay films on faces of peds; common distinct manganese stains; about 40 percent semirounded shale, siltstone, and sandstone channers; strongly acid; clear wavy boundary.

Bx—43 to 65 inches; light brownish gray (2.5Y 6/2) silty clay loam; many medium prominent strong brown (7.5YR 4/6) and common medium distinct yellowish brown (10YR 5/8) mottles; weak coarse prismatic structure parting to moderate fine subangular blocky; firm, slightly sticky and slightly plastic; very brittle; many medium and coarse vesicular pores; common distinct manganese stains and common fine manganese concretions; about 5 percent semirounded shale channers; strongly acid.

The thickness of the solum ranges from 36 to 72 inches. The depth to a fragipan ranges from 20 to 36 inches. The depth to bedrock is more than 60 inches. The content of rock fragments ranges from 0 to 25 percent in the A and E horizons, from 5 to 25 percent in

the B horizon, from 5 to 40 percent in the Bx horizon, and from 15 to 50 percent in the C horizon. In unlimed areas reaction is very strongly to moderately acid in the A horizon and very strongly acid or strongly acid in the B horizon.

The A horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. The E horizon, if it occurs, has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. It is silt loam in the fine-earth fraction.

The Bt horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 8. It is silt loam or silty clay loam in the fine- earth fraction.

The Bx horizon has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 2 to 8. It is loam, silt loam, or silty clay loam in the fine-earth fraction.

The C horizon, if it occurs, has hue of 7.5YR to 2.5Y, value of 4 to 7, and chroma of 2 to 6. It is loam, silt loam, silty clay loam, or silty clay in the fine-earth fraction.

Flatwoods Series

Soils of the Flatwoods series are moderately deep and moderately well drained. They formed in material weathered from acid shale. They are on uplands in the Fincastle Valley. Slope ranges from 2 to 15 percent.

Flatwoods soils are near Berks and Weikert soils. Unlike the nearby soils, Flatwoods soils have gray mottles. Also, they have fewer shale fragments and more clay in the subsoil than Berks and Weikert soils.

Typical pedon of Flatwoods silt loam, 2 to 7 percent slopes, about 2 miles northwest of Fincastle, 1 mile northwest of intersection of Virginia Highways 606 and 600, and 1,000 feet west of North Fork, at an elevation of 1,170 feet:

Oi—3 inches to 1 inch; undecomposed and partially decomposed hardwood leaves, pine needles, and twigs.

Oe—1 inch to 0; very dark grayish brown, partially decomposed mat of organic matter.

A—0 to 2 inches; brown (10YR 5/3) silt loam; weak medium granular structure; friable, slightly sticky and slightly plastic; many very fine and fine and common medium roots; very strongly acid; abrupt smooth boundary.

E—2 to 6 inches; brownish yellow (10YR 6/6) silt loam; weak fine subangular blocky structure; friable, slightly sticky and slightly plastic; common fine and few medium roots; common faint light yellowish brown (10YR 6/4) coatings on faces of peds; strongly acid; clear smooth boundary.

Bt1—6 to 13 inches; yellowish brown (10YR 5/6) clay; moderate medium subangular blocky structure; firm, slightly sticky and plastic; few fine and medium roots; few faint brownish yellow (10YR 6/6) clay films on faces of peds; very strongly acid; clear smooth boundary.

Bt2—13 to 17 inches; yellowish brown (10YR 5/8) clay; few fine prominent yellowish red (5YR 5/8) and pale brown (10YR 6/3) mottles; weak medium platy structure parting to weak very fine subangular blocky; firm, slightly sticky and plastic; few fine roots; many distinct brownish yellow (10YR 6/6) clay films on faces of peds; few pockets of yellowish red, highly weathered shale fragments; very strongly acid; clear wavy boundary.

Bt3—17 to 24 inches; mottled yellowish brown (10YR 5/8), strong brown (7.5YR 5/6), and light brownish gray (10YR 6/2) clay; weak fine and medium subangular blocky structure; firm, slightly sticky and plastic; few fine and medium roots; common distinct brownish yellow (10YR 6/6) clay films on faces of peds; common pockets of yellowish red, highly weathered shale fragments; strongly acid; clear smooth boundary.

BC—24 to 32 inches; mottled yellowish brown (10YR 5/8) and gray (10YR 6/1) clay; weak medium subangular blocky structure; firm, sticky and plastic; few fine roots; few distinct pale brown (10YR 6/3) clay films on faces of peds; common pockets of yellowish red, highly weathered shale fragments; strongly acid; clear wavy boundary.

R—32 inches; shale bedrock.

The thickness of the solum ranges from 18 to 36 inches. The depth to bedrock ranges from 20 to 40 inches. The content of shale fragments ranges from 0 to 10 percent in the A and E horizons, from 0 to 15 percent in the Bt horizon, from 0 to 35 percent in the BC horizon, and from 35 to 60 percent in the C horizon. Reaction is very strongly acid or strongly acid throughout the profile in unlimed areas.

The A horizon has hue of 10YR, value of 5, and chroma of 2 to 4. The E horizon has hue of 10YR, value of 5 or 6, and chroma of 4 to 6.

The Bt horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 6 to 8. It commonly is mottled in shades of red, brown, or gray in the lower part. This horizon is silty clay loam, silty clay, or loam in the fine-earth fraction.

The BC horizon, has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 1 to 8 and commonly is mottled. It is silty clay or clay in the fine-earth fraction.

The C horizon, if it occurs, is mottled with hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 1 to 8. It is silty clay or clay in the fine-earth fraction.

Frederick Series

Soils of the Frederick series are very deep and well drained. They formed in material weathered from dolomitic limestone. They are on uplands in a limestone valley. Slope ranges from 2 to 45 percent.

Frederick soils are near Carbo, Groseclose, and Opequon soils. Frederick soils are deeper over bedrock than Carbo and Opequon soils. They have more clay in the lower part of the subsoil than Groseclose soils.

Typical pedon of Frederick loam, 7 to 15 percent slopes, 2.5 miles west of Springwood and 1,500 feet northwest of the intersection of Virginia Highways 630 and 634, at an elevation of 1,130 feet:

Ap—0 to 11 inches; dark yellowish brown (10YR 4/4) loam; moderate medium granular structure; friable, slightly sticky and slightly plastic; many fine roots; moderately acid; abrupt smooth boundary.

Bt1—11 to 29 inches; yellowish red (5YR 5/8) clay; moderate medium subangular blocky structure; firm, sticky and plastic; many distinct clay films on faces of peds; strongly acid; gradual smooth boundary.

Bt2—29 to 55 inches; yellowish red (5YR 5/8) clay; many medium distinct reddish yellow (7.5YR 6/6) mottles; moderate medium subangular blocky structure; firm, sticky and plastic; few fine roots; many distinct clay films on faces of peds; very strongly acid; gradual wavy boundary.

Bt3—55 to 65 inches; yellowish red (5YR 5/8) clay; many medium distinct red (2.5YR 4/6) and reddish yellow (7.5YR 6/6) mottles; moderate medium subangular blocky structure; friable, sticky and plastic; many distinct clay films on faces of peds; very strongly acid.

The solum is more than 60 inches thick. The depth to bedrock is more than 72 inches. The content of chert and sandstone gravel ranges from 0 to 60 percent in the A or Ap horizon and from 0 to 25 percent in the Bt horizon. Reaction is very strongly acid to moderately acid throughout the profile in unlimed areas.

The Ap horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 2 to 8. It is loam or silty clay loam in the fine-earth fraction. The A horizon, if it occurs, has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 1 to 4. It is loam or silt loam in the fine-earth fraction.

The Bt horizon has hue of 2.5YR or 5YR, value of 4 to 6, and chroma of 4 to 8. It commonly is mottled in shades of red, brown, yellow, or gray in the lower part. This horizon is clay loam, silty clay loam, silty clay, or clay in the fine-earth fraction.

Gilpin Series

Soils of the Gilpin series are moderately deep and well drained. They formed in material weathered from shale, siltstone, and fine grained sandstone. They are on uplands. Slope ranges from 7 to 15 percent.

Gilpin soils are near Berks, Ernest, and Weikert soils. Gilpin soils have fewer rock fragments in the subsoil than Berks and Weikert soils. Also, they are deeper over bedrock than Weikert soils. Unlike Ernest soils, they do not have gray mottles and do not have a fragipan.

Typical pedon of Gilpin silt loam, 7 to 15 percent slopes, about 3 miles northwest of Gala, 1¾ miles south of the end of Virginia Highway 633, and 300 feet south of Shirley Mill Branch, at an elevation of 1,080 feet:

Oe—1 inch to 0; decomposed mat of hardwood leaves and twigs.

A—0 to 1 inch; very dark brown (10YR 2/2) silt loam; moderate very fine granular structure; very friable, nonsticky and nonplastic; many very fine, fine, and medium roots; about 5 percent shale channers; very strongly acid; abrupt smooth boundary.

E—1 to 5 inches; light olive brown (2.5Y 5/4) silt loam; moderate fine granular structure; friable, slightly sticky and slightly plastic; common fine and medium roots; about 5 percent shale channers; very strongly acid; abrupt smooth boundary.

Bt1—5 to 19 inches; yellowish brown (10YR 5/6) silty clay loam; moderate fine and medium subangular blocky structure; friable, slightly sticky and slightly plastic; few fine roots; common faint clay films on faces of peds; about 5 percent shale channers; very strongly acid; clear smooth boundary.

Bt2—19 to 28 inches; yellowish brown (10YR 5/8) channery silty clay loam; weak medium subangular blocky structure; friable, slightly sticky and slightly plastic; few fine roots; common distinct clay films on faces of peds; about 20 percent shale channers; strongly acid; gradual wavy boundary.

C—28 to 34 inches; strong brown (7.5YR 5/6) very channery silty clay loam; few fine distinct pale brown (10YR 6/3) mottles; massive; friable, slightly sticky and slightly plastic; about 50 percent shale channers; strongly acid; abrupt wavy boundary.

R—34 inches; shale bedrock.

The thickness of the solum ranges from 18 to 36 inches. The depth to bedrock ranges from 20 to 40 inches. The content of shale and siltstone fragments ranges from 5 to 40 percent in the A, E, and Bt

horizons and from 30 to 90 percent in the C horizon. Reaction is extremely acid to strongly acid throughout the profile in unlimed areas.

The A horizon has hue of 10YR, value of 2 to 5, and chroma of 2 to 4. The E horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 3 to 6. It is silt loam or loam.

The Bt horizon has hue of 7.5YR to 2.5Y, value of 5, and chroma of 4 to 8. It is loam, silt loam, or silty clay loam in the fine-earth fraction.

The C horizon has hue of 7.5YR to 2.5Y, value of 4 or 5, and chroma of 2 to 6. It is loam, silt loam, or silty clay loam in the fine-earth fraction.

The bedrock is shale or siltstone. It is characterized by little or no displacement.

Gladehill Series

Soils of the Gladehill series are very deep and well drained. They formed in alluvium derived from limestone, sandstone, shale, and siltstone. They are on flood plains along streams and rivers. Slope ranges from 0 to 3 percent.

Gladehill soils are near Derroc, Irongate, and Wolfgap soils. Gladehill soils have fewer rock fragments than Derroc soils. They are not so wet as Irongate soils. They have more sand and less clay in the subsoil than Wolfgap soils.

Typical pedon of Gladehill fine sandy loam, 0 to 3 percent slopes, occasionally flooded, about 1 mile southeast of Springwood, 3,000 feet southwest of the intersection of Virginia Highways 43 and 630, and 300 feet north of the James River, at an elevation of 850 feet:

Ap—0 to 5 inches; very dark grayish brown (10YR 3/2) fine sandy loam; weak fine granular structure; very friable, slightly sticky and nonplastic; many fine and medium roots; slightly acid; abrupt smooth boundary.

Bw1—5 to 12 inches; dark brown (10YR 3/3) fine sandy loam; weak medium subangular blocky structure; friable, slightly sticky and nonplastic; common fine roots; slightly acid; clear smooth boundary.

Bw2—12 to 42 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak medium subangular blocky structure; friable, slightly sticky and nonplastic; few fine roots; about 5 percent gravel; slightly acid; clear smooth boundary.

C1—42 to 60 inches; dark yellowish brown (10YR 4/4) loam; massive; friable, slightly sticky and nonplastic; about 10 percent gravel; neutral; clear smooth boundary.

C2—60 to 65 inches; dark brown (10YR 3/3) fine sandy loam; massive; friable, slightly sticky and nonplastic; neutral; abrupt smooth boundary.

C3—65 to 72 inches; dark brown (10YR 4/3) fine sandy loam; massive; friable, slightly sticky and nonplastic; neutral.

The thickness of the solum ranges from 30 to more than 60 inches. The content of rounded gravel and cobbles ranges from 0 to 30 percent in the Ap, Bw, and C horizons and from 15 to 80 percent in the 2C horizon. Reaction ranges from slightly acid to moderately alkaline.

The Ap horizon has hue of 7.5YR or 10YR and value and chroma of 2 or 3. The Bw and C horizons are sandy loam, fine sandy loam, or loam in the fine-earth fraction. The Bw horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 3 to 6. The C horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 3 to 8.

Groseclose Series

Soils of the Groseclose series are very deep and well drained. They formed in material weathered from interbedded limestone, siltstone, and shale. They are on uplands in a limestone valley. Slope ranges from 2 to 60 percent.

Groseclose soils are near Carbo, Chilhowie, Chiswell, Frederick, Litz, and Opequon soils. Groseclose soils are deeper over bedrock than Carbo, Chilhowie, Chiswell, Litz, and Opequon soils. They have less clay in the lower part of the subsoil than Frederick soils.

Typical pedon of Groseclose silt loam, 7 to 15 percent slopes, about 1 mile west of Amsterdam, 3,400 feet west of the intersection of U.S. Highway 220 and Virginia Highway 675, and 1,000 feet north of Virginia Highway 675, at an elevation of 1,320 feet:

Ap—0 to 7 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium and coarse granular structure; friable, slightly sticky and slightly plastic; many very fine and fine roots; few fine tubular pores; about 2 percent chert gravel; strongly acid; abrupt smooth boundary.

Bt1—7 to 13 inches; yellowish brown (10YR 5/8) clay; moderate fine subangular blocky structure; firm, sticky and plastic; common very fine and fine roots; many very fine and few fine tubular pores; common distinct strong brown (7.5YR 5/6) clay films on faces of peds; about 2 percent chert gravel; strongly acid; clear smooth boundary.

Bt2—13 to 26 inches; strong brown (7.5YR 5/8) clay; moderate fine subangular blocky structure; firm, sticky and very plastic; common very fine roots;

common very fine tubular pores; many distinct strong brown (7.5YR 5/6) clay films on faces of peds; few prominent manganese stains on faces of peds; strongly acid; clear wavy boundary.

Bt3—26 to 37 inches; strong brown (7.5YR 5/8) silty clay loam; moderate fine subangular blocky structure; firm, sticky and plastic; few very fine roots; few very fine tubular pores; common distinct strong brown (7.5YR 5/6) clay films on faces of peds; common medium yellow (10YR 7/6), weathered shale fragments; very strongly acid; gradual wavy boundary.

BC—37 to 50 inches; yellowish brown (10YR 5/8) silty clay loam; weak fine subangular blocky structure; firm, sticky and plastic; few very fine roots; few very fine tubular pores; few distinct strong brown (7.5YR 5/6) clay films on faces of peds; many medium yellow (10YR 7/6), highly weathered shale fragments; very strongly acid; gradual wavy boundary.

C—50 to 65 inches; yellowish brown (10YR 5/8), light gray (10YR 7/2), and red (2.5YR 4/8) silty clay loam; massive; firm, slightly sticky and slightly plastic; few distinct strong brown (7.5YR 5/6) clay flows along bedding planes; many medium yellow (10YR 7/6), highly weathered shale fragments; extremely acid.

The thickness of the solum ranges from 30 to 60 inches. The depth to bedrock is more than 60 inches. The content of chert, shale, and siltstone fragments ranges from 0 to 15 percent in the A and Bt horizons and from 0 to 35 percent in the C horizon. Reaction is extremely acid to strongly acid throughout the profile in unlimed areas.

The Ap horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 8. The A horizon, if it occurs, has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. It is loam or silt loam.

The Bt and BC horizons have hue of 5YR to 10YR, value of 4 to 6, and chroma of 4 to 8. They are silty clay loam, clay loam, silty clay, or clay.

The C horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 4 to 8 and commonly is mottled. It is silt loam, silty clay loam, clay loam, silty clay, or clay in the fine-earth fraction.

Hayesville Series

Soils of the Hayesville series are very deep and well drained. They formed in material weathered from granite and granite gneiss. They are on uplands on the Blue Ridge. Slope ranges from 7 to 30 percent.

Hayesville soils are near Edneytown, Peaks, and Thurmont soils. Hayesville soils have more clay in the subsoil than the nearby soils. Also, they are deeper over bedrock than Peaks soils.

Typical pedon of Hayesville loam, 7 to 15 percent slopes, 2.5 miles southeast of Arcadia and ¼ mile southwest of the intersection of Virginia Highways 618 and 714, at an elevation of 1,400 feet:

Ap—0 to 10 inches; yellowish brown (10YR 5/4) loam; weak medium granular structure; very friable, nonsticky and nonplastic; few very fine and fine roots; about 2 percent gravel; slightly acid; abrupt smooth boundary.

Bt1—10 to 19 inches; yellowish red (5YR 4/6) clay; moderate medium subangular blocky structure; firm, sticky and plastic; few fine roots; few faint clay films on faces of peds; few very fine flakes of mica; slightly acid; clear smooth boundary.

Bt2—19 to 36 inches; red (2.5YR 4/8) clay; moderate fine and medium subangular blocky structure; firm, sticky and plastic; few fine roots; common distinct clay films on faces of peds; few very fine flakes of mica; moderately acid; clear wavy boundary.

BC—36 to 43 inches; mixed red (2.5YR 4/6) and strong brown (7.5YR 5/6) sandy clay loam; weak medium subangular blocky structure; friable, slightly sticky and nonplastic; few clay flows; few very fine flakes of mica; strongly acid; clear wavy boundary.

C1—43 to 54 inches; mottled strong brown (7.5YR 5/6) and brownish yellow (10YR 6/6) sandy clay loam; friable, nonsticky and nonplastic; few clay flows in fracture planes; few very fine flakes of mica; very strongly acid; abrupt wavy boundary.

C2—54 to 65 inches; variegated yellow (10YR 7/6) and reddish yellow (7.5YR 6/6) sandy loam; massive; very friable, nonsticky and nonplastic; few very fine flakes of mica; very strongly acid.

The thickness of the solum ranges from 30 to 60 inches. The depth to bedrock is more than 60 inches. The content of rock fragments ranges from 0 to 15 percent throughout the profile. In unlimed areas reaction is extremely acid to slightly acid in the A horizon and extremely acid to moderately acid in the B and C horizons.

The Ap horizon has hue of 5YR to 10YR, value of 4 or 5, and chroma of 3 or 4. The A horizon, if it occurs, has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 to 4. It is loam.

The E horizon, if it occurs, has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 8. It is fine sandy loam or loam.

The Bt horizon has hue of 10R to 5YR, value of 4 or 5, and chroma of 6 to 8. It is clay loam or clay.

The BC horizon has hue of 2.5YR to 5YR, value of 4

or 5, and chroma of 6 to 8. It is loam, sandy clay loam, or clay loam.

The C horizon is multicolored in shades of red, yellow, brown, black, or white. It is granite or gneiss saprolite that has a texture of sandy loam, fine sandy loam, loam, or sandy clay loam.

Irongate Series

Soils of the Irongate series are very deep and moderately well drained. They formed in alluvium derived from limestone, sandstone, siltstone, and shale. They are on flood plains along streams. Slope ranges from 0 to 3 percent.

Irongate soils are near Derroc and Gladehill soils. Irongate soils are wetter than Derroc and Gladehill soils. Also, they have fewer rock fragments in the subsoil than Derroc soils.

Typical pedon of Irongate loam, 0 to 3 percent slopes, occasionally flooded, about 3 miles northwest of Eagle Rock, ¾ mile northwest of the intersection of Virginia Highways 685 and 818, and 330 feet northeast of Virginia Highway 685, at an elevation of 950 feet:

Ap1—0 to 6 inches; dark brown (10YR 3/3) loam; moderate fine granular structure; friable, nonsticky and nonplastic; many very fine and fine and few medium roots; slightly acid; abrupt smooth boundary.

Ap2—6 to 13 inches; dark brown (10YR 3/3) loam; moderate medium granular structure; friable, nonsticky and nonplastic; common very fine and fine and few medium roots; slightly acid; abrupt smooth boundary.

Bw1—13 to 19 inches; dark yellowish brown (10YR 4/4) silt loam; weak very fine and fine subangular blocky structure; friable, slightly sticky and nonplastic; few very fine and fine roots; slightly acid; clear wavy boundary.

Bw2—19 to 29 inches; dark brown (10YR 4/3) loam; few fine faint grayish brown (10YR 5/2) and dark yellowish brown (10YR 4/6) mottles; weak fine subangular blocky structure; friable, slightly sticky and slightly plastic; few very fine and fine roots; slightly acid; gradual wavy boundary.

Bw3—29 to 41 inches; dark brown (10YR 4/3) fine sandy loam; few fine faint grayish brown (10YR 5/2) and dark yellowish brown (10YR 4/4) mottles; weak medium subangular blocky structure; friable, slightly sticky and nonplastic; few very fine and fine roots; slightly acid; clear wavy boundary.

C1—41 to 49 inches; dark yellowish brown (10YR 4/4) fine sandy loam; many fine faint grayish brown (10YR 5/2) mottles; massive; very friable, nonsticky and nonplastic; few very fine roots; moderately acid; gradual smooth boundary.

C2—49 to 65 inches; dark yellowish brown (10YR 4/4) loam; many fine distinct light brownish gray (10YR 6/2) and few fine distinct strong brown (7.5YR 4/6) mottles; massive; friable, slightly sticky and slightly plastic; few very fine roots; few medium charcoal fragments; moderately acid.

The thickness of the solum ranges from 30 to 50 inches. The depth to bedrock is more than 60 inches. The content of rounded sandstone, chert, and quartzite gravel and cobbles ranges from 0 to 15 percent in the A or Ap horizon and from 0 to 35 percent in the Bw and C horizons. Reaction ranges from slightly acid to slightly alkaline throughout the profile.

The Ap horizon and the A horizon, if it occurs, have hue of 10YR and value and chroma of 2 or 3. The Ap horizon is fine sandy loam, loam, or silt loam. The A horizon is loam.

The Bw horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 3 to 6. It is mottled in shades of gray or brown. It is sandy loam, fine sandy loam, loam, or silt loam in the fine-earth fraction.

The C horizon has hue of 7.5YR or 10YR, value of 3 to 6, and chroma of 1 to 6. It is mottled in shades of gray or brown. It is sandy loam, fine sandy loam, loam, or silt loam in the fine-earth fraction.

Laidig Series

Soils of the Laidig series are very deep and well drained. They formed in colluvium derived from sandstone, shale, and quartzite. They are on foot slopes and colluvial fans in the Blue Ridge and Appalachian Mountains. Slope ranges from 2 to 45 percent.

Laidig soils are near Bailegap, Berks, Tumbling, and Weikert soils. Unlike the nearby soils, Laidig soils have a fragipan. They are deeper over bedrock than Berks and Weikert soils. Unlike Tumbling soils, they do not have red colors in the subsoil.

Typical pedon of Laidig cobbly fine sandy loam, 7 to 15 percent slopes, about ¾ mile northeast of Strom and ¾ mile northeast of the intersection of Virginia Highways 615 and 621, at an elevation of 1,450 feet:

Oi—1 inch to 0; partly decomposed layer of hardwood leaves and pine needles.

A—0 to 1 inch; very dark grayish brown (10YR 3/2) cobbly fine sandy loam; weak fine granular structure; very friable, nonsticky and nonplastic; many very fine, fine, and medium roots; about 15 percent cobbles; very strongly acid; abrupt smooth boundary.

E—1 to 7 inches; light yellowish brown (10YR 6/4) cobbly fine sandy loam; weak fine subangular blocky structure; very friable, nonsticky and nonplastic; many very fine and fine and few coarse roots; about 20 percent cobbles; very strongly acid; clear smooth boundary.

BEt—7 to 14 inches; brownish yellow (10YR 6/6) loam; moderate fine subangular blocky structure; friable, slightly sticky and slightly plastic; many very fine and fine roots; few faint clay films on faces of peds; about 12 percent cobbles; very strongly acid; clear smooth boundary.

Bt1—14 to 24 inches; yellowish brown (10YR 5/8) clay loam; moderate medium subangular blocky structure; friable, slightly sticky and slightly plastic; few very fine and fine roots; few distinct clay films on faces of peds; about 12 percent gravel; strongly acid; clear smooth boundary.

Bt2—24 to 32 inches; yellowish brown (10YR 5/8) clay loam; common medium distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; friable, slightly sticky and slightly plastic; few very fine and fine roots; few distinct clay films on faces of peds; about 5 percent gravel; strongly acid; clear wavy boundary.

Btx1—32 to 42 inches; yellowish brown (10YR 5/6) channery clay loam; common medium distinct strong brown (7.5YR 5/6) and few fine faint light yellowish brown (10YR 6/4) mottles; moderate thick platy structure parting to moderate medium subangular blocky; firm, slightly sticky and slightly plastic; brittle; few distinct clay films on faces of plates; about 15 percent channers; strongly acid; gradual wavy boundary.

Btx2—42 to 65 inches; yellowish brown (10YR 5/6) cobbly clay loam; common medium distinct strong brown (7.5YR 5/8) and light brownish gray (10YR 6/2) mottles; moderate thick platy structure parting to moderate medium subangular blocky; firm, slightly sticky and slightly plastic; brittle; few distinct clay films on faces of plates; about 15 percent cobbles and 5 percent gravel; strongly acid.

The thickness of the solum ranges from 50 to more than 80 inches. The depth to a fragipan ranges from 30 to 50 inches. The depth to bedrock is more than 60 inches. The content of rock fragments ranges from 5 to 35 percent in the A, E, and Bt horizons and from 15 to 70 percent in individual subhorizons of the Btx horizon. Reaction is extremely acid to strongly acid throughout the profile in unlimed areas.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 to 4. It is fine sandy loam, loam, or silt loam in the fine-earth fraction. The Ap horizon, if it occurs, has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. It is fine sandy loam or loam in the fine-earth fraction.

The E horizon has hue of 10YR and value and chroma of 4 to 6. It is fine sandy loam, loam, or silt loam in the fine-earth fraction.

The BE horizon, if it occurs, has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 4 to 8. It is fine sandy loam or loam in the fine-earth fraction.

The Bt horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 4 to 8. It has hue of 5YR only in the lower part. This horizon is loam, sandy clay loam, clay loam, or silt loam in the fine-earth fraction.

The Btx horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 3 to 8. It commonly has high- and low-chroma mottles throughout. It is fine sandy loam, loam, sandy clay loam, clay loam, or silt loam in the fine-earth fraction.

Lehew Series

Soils of the Lehew series are moderately deep and well drained to excessively drained. They formed in material weathered from red sandstone and minor amounts of siltstone and shale. They are on uplands in the Appalachian Mountains. Slope ranges from 15 to 60 percent.

Lehew soils are near Bailegap, Dekalb, and Lily soils. Lehew soils are not so deep over bedrock as Bailegap soils. They are redder than Dekalb soils. They have more rock fragments in the subsoil than Lily soils.

Typical pedon of Lehew very channery fine sandy loam, in an area of Lehew-Dekalb complex, 30 to 60 percent slopes, extremely stony, about 3 miles north of Oriskany and 0.5 mile south of the crest of Rich Patch Mountain, at an elevation of 2,400 feet:

Oi—0.5 inch to 0; partially decomposed mat of hardwood leaves and pine needles.

A—0 to 1 inch; dark brown (7.5YR 3/2) very channery fine sandy loam; weak very fine granular structure; very friable, nonsticky and nonplastic; many very fine and fine roots; about 40 percent sandstone channers; very strongly acid; abrupt smooth boundary.

E—1 to 6 inches; reddish brown (5YR 5/3) very channery fine sandy loam; weak fine granular structure; very friable, nonsticky and nonplastic; common very fine and fine and few medium roots; about 35 percent sandstone channers; strongly acid; clear wavy boundary.

Bw1—6 to 18 inches; reddish brown (5YR 4/4) very channery loam; weak very fine subangular blocky structure; friable, slightly sticky and nonplastic; few fine, medium, and coarse roots; about 45 percent

sandstone channers; strongly acid; gradual wavy boundary.

Bw2—18 to 26 inches; reddish brown (2.5YR 4/4) very channery fine sandy loam; weak fine subangular blocky structure; friable, nonsticky and nonplastic; few fine and medium roots; about 60 percent sandstone channers; very strongly acid; gradual wavy boundary.

C—26 to 31 inches; dark reddish brown (2.5YR 3/4) extremely flaggy sandy loam; massive; friable, nonsticky and nonplastic; few fine roots; about 75 percent sandstone channers and flagstones; very strongly acid; abrupt smooth boundary.

R—31 inches; fractured sandstone bedrock.

The thickness of the solum ranges from 15 to 30 inches. The depth to bedrock ranges from 20 to 40 inches. The content of sandstone channers and flagstones ranges from 15 to 50 percent in the A and E horizons, from 35 to 60 percent in the Bw horizon, and from 35 to 90 percent in the C horizon. Reaction is very strongly acid or strongly acid throughout the profile in unlimed areas.

The A horizon has hue of 7.5YR or 10YR, value of 2 to 4, and chroma of 1 or 2. The E horizon has hue of 5YR or 7.5YR, value of 5, and chroma of 3 or 4. It is sandy loam, fine sandy loam, or loam in the fine-earth fraction.

The Bw horizon has hue of 2.5YR or 5YR, value of 3 to 5, and chroma of 3 to 6. It is sandy loam, fine sandy loam, or loam in the fine-earth fraction.

The C horizon has hue of 2.5YR or 5YR, value of 3 to 5, and chroma of 2 to 4. It is loamy sand, sandy loam, or fine sandy loam in the fine-earth fraction.

Lily Series

Soils of the Lily series are moderately deep and well drained. They formed in material weathered from sandstone. They are on uplands in the Appalachian Mountains. Slope ranges from 2 to 60 percent.

Lily soils are near Bailegap and Lehew soils. Lily soils are not so deep as Bailegap soils. They have more clay and fewer rock fragments in the subsoil than Lehew soils.

Typical pedon of Lily gravelly sandy loam, 2 to 15 percent slopes, very stony, about 2.5 miles north of Strom and the intersection of Virginia Highways 615 and 621 and 500 feet east of the Alleghany County line, on Bearwallow Mountain, at an elevation of 2,740 feet:

Oe—1 inch to 0; decomposed mat of hardwood leaves and twigs.

A—0 to 3 inches; dark brown (7.5YR 3/2) gravelly sandy loam; weak very fine granular structure; very friable, nonsticky and nonplastic; common fine and medium roots; about 25 percent gravel; very strongly acid; abrupt smooth boundary.

E—3 to 8 inches; light brown (7.5YR 6/4) gravelly sandy loam; weak fine granular structure; very friable, nonsticky and nonplastic; common fine and medium roots; about 20 percent gravel; strongly acid; clear smooth boundary.

Bt—8 to 29 inches; strong brown (7.5YR 5/6) gravelly loam; weak medium subangular blocky structure; friable, nonsticky and slightly plastic; few fine roots; common distinct clay films on faces of peds; about 20 percent gravel; very strongly acid; abrupt wavy boundary.

R—29 inches; fractured sandstone bedrock.

The thickness of the solum and the depth to bedrock range from 20 to 40 inches. The content of rock fragments ranges from 0 to 30 percent in the A and E horizons and in the upper part of the Bt horizon and from 5 to 35 percent in the lower part of the Bt horizon and in the C horizon. Reaction ranges from extremely acid to strongly acid throughout the profile in unlimed areas.

The A horizon has hue of 7.5YR or 10YR, value of 2 to 5, and chroma of 1 to 3. The E horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 2 to 4. It is sandy loam, fine sandy loam, or loam in the fine-earth fraction.

The Bt horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 4 to 8. It is loam, sandy clay loam, or clay loam in the fine-earth fraction.

The C horizon, if it occurs, has hue of 2.5YR to 10YR, value of 4 to 6, and chroma of 4 to 8. It is sandy loam, fine sandy loam, loam, or sandy clay loam in the fine-earth fraction.

Lindside Series

Soils of the Lindside series are very deep and moderately well drained. They formed in alluvium derived from limestone, shale, and small amounts of sandstone. They are on flood plains along streams and rivers. Slope ranges from 0 to 2 percent.

Lindside soils are near Toms and Wolfgap soils. Lindside soils have less clay than Toms soils. They are wetter than Wolfgap soils.

Typical pedon of Lindside silt loam, 0 to 2 percent slopes, occasionally flooded, about 1 mile south of Daleville, 2,000 feet west of the intersection of U.S. Highway 220 and Virginia Highway 653, and 100 feet east of Tinker Creek, at an elevation of 1,170 feet:

Ap—0 to 5 inches; brown (10YR 4/3) silt loam; weak medium platy structure parting to moderate medium

granular; friable, slightly sticky and slightly plastic; common very fine and fine roots; slightly alkaline; clear smooth boundary.

Bw1—5 to 14 inches; yellowish brown (10YR 5/6) silt loam; many fine distinct pale brown (10YR 6/3) mottles; moderate very fine and fine subangular blocky structure; friable, slightly sticky and slightly plastic; common fine and few very fine roots; few prominent manganese stains on faces of peds; neutral; clear smooth boundary.

Bw2—14 to 24 inches; yellowish brown (10YR 5/4) silt loam; many fine faint pale brown (10YR 6/3) and few fine distinct light brownish gray (10YR 6/2) mottles; weak fine subangular blocky structure; friable, slightly sticky and slightly plastic; few very fine and fine roots; few prominent manganese stains on faces of peds; neutral; clear wavy boundary.

Bw3—24 to 33 inches; yellowish brown (10YR 5/6) silt loam that has thin strata of fine sandy loam; many medium distinct light gray (10YR 7/2) and pale brown (10YR 6/3) mottles; weak medium subangular blocky structure; friable, slightly sticky and slightly plastic; few fine roots; common prominent manganese stains on faces of peds; slightly alkaline; clear smooth boundary.

C—33 to 46 inches; pale brown (10YR 6/3) silt loam; common fine faint light gray (10YR 7/2) and common medium distinct strong brown (7.5YR 5/6) mottles; massive; friable, slightly sticky and slightly plastic; few fine roots; few medium and coarse shells and concretions of calcium carbonate; slightly alkaline; abrupt smooth boundary.

Cg—46 to 65 inches; dark grayish brown (2.5Y 4/2), stratified loam and silt loam; massive; friable, sticky and slightly plastic; few medium concretions of calcium carbonate; slightly alkaline.

The thickness of the solum ranges from 25 to 50 inches. The depth to bedrock is more than 60 inches. The content of gravel ranges from 0 to 5 percent in the A and Bw horizons and from 0 to 30 percent in the C horizon. Reaction is strongly acid to slightly alkaline in the A and B horizons and moderately acid to slightly alkaline in the C horizon.

The Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 2 or 3.

The Bw horizon has hue of 7.5YR to 2.5Y, value of 4 or 5, and chroma of 3 to 6 and commonly is mottled. It is loam, silt loam, silty clay loam, or clay loam.

The C horizon has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 1 to 8. It is fine sandy loam, loam, silt loam, silty clay loam, or clay loam and commonly is stratified.

Litz Series

Soils of the Litz series are moderately deep and well drained. They formed in material weathered from interbedded shale, siltstone, and limestone. They are on uplands in a limestone valley. Slope ranges from 7 to 45 percent.

Litz soils commonly are near Chiswell and Groseclose soils. Litz soils are deeper than Chiswell soils and are not so deep over bedrock as Groseclose soils. Also, they have less clay in the subsoil than Groseclose soils.

Typical pedon of Litz channery silt loam, in an area of Groseclose-Litz complex, 15 to 30 percent slopes, about ¾ mile east of Bonsack, 0.5 mile south of the intersection of Virginia Highways 738 and 658, and ¼ mile southeast of the Blue Ridge Parkway, at an elevation of 1,160 feet:

Ap—0 to 5 inches; dark brown (10YR 3/3) channery silt loam; weak fine granular structure; very friable, slightly sticky and nonplastic; common very fine and fine and few medium roots; about 30 percent shale channers; strongly acid; abrupt smooth boundary.

E—5 to 9 inches; yellowish brown (10YR 5/4) channery silt loam; weak fine granular structure; friable, slightly sticky and slightly plastic; common very fine and fine roots; about 30 percent shale channers; strongly acid; clear smooth boundary.

Bw/Bt—9 to 13 inches; yellowish brown (10YR 5/6) very channery silt loam; weak very fine subangular blocky structure; friable, slightly and slightly plastic; few very fine and fine roots; a few pockets of silty clay loam that has a few faint clay films on faces of peds; about 45 percent shale channers; strongly acid; clear smooth boundary.

Bw—13 to 27 inches; yellowish brown (10YR 5/6) extremely channery silt loam; weak fine subangular blocky structure; friable, slightly sticky and slightly plastic; few very fine roots; about 60 percent shale channers; very strongly acid; abrupt wavy boundary.

R—27 inches; shale bedrock.

The thickness of the solum ranges from 10 to 30 inches. The depth to bedrock ranges from 20 to 40 inches. The content of shale or siltstone fragments ranges from 5 to 35 percent in the A and E horizons, from 35 to 65 percent in the B horizon, and from 35 to 90 percent in the C horizon. Reaction is very strongly acid or strongly acid throughout the profile in unlimed areas.

The A horizon has hue of 7.5YR or 10YR and value and chroma of 2 to 4. The E horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 4 to 6.

The B horizon has hue of 5YR to 10YR, value of 4 or

5, and chroma of 4 to 6. It is loam, silt loam, or silty clay loam in the fine-earth fraction.

The C horizon, if it occurs, has hue of 2.5YR, 5YR, 7.5YR, 10YR, or 2.5Y and value and chroma of 4 to 6. It is loam or silt loam in the fine-earth fraction.

The bedrock is fractured shale or siltstone that has thin beds of limestone.

Massanetta Series

Soils of the Massanetta series are very deep and moderately well drained. They formed in alluvium derived from limestone and shale. They are on flood plains along small streams that drain from springs in a limestone valley. Slope ranges from 0 to 3 percent.

Massanetta soils are near Carbo, Frederick, Groseclose, Lindside, and Timberville soils. Massanetta soils are more poorly drained than Carbo, Frederick, Groseclose, and Timberville soils. Also, they are deeper over bedrock than Carbo soils. Their surface layer is thicker than that of Lindside soils.

Typical pedon of Massanetta silt loam, 0 to 3 percent slopes, occasionally flooded, about 3.5 miles east of Fincastle and 200 feet south of the intersection of Virginia Highways 638 and 639, at an elevation of 1,130 feet:

Ap—0 to 11 inches; very dark grayish brown (10YR 3/2) silt loam; strong fine and medium granular structure; very friable, slightly sticky and nonplastic; many very fine, fine, and medium roots; common fine shell fragments and concretions of calcium carbonate; few old root channels filled with yellowish brown (10YR 5/8) material; violently effervescent; slightly alkaline; clear smooth boundary.

Bw1—11 to 17 inches; very dark gray (10YR 3/1) silt loam; moderate fine granular structure; friable, slightly sticky and slightly plastic; common very fine and fine roots; common fine shell fragments and concretions of calcium carbonate; few old root channels filled with yellowish brown (10YR 5/8) material; violently effervescent; slightly alkaline; clear smooth boundary.

Bw2—17 to 28 inches; dark grayish brown (10YR 4/2) silty clay loam; moderate fine and medium subangular blocky structure; friable, slightly sticky and slightly plastic; common very fine and fine roots; common fine shell fragments and concretions of calcium carbonate; few old root channels filled with yellowish brown (10YR 5/8) material; violently effervescent; moderately alkaline; clear smooth boundary.

C1—28 to 34 inches; grayish brown (10YR 5/2) gravelly loam; massive; friable, nonsticky and nonplastic; few fine roots; many fine and common medium shell fragments and concretions of calcium carbonate; violently effervescent; moderately alkaline; abrupt smooth boundary.

C2—34 to 40 inches; dark gray (10YR 4/1) silt loam; massive; friable, slightly sticky and slightly plastic; few fine roots; many fine shell fragments and concretions of calcium carbonate; violently effervescent; moderately alkaline; abrupt smooth boundary.

C3—40 to 52 inches; grayish brown (10YR 5/2) silt loam; few medium distinct pale brown (10YR 6/3) mottles; massive; friable, slightly sticky and slightly plastic; few fine roots; many fine shell fragments and concretions of calcium carbonate; violently effervescent; moderately alkaline; abrupt smooth boundary.

C4—52 to 65 inches; dark gray (10YR 4/1) silt loam; massive; friable, slightly sticky and nonplastic; few fine roots; many fine and few medium shell fragments and concretions of calcium carbonate; violently effervescent; moderately alkaline.

The thickness of the solum ranges from 20 to 40 inches. The depth to bedrock is more than 60 inches. The content of rock fragments, mostly secondary concretions of calcium carbonate, ranges from 0 to 10 percent in the Ap and Bw horizons and from 0 to 30 percent in the C horizon. Shells are common in many pedons. The soils are slightly alkaline or moderately alkaline and effervesce with acid throughout.

The Ap horizon has hue of 10YR, value of 3, and chroma of 1 to 3. The BA or AB horizon, if it occurs, has hue of 10YR, value of 3 to 5, and chroma of 1 to 4. It is silt loam, loam, or silty clay loam.

The Bw horizon has hue of 10YR, value of 3 to 5, and chroma of 1 to 3. It is silt loam, silty clay loam, or clay loam.

The C horizon is neutral in hue or has hue of 7.5YR or 10YR. It has value of 3 to 5 and chroma of 0 to 3. It is loam, silt loam, silty clay loam, or clay loam in the fine-earth fraction.

Moomaw Series

Soils of the Moomaw series are very deep and moderately well drained. They formed in old alluvium derived from sandstone, shale, and small amounts of limestone. They are on stream terraces along the larger streams and rivers. Slope ranges from 2 to 15 percent.

Moomaw soils commonly are near Alonzville, Botetourt, Tygart, and Wolfgap soils. Unlike the nearby soils, Moomaw soils have a fragipan. They are wetter than Alonzville and Wolfgap soils. They are less clayey

in the subsoil than Tygart soils. Also, they are better drained.

Typical pedon of Moomaw loam, 2 to 7 percent slopes, about ¾ mile west of Iron Gate and 0.5 mile west of intersection of Virginia Highways 701 and 703, at an elevation of 1,180 feet:

Oi—1 inch to 0; loose layer of pine needles.

A—0 to 1 inch; grayish brown (10YR 5/2) loam; weak fine granular structure; very friable, nonsticky and nonplastic; many very fine, fine, and medium roots; strongly acid; abrupt smooth boundary.

E—1 to 9 inches; pale brown (10YR 6/3) loam; weak medium subangular blocky structure; very friable, nonsticky and nonplastic; many fine and medium and common coarse roots; about 2 percent gravel; strongly acid; clear smooth boundary.

Bt—9 to 21 inches; light yellowish brown (10YR 6/4) loam; moderate medium subangular blocky structure; friable, nonsticky and nonplastic; common very fine roots; few faint yellowish brown (10YR 5/6) clay films on faces of peds; about 5 percent gravel; strongly acid; abrupt smooth boundary.

Btx1—21 to 32 inches; brownish yellow (10YR 6/6) loam; many medium faint light yellowish brown (2.5Y 6/4) skeletans; moderate very coarse prismatic structure parting to weak coarse subangular blocky; firm, slightly sticky and nonplastic; very brittle; common faint yellowish brown (10YR 5/6) clay films on faces of peds; about 5 percent gravel; strongly acid; clear smooth boundary.

Btx2—32 to 42 inches; brownish yellow (10YR 6/6) loam; moderate very coarse prismatic structure parting to moderate medium subangular blocky; firm, slightly sticky and slightly plastic; slightly brittle; common distinct strong brown (7.5YR 5/6) clay films on faces of peds; about 5 percent gravel; very strongly acid; clear wavy boundary.

C1—42 to 55 inches; yellowish brown (10YR 5/6) clay loam; common medium prominent red (2.5YR 5/8) and few fine distinct light brownish gray (10YR 6/2) mottles; massive; friable, slightly sticky and slightly plastic; few distinct strong brown (7.5YR 5/6) clay films on faces of peds; about 10 percent gravel; very strongly acid; clear wavy boundary.

C2—55 to 65 inches; yellowish brown (10YR 5/6) very cobbly clay loam; common medium prominent red (2.5YR 5/8) and light brownish gray (10YR 6/2) mottles; massive; friable, slightly sticky and slightly plastic; about 30 percent cobbles and 10 percent gravel; very strongly acid.

The thickness of the solum ranges from 40 to more than 60 inches. The depth to bedrock is more than 60 inches. The depth to a fragipan ranges from 18 to 30 inches. The content of rock fragments ranges from 0 to 30 percent in the A and Bt horizons, from 0 to 35 percent in the Btx horizon, and from 0 to 40 percent in the C horizon. Reaction is very strongly acid or strongly acid throughout the profile in unlimed areas.

The A horizon has hue of 10YR, value of 4 or 5 , and chroma of 2 to 4. The E horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 3 to 6. It is fine sandy loam, loam, or silt loam in the fine-earth fraction.

The Bt horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 4 to 8. It is silt loam, loam, silty clay loam, clay loam, or sandy clay loam in the fine-earth fraction.

The Bt horizon has hue of 7.5YR to 2.5Y, value of 5 or 6, and chroma of 2 to 8. It is loam, clay loam, or sandy clay loam in the fine-earth fraction.

The C horizon has hue of 7.5YR to 2.5Y, value of 4 to 7, and chroma of 2 to 8 and commonly is mottled. It is loam, silt loam, silty clay loam, or clay loam in the fine-earth fraction.

Opequon Series

Soils of the Opequon series are shallow and well drained. They formed in material weathered from limestone and dolomite. They are on uplands in a limestone valley. Slope ranges from 2 to 60 percent.

Opequon soils are near Carbo, Frederick, and Groseclose soils. Opequon soils are not so deep over bedrock as the nearby soils.

Typical pedon of Opequon silty clay loam, in an area of Carbo-Opequon-Rock outcrop complex, 15 to 45 percent slopes, about 2 miles northwest of Springwood and ¼ mile west of Virginia Highway 625 on Westvaco Road, at an elevation of 1,260 feet:

A—0 to 6 inches; dark brown (7.5YR 3/4) silty clay loam; moderate medium granular structure; friable, sticky and slightly plastic; common fine and coarse roots; neutral; clear smooth boundary.

Bt—6 to 17 inches; yellowish red (5YR 4/6) clay; strong fine subangular blocky structure; firm, sticky and plastic; few coarse roots; common faint reddish brown (5YR 4/4) clay films on faces of peds; few prominent manganese oxide stains on faces of peds; neutral; abrupt wavy boundary.

R—17 inches; limestone bedrock.

The thickness of the solum and the depth to bedrock range from 12 to 20 inches. The content of rock fragments, mainly limestone and chert, ranges from 0 to 35 percent in individual horizons. Reaction ranges from strongly acid to slightly alkaline.

The A horizon has hue of 7.5YR or 10YR, value of 3

to 5, and chroma of 2 to 4. The Bt horizon has hue of 2.5YR to 10YR, value of 4 or 5, and chroma of 4 to 8. It is silty clay loam, silty clay, or clay in the fine-earth fraction. The bedrock is hard, dark gray or black limestone or dolomite.

Oriskany Series

Soils of the Oriskany series are very deep and well drained. They formed in colluvium derived from sandstone, quartzite, and shale. They are on foot slopes, on colluvial fans, and in mountain hollows. Slope ranges from 2 to 60 percent.

Oriskany soils commonly are near Bailegap, Berks, Dekalb, Lehew, Lily, and Weikert soils. Oriskany soils are deeper than the nearby soils.

Typical pedon of Oriskany very cobbly sandy loam, 15 to 30 percent slopes, extremely bouldery; 2.5 miles west of Glen Wilton, 0.5 mile northwest of the end of Virginia Highway 633, and 20 feet north of a USDA Forest Service road, at an elevation of 1,440 feet:

A—0 to 2 inches; very dark brown (10YR 2/2) very cobbly sandy loam; weak medium granular structure; very friable, nonsticky and nonplastic; few very fine, many fine and medium, and common coarse roots; about 15 percent gravel, 20 percent cobbles, and 5 percent stones; strongly acid; abrupt smooth boundary.

E—2 to 9 inches; yellowish brown (10YR 5/4) very cobbly sandy loam; weak medium granular structure; very friable, nonsticky and nonplastic; many very fine and fine and few medium, coarse, and very coarse roots; about 10 percent gravel, 25 percent cobbles, and 5 percent stones; strongly acid; clear smooth boundary.

Bt1—9 to 34 inches; brown (7.5YR 5/4) very cobbly sandy clay loam; moderate very fine subangular blocky structure; friable, slightly sticky and slightly plastic; common very fine and fine and few medium and coarse roots; few fine clay films on faces of peds; about 10 percent gravel, 30 percent cobbles, and 2 percent stones; strongly acid; gradual wavy boundary.

Bt2—34 to 56 inches; strong brown (7.5YR 5/6) extremely cobbly clay loam; moderate very fine and fine subangular blocky structure; friable, slightly sticky and slightly plastic; common very fine and fine and few medium and coarse roots; few faint clay films on faces on peds; about 10 percent gravel, 40 percent cobbles, and 20 percent stones; very strongly acid; clear wavy boundary.

C—56 to 74 inches; strong brown (7.5YR 5/6) very cobbly sandy clay loam; massive; friable, slightly sticky and nonplastic; common fine and medium roots; about 10 percent gravel, 25 percent cobbles, and 10 percent stones; very strongly acid.

The thickness of the solum ranges 40 to more than 60 inches. The depth to bedrock is more than 60 inches. The content of rock fragments ranges from 15 to 65 percent in the A and E horizons and from 35 to 75 percent in the B and C horizons. Reaction is very strongly acid or strongly acid throughout the profile in unlimed areas.

The A horizon has hue of 7.5YR or 10YR, value of 2 to 4, and chroma of 2 or 3. The E horizon has hue of 7.5YR or 10YR and value and chroma of 4 to 6.

The Bt horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 4 to 8. It is loam, sandy clay loam, or clay loam in the fine-earth fraction.

The C horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 4 to 8. It is sandy loam, loam, or sandy clay loam in the fine-earth fraction.

Peaks Series

Soils of the Peaks series are moderately deep and somewhat excessively drained. They formed in material weathered from granite and gneiss. They are on uplands on the Blue Ridge. Slope ranges from 30 to 80 percent.

Peaks soils are near Edneytown, Hayesville, and Thurmont soils. Peaks soils are not so deep over bedrock as the nearby soils. Also, they have more rock fragments in the subsoil.

Typical pedon of Peaks gravelly sandy loam, 60 to 80 percent slopes, very stony, about 1.5 miles southeast of Webster, 100 feet south of Virginia Highway 603, and 250 feet north of the Bedford County line, at an elevation of 1,900 feet:

Oi—0.5 inch to 0; partially decomposed layer of hardwood leaves and twigs.

A—0 to 4 inches; dark brown (10YR 3/3) gravelly sandy loam; weak very fine granular structure; very friable, nonsticky and nonplastic; many fine roots; about 20 percent gravel; strongly acid; abrupt smooth boundary.

Bw—4 to 16 inches; dark yellowish brown (10YR 4/4) very gravelly sandy loam; weak very fine subangular blocky structure; very friable, nonsticky and nonplastic; common medium and few fine and coarse roots; about 45 percent gravel; few very fine flakes of mica; very strongly acid; clear wavy boundary.

C—16 to 24 inches; dark yellowish brown (10YR 4/6) extremely channery sandy loam; massive; very friable, nonsticky and nonplastic; few medium and coarse roots; about 65 percent channers and

gravel; common very fine and fine flakes of mica; very strongly acid; clear smooth boundary.

R—24 inches; moderately hard granite gneiss bedrock.

The thickness of the solum ranges from 15 to 30 inches. The depth to bedrock ranges from 20 to 40 inches. The content of rock fragments ranges from 15 to 40 percent in the A and E horizons and from 35 to 75 percent in the Bw and C horizons. Reaction ranges from very strongly acid to moderately acid throughout the profile.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The E horizon, if it occurs, has hue of 10YR, value of 4 or 5, and chroma of 4 to 6. It is sandy loam, fine sandy loam, or loam in the fine-earth fraction.

The Bw and C horizons have hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 4 to 8. The Bw horizon is fine sandy loam, sandy loam, or loam in the fine-earth fraction. The C horizon is fine sandy loam or sandy loam in the fine-earth fraction.

The bedrock is fractured and jointed granite or granite gneiss.

Purdy Series

Soils of the Purdy series are very deep and poorly drained. They formed in alluvium derived from shale, siltstone, and sandstone. They are on stream terraces. Slope ranges from 0 to 4 percent.

Purdy soils are near Botetourt, Moomaw, Tygart, and Zoar soils. Purdy soils are deeper and wetter than the nearby soils. They have more clay in the subsoil than Botetourt, Moomaw, and Tygart soils. Unlike Moomaw soils, they do not have a fragipan.

Typical pedon of Purdy silty clay loam, 0 to 4 percent slopes, about 4.5 miles northeast of Oriskany and 2,000 feet south of Craig Creek, at an elevation of 1,000 feet:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silty clay loam; moderate fine granular structure; friable, slightly sticky and slightly plastic; common very fine and fine roots; strongly acid; abrupt smooth boundary.

Btg1—7 to 11 inches; grayish brown (10YR 5/2) silty clay loam; weak fine subangular blocky structure; firm, slightly sticky and slightly plastic; common very fine roots; few faint clay films on faces of peds; few medium prominent charcoal fragments; strongly acid; clear smooth boundary.

Btg2—11 to 22 inches; gray (10YR 5/1) clay; many coarse prominent strong brown (10YR 5/8) mottles; weak fine and medium subangular blocky structure; very firm, sticky and very plastic; few very fine roots; few faint clay films on faces of peds; very strongly acid; abrupt smooth boundary.

Btg3—22 to 32 inches; dark gray (5Y 4/1) clay; common medium prominent strong brown (10YR 5/6) mottles; weak fine and medium subangular blocky structure; very firm, sticky and very plastic; few very fine roots; few distinct clay films on faces of peds; extremely acid; clear wavy boundary.

Cg1—32 to 47 inches; variegated gray (10YR 6/1) and light gray (N 7/0) clay loam; massive; firm, sticky and plastic; about 1 percent gravel; very strongly acid; clear wavy boundary.

Cg2—47 to 55 inches; light gray (5Y 7/1) silty clay loam; common coarse prominent strong brown (7.5YR 5/8) and few medium distinct greenish gray (5GY 7/1) mottles; massive; firm, sticky and plastic; very strongly acid; clear wavy boundary.

Cg3—55 to 65 inches; variegated gray (10YR 6/1) and light gray (5Y 7/1) clay loam; few fine prominent yellowish brown (10YR 5/8) mottles; massive; firm, sticky and plastic; strongly acid.

The thickness of the solum ranges from 28 to 50 inches. The depth to bedrock is more than 60 inches. The content of gravel and cobbles ranges from 0 to 2 percent in the A and Btg horizons and from 0 to 10 percent in the Cg horizon. Reaction is extremely acid to strongly acid throughout the profile in unlimed areas.

The Ap horizon has hue of 10YR or 2.5Y or is neutral in hue. It has value of 4 or 5 and chroma of 0 to 2.

The Btg horizon has hue of 10YR to 5Y or is neutral in hue. It has value of 4 or 5 and chroma of 0 to 2. It commonly has mottles with high chroma. It is clay loam, silty clay loam, silty clay, or clay.

The Cg horizon has hue of 10YR to 5Y or is neutral in hue. It has value of 4 to 6 and chroma of 0 to 3. It is clay loam, silty clay loam, silty clay, or clay.

Rushtown Series

Soils of the Rushtown series are very deep and excessively drained. They formed in colluvium derived from shale, siltstone, and sandstone. They are on foot slopes and colluvial fans at the foot of shale uplands. Slope ranges from 3 to 15 percent.

Rushtown soils commonly are near Berks, Ernest, Gilpin, and Weikert soils. Rushtown soils are deeper than Berks, Gilpin, and Weikert soils. Unlike Ernest soils, they do not have a fragipan.

Typical pedon of Rushtown very channery silt loam, 3 to 15 percent slopes, about 2¾ miles southeast of Iron Gate and 1¼ miles southeast of the intersection of Virginia Highways 699 and 633, at an elevation of 1,100 feet:

Ap—0 to 13 inches; brown (10YR 4/3) very channery silt loam; weak fine granular structure; friable,

slightly sticky and slightly plastic; few very fine, fine, and medium roots; about 40 percent shale channers; strongly acid; clear smooth boundary.

Bw1—13 to 19 inches; strong brown (7.5YR 5/6) very channery silt loam that has pockets of yellowish red (5YR 5/6) material; weak fine subangular blocky structure; friable, slightly sticky and slightly plastic; few medium roots; about 55 percent shale channers; moderately acid; clear wavy boundary.

Bw2—19 to 27 inches; strong brown (7.5YR 5/6) extremely channery silt loam; weak fine subangular blocky structure; friable, slightly sticky and nonplastic; few medium roots; uncoated lenses of shale; about 60 percent shale channers; strongly acid; clear wavy boundary.

C1—27 to 39 inches; yellowish brown (10YR 5/6) extremely channery silt loam; single grain; friable, slightly sticky and nonplastic; silt loam coating shale fragments and filling pockets 2 inches in diameter; about 85 percent shale channers; strongly acid; clear wavy boundary.

C2—39 to 57 inches; yellowish brown (10YR 5/6) extremely channery silt loam; single grain; friable, slightly sticky and nonplastic; about 90 percent shale channers, most of which are uncoated; strongly acid; abrupt wavy boundary.

C3—57 to 65 inches; strong brown (7.5YR 5/6) extremely channery silt loam; single grain; friable, slightly sticky and slightly plastic; few dark stains on faces of peds; about 60 percent shale channers; strongly acid.

The thickness of the solum ranges from 15 to 35 inches. The depth to bedrock is more than 60 inches. The content of rock fragments ranges from 20 to 50 percent in the Ap horizon, from 20 to 60 percent in the Bw horizon, and from 60 to 90 percent in the C horizon. Reaction is very strongly acid to moderately acid throughout the profile in unlimed areas.

The Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 2 or 3. The Bw horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. The C horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6.

Sequoia Series

Soils of the Sequoia series are moderately deep and well drained. They formed in material weathered from shale and siltstone. They are on uplands in the foothills of the Appalachian Mountains. Slope ranges from 7 to 30 percent.

Sequoia soils are near Berks, Tumbling, and Weikert soils. Sequoia soils have more clay in the subsoil than Berks and Weikert soils and are deeper over bedrock than Weikert soils. They are not so deep over bedrock as Tumbling soils.

Typical pedon of Sequoia silt loam, 15 to 30 percent slopes, about 1 mile southwest of Daleville, ¾ mile west of the intersection of U.S. Highway 220 and Virginia Highway 674, and 1,000 feet west of a gas pipeline, at an elevation of 1,330 feet:

A—0 to 2 inches; dark brown (10YR 4/3) silt loam; moderate medium granular structure; friable, slightly sticky and slightly plastic; many very fine and fine and common medium and coarse roots; about 5 percent shale channers; strongly acid; abrupt smooth boundary.

E—2 to 6 inches; yellowish brown (10YR 5/6) silt loam; moderate medium granular structure; friable, slightly sticky and slightly plastic; common fine and medium roots; common very fine vesicular pores; about 5 percent shale channers; very strongly acid; clear smooth boundary.

Bt1—6 to 13 inches; strong brown (7.5YR 5/8) channery silty clay; moderate medium subangular blocky structure; firm, sticky and plastic; few fine and medium roots; common very fine and few coarse vesicular pores; common faint strong brown (7.5YR 5/6) clay films on faces of peds; about 15 percent shale channers; strongly acid; clear wavy boundary.

Bt2—13 to 24 inches; yellowish red (5YR 5/8) channery clay; few faint distinct red (2.5YR 4/8) mottles; moderate medium and coarse subangular blocky structure; firm, sticky and plastic; few fine and medium roots; common very fine and few coarse vesicular pores; common distinct strong brown (7.5YR 5/6) clay films on faces of peds; about 15 percent shale channers; strongly acid; gradual wavy boundary.

BCt—24 to 30 inches; yellowish red (5YR 5/8) channery clay; moderate fine subangular blocky structure; firm, sticky and plastic; few fine roots; few very fine vesicular pores; few distinct strong brown (7.5YR 5/6) clay films on faces of peds; few prominent manganese stains on shale fragments; about 30 percent shale channers; strongly acid; clear wavy boundary.

Cr1—30 to 39 inches; brownish yellow (10YR 6/8), soft shale bedrock; massive; very firm in place; few fine roots in clay flows; few prominent yellowish red (5YR 5/8) clay coatings and flows in shale crevices; few prominent manganese stains on shale fragments; strongly acid; gradual wavy boundary.

Cr2—39 to 65 inches; brownish yellow (10YR 6/8), soft shale bedrock; massive; very firm in place; few distinct brownish yellow (10YR 6/8) clay coatings in

shale crevices; few prominent manganese stains on shale fragments; very strongly acid.

The thickness of the solum and the depth to soft shale bedrock range from 20 to 40 inches. The content of shale and siltstone fragments ranges from 0 to 10 percent in the A and E horizons and from 5 to 25 percent in the Bt horizon. Reaction is very strongly acid or strongly acid throughout the profile in unlimed areas.

The A horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 to 4. The E horizon has hue of 10YR, value of 4 or 5, and chroma of 4 to 6. It is silt loam or loam.

The Bt horizon has hue of 2.5YR to 7.5YR, value of 5 or 6, and chroma of 6 to 8. It is silty clay or clay in the fine-earth fraction.

The BC horizon has hue of 5YR to 10YR, value of 5, and chroma of 6 to 8. It is silty clay loam, silty clay, or clay in the fine-earth fraction.

Shelocta Series

Soils of the Shelocta series are very deep and well drained. They formed in colluvium derived from shale, sandstone, and siltstone. They are on foot slopes and colluvial fans in the Appalachian Mountains. Slope ranges from 7 to 30 percent.

Shelocta soils are near Berks, Ernest, and Gilpin soils. Shelocta soils are deeper over bedrock than Berks and Gilpin soils. They are better drained than Ernest soils and do not have a fragipan, which is characteristic of Ernest soils.

Typical pedon of Shelocta gravelly silt loam, 7 to 15 percent slopes, about 4.5 miles west of Daleville and 2,000 feet northeast of the intersection of Virginia Highway 740 and a fire trail, at an elevation of 1,420 feet:

Oi—1 inch to 0; decomposed mat of hardwood leaves and many very fine roots.

A—0 to 1 inch; very dark grayish brown (10YR 3/2) gravelly silt loam; weak fine granular structure; very friable, nonsticky and nonplastic; many very fine, fine, and medium and few coarse roots; about 20 percent sandstone gravel; very strongly acid; abrupt smooth boundary.

E—1 to 8 inches; light yellowish brown (10YR 6/4) gravelly silt loam; moderate very fine and fine subangular blocky structure; very friable, nonsticky and nonplastic; common fine and medium and few coarse roots; about 15 percent sandstone gravel; very strongly acid; clear smooth boundary.

Bt1—8 to 18 inches; yellowish brown (10YR 5/8) channery silty clay loam; moderate fine subangular blocky structure; friable, slightly sticky and slightly plastic; common fine and medium and few coarse roots; common distinct clay films on faces of peds; about 20 percent sandstone and shale channers; very strongly acid; clear wavy boundary.

Bt2—18 to 41 inches; strong brown (7.5YR 5/6) very channery silty clay loam; moderate fine subangular blocky structure; friable, slightly sticky and slightly plastic; few fine, medium, and coarse roots; common faint clay films on faces of peds; about 45 percent sandstone and shale channers and cobbles; very strongly acid; gradual wavy boundary.

C—41 to 65 inches; mottled yellowish brown (10YR 5/8), yellowish red (5YR 5/8), and light olive brown (2.5Y 5/6) very channery silt loam; massive; friable, slightly sticky and nonplastic; about 45 percent sandstone channers and cobbles; very strongly acid.

The thickness of the solum ranges from 40 to 60 inches. The depth to bedrock is more than 60 inches. The content of rock fragments ranges from 2 to 35 percent in the A and E horizons, from 5 to 50 percent in the Bt horizon, and from 15 to 70 percent in the C horizon. Reaction is very strongly acid or strongly acid throughout the profile in unlimed areas.

The A horizon has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 2 or 3. The E horizon has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 3 or 4. It is loam or silt loam in the fine-earth fraction.

The Bt horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 4 to 8. It is silt loam or silty clay loam in the fine-earth fraction.

The C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 3 to 6. It commonly has high- and low-chroma mottles throughout. It is silt loam, loam, silty clay loam, or clay loam in the fine-earth fraction.

Shottower Series

Soils of the Shottower series are very deep and well drained. They formed in old alluvium derived from sandstone, shale, and limestone. They are on stream terraces, mainly in a limestone valley. Slope ranges from 2 to 30 percent.

Shottower soils are near Alonzville and Moomaw soils. Shottower soils have more clay in the subsoil than Alonzville soils. Unlike Moomaw soils, they do not have a fragipan.

Typical pedon of Shottower loam, 2 to 7 percent slopes, about 1 mile west of Arcadia, 4,000 feet south of a crossing of Virginia Highway 614 over the James River, at an elevation of 1,008 feet:

Ap—0 to 10 inches; brown (10YR 4/3) loam; weak medium granular structure; very friable, nonsticky

and nonplastic; few fine roots; moderately acid; abrupt smooth boundary.

Bt1—10 to 17 inches; strong brown (7.5YR 5/6) clay loam; weak fine and medium subangular blocky structure; firm, slightly sticky and slightly plastic; few fine roots; few faint clay films on faces of peds; few old root channels filled with material from the Ap horizon; moderately acid; clear smooth boundary.

Bt2—17 to 34 inches; yellowish red (5YR 5/8) clay; moderate fine subangular blocky structure; firm, sticky and slightly plastic; common faint clay films on faces of peds; strongly acid; clear wavy boundary.

Bt3—34 to 55 inches; red (2.5YR 4/8) clay; few fine prominent strong brown (7.5YR 5/6) mottles; moderate very fine and fine subangular blocky structure; firm, sticky and slightly plastic; common distinct clay films on faces of peds; very strongly acid; clear wavy boundary.

Bt4—55 to 65 inches; red (2.5YR 4/6) clay; common medium prominent yellowish brown (10YR 5/6) mottles; moderate very fine subangular blocky structure; friable, sticky and slightly plastic; common distinct clay films on faces of peds; very strongly acid.

The thickness of the solum and the depth to bedrock are more than 60 inches. The content of gravel and cobbles ranges from 0 to 35 percent in the A or Ap horizon and in the upper part of the Bt horizon and from 0 to 60 percent in the lower part of the Bt horizon. Reaction is extremely acid to moderately acid throughout the profile in unlimed areas.

The Ap horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 3 or 4. The A horizon, if it occurs, has hue of 7.5YR or 10YR and value and chroma of 2 or 3. It is fine sandy loam or loam in the fine-earth fraction.

The Bt horizon has hue of 10R to 7.5YR, value of 4 or 5, and chroma of 4 to 8. It is sandy clay loam, clay loam, silty clay loam, or clay in the fine-earth fraction.

Thurmont Series

Soils of the Thurmont series are very deep and well drained. They formed in colluvium derived from granite and granite gneiss. They are on foot slopes and colluvial fans at the foot of the Blue Ridge. Slope ranges from 2 to 30 percent.

Thurmont soils commonly are near Chiswell, Edneytown, Groseclose, Hayesville, Litz, and Peaks soils. Thurmont soils are deeper over bedrock than Chiswell, Litz, and Peaks soils. They have a solum that is thicker than that of Edneytown soils. They have less clay in the subsoil than Groseclose and Hayesville soils.

Typical pedon of Thurmont loam, 15 to 30 percent slopes, very stony, about 1¼ miles east of Bonsack and 1 mile northeast of the intersection of Virginia Highway 636 and the Blue Ridge Parkway, at an elevation of 1,360 feet:

A—0 to 3 inches; dark brown (10YR 3/3) loam; moderate fine granular structure; friable, nonsticky and nonplastic; common very fine and fine roots; moderately acid; abrupt smooth boundary.

E—3 to 7 inches; yellowish brown (10YR 5/4) loam; moderate fine granular structure; friable, nonsticky and nonplastic; common very fine and fine roots; about 5 percent gravel; moderately acid; abrupt smooth boundary.

Bt1—7 to 12 inches; strong brown (7.5YR 5/6) loam; moderate fine subangular blocky structure; friable, slightly sticky and nonplastic; few fine roots; few distinct clay films on faces of peds; about 3 percent gravel; strongly acid; abrupt smooth boundary.

Bt2—12 to 34 inches; yellowish red (5YR 5/8) clay loam; moderate fine subangular blocky structure; friable, slightly sticky and slightly plastic; few fine roots; few distinct clay films on faces of peds; about 3 percent gravel; strongly acid; clear smooth boundary.

Bt3—34 to 52 inches; strong brown (7.5YR 5/8) clay loam; few fine faint yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; friable, slightly sticky and slightly plastic; common distinct clay films on faces of peds; few prominent manganese stains on faces of peds; about 5 percent gravel; strongly acid; clear wavy boundary.

C—52 to 65 inches; strong brown (7.5YR 5/6) sandy clay loam; massive; friable, nonsticky and nonplastic; common prominent manganese concretions; about 10 percent gravel; strongly acid.

The thickness of the solum ranges from 40 to 60 inches. The depth to bedrock is more than 60 inches. The content of rock fragments ranges from 0 to 25 percent in the A horizon, from 2 to 35 percent in the Bt horizon, and from 15 to 50 percent in the C horizon. In unlimed areas reaction is very strongly acid to moderately acid in the A horizon and very strongly acid or strongly acid in the B and C horizons.

The A horizon has hue or 7.5YR or 10YR, value of 3 to 5, and chroma of 3 or 4. The E horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. It is fine sandy loam or loam in the fine-earth fraction.

The Bt horizon has hue of 5YR or 7.5YR, value of 4 to 6, and chroma of 6 to 8. It is loam, sandy clay loam, or clay loam in the fine-earth fraction.

The C horizon has hue of 5YR to 10YR, value of 4 to

6, and chroma of 2 to 8. It is sandy loam, loam, sandy clay loam, or clay loam in the fine-earth fraction.

Timberville Series

Soils of the Timberville series are very deep and well drained. They formed in local alluvium and colluvium derived from limestone and shale. They are on foot slopes, on toe slopes, and along intermittent drainageways. Slope ranges from 0 to 7 percent.

Timberville soils commonly are near Carbo, Frederick, and Groseclose soils. Timberville soils are deeper than Carbo soils. They have less clay in the subsoil than Frederick and Groseclose soils.

Typical pedon of Timberville silt loam, 0 to 7 percent slopes, occasionally flooded, about 1¼ miles west of Amsterdam, 1.5 miles west of the intersection of U.S. Highway 220 and Virginia Highway 675, at an elevation of 1,320 feet:

Ap—0 to 14 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium granular structure; very friable, nonsticky and nonplastic; common very fine and few medium roots; moderately acid; clear smooth boundary.

Bw—14 to 30 inches; dark yellowish brown (10YR 4/6) silt loam; many medium distinct yellowish brown (10YR 5/8) and common fine distinct yellowish brown (10YR 5/4) mottles; weak fine subangular blocky structure; friable, slightly sticky and slightly plastic; few very fine and fine roots; about 5 percent chert gravel; many prominent manganese stains on faces of peds; moderately acid; clear wavy boundary.

2Bt1—30 to 43 inches; yellowish brown (10YR 5/8) silty clay loam; moderate medium subangular blocky structure; firm, slightly sticky and slightly plastic; few fine roots; many distinct strong brown (7.5YR 5/6) clay films on faces of peds; common very fine manganese stains on faces of peds; moderately acid; gradual wavy boundary.

2Bt2—43 to 55 inches; strong brown (7.5YR 5/8) clay; moderate medium subangular blocky structure; friable, slightly sticky and slightly plastic; many distinct strong brown (7.5YR 5/6) clay films on faces of peds; few distinct yellow (10YR 7/6), highly weathered shale fragments; moderately acid; gradual wavy boundary.

2BC—55 to 65 inches; yellowish brown (10YR 5/8) clay; weak medium subangular blocky structure; friable, slightly sticky and slightly plastic; common distinct yellowish brown (10YR 5/8) clay films on faces of peds; common distinct yellow (10YR 7/6), highly weathered shale fragments; moderately acid.

The thickness of the solum and the depth to bedrock are more than 60 inches. The content of chert, shale, and sandstone fragments ranges from 0 to 20 percent in the Ap horizon and from 0 to 50 percent in individual subhorizons of the B horizon. Reaction ranges from very strongly acid to moderately acid throughout the profile in unlimed areas.

The Ap horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 5.

The Bw horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 8. It is silt loam, silty clay loam, or clay loam in the fine-earth fraction.

The AB horizon, if it occurs, has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 to 4. It is loam, silt loam, or silty clay loam in the fine-earth fraction.

The Bb horizon, if it occurs, has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 4 to 8. It is silt loam, silty clay loam, sandy clay loam, or clay loam in the fine-earth fraction.

The Bt or 2Bt horizon has hue of 5YR to 10YR, value of 4 or 5, and chroma of 4 to 8. It is silty clay loam, clay loam, silty clay, or clay in the fine-earth fraction.

Toms Series

Soils of the Toms series are very deep and somewhat poorly drained. They formed in alluvium derived from limestone, shale, and small amounts of sandstone. They are on low terraces along streams in a limestone valley. Slope ranges from 0 to 4 percent.

Toms soils are near Lindside and Wolfgap soils. Toms soils have more clay in the subsoil than the nearby soils. Also, they are more poorly drained.

Typical pedon of Toms silt loam, 0 to 4 percent slopes, rarely flooded, about 1¾ miles northwest of Fincastle, 0.5 mile northeast of the intersection of Virginia Highways 606 and 600, and 400 feet northwest of Catawba Creek, at an elevation of 1,063 feet:

Ap—0 to 7 inches; dark brown (10YR 4/3) silt loam; strong medium and fine granular structure; friable, slightly sticky and slightly plastic; many fine and very fine roots; neutral; abrupt smooth boundary.

Bt—7 to 24 inches; yellowish brown (10YR 5/8) clay; many medium distinct light brownish gray (10YR 6/2) mottles; moderate medium and coarse subangular blocky structure; very firm, sticky and plastic; few very fine roots; many prominent gray (10YR 5/1) clay films on faces of peds; about 2 percent rounded sandstone gravel; neutral; gradual smooth boundary.

Btg1—24 to 36 inches; grayish brown (10YR 5/2) clay; many medium distinct yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm, sticky and plastic; few very fine

roots; common distinct gray (10YR 5/1) clay films on faces of peds; few medium black (10YR 2/1) concretions; about 2 percent rounded sandstone gravel; slightly alkaline; gradual wavy boundary.

Btg2—36 to 53 inches; light brownish gray (10YR 6/2) silty clay loam; common fine distinct yellowish brown (10YR 5/8) mottles; moderate fine subangular blocky structure; firm, sticky and plastic; few distinct gray (10YR 5/1) clay films on faces of peds; few medium black (10YR 2/1) concretions; about 2 percent rounded sandstone gravel; slightly alkaline; clear wavy boundary.

C—53 to 65 inches; yellowish brown (10YR 5/8) silty clay loam; common fine distinct grayish brown (10YR 5/2) mottles; massive; firm, slightly sticky and plastic; common distinct gray (10YR 5/1) clay flows; slightly alkaline.

The thickness of the solum ranges from 40 to more than 60 inches. The depth to bedrock is more than 60 inches. The content of gravel ranges from 0 to 5 percent in the Ap and Bt horizons and from 0 to 35 percent in the Btg and C horizons. Reaction ranges from moderately acid to slightly alkaline throughout the profile.

The Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4. The BA horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 3 or 4.

The Bt horizon has hue of 7.5YR to 2.5Y, value of 5 or 6, and chroma of 2 to 8. It is silty clay loam, silty clay, or clay.

The Btg horizon has hue of 7.5YR to 5Y, value of 5 to 7, and chroma of 1 to 4 and commonly is mottled. It is silty clay loam, silty clay, or clay in the fine-earth fraction.

The C horizon has hue of 7.5YR to 2.5Y, value of 5 to 7, and chroma of 1 to 8. It is clay loam, silty clay loam, silty clay, or clay in the fine-earth fraction.

Tumbling Series

Soils of the Tumbling series are very deep and well drained. They formed in colluvium derived from sandstone, quartzite, and shale. They are on colluvial fans at the foot of the Blue Ridge and Appalachian Mountains. Slope ranges from 2 to 30 percent.

Tumbling soils commonly are near Frederick, Groseclose, and Laidig soils. Tumbling soils have more sand in the subsoil than Frederick and Groseclose soils. Unlike Laidig soils, they do not have a fragipan.

Typical pedon of Tumbling cobbly loam, 7 to 15 percent slopes, about 1 mile west of Blue Ridge, 1 mile northwest of the intersection of U.S. Highway 460/221 and Virginia Highway 652, and 1,000 feet northwest of a power transmission line, at an elevation of 1,360 feet:

A—0 to 1 inch; very dark grayish brown (10YR 3/2) cobbly loam; weak fine granular structure; very friable, nonsticky and nonplastic; many fine and medium roots; about 10 percent quartzite cobbles and 5 percent quartzite gravel; very strongly acid; abrupt smooth boundary.

E—1 to 9 inches; yellowish brown (10YR 5/6) cobbly loam; moderate medium granular structure; friable, nonsticky and nonplastic; common fine, medium, and coarse roots; few fine vesicular pores; about 10 percent quartzite cobbles and 5 percent quartzite gravel; very strongly acid; clear wavy boundary.

Bt1—9 to 14 inches; yellowish red (5YR 5/8) clay loam; moderate fine subangular blocky structure; friable, slightly sticky and plastic; common fine, medium, and coarse roots; few very fine tubular pores; common distinct red (2.5YR 4/8) clay films on faces of peds; about 5 percent quartzite cobbles and 2 percent quartzite gravel; very strongly acid; gradual smooth boundary.

Bt2—14 to 30 inches; red (2.5YR 4/6) clay; moderate very fine subangular blocky structure; firm, slightly sticky and plastic; few fine and medium roots; few fine tubular pores; many faint dark red (2.5YR 3/6) clay films on faces of peds; about 10 percent quartzite gravel; very strongly acid; clear wavy boundary.

Bt3—30 to 44 inches; red (2.5YR 4/6) very cobbly clay; moderate very fine subangular blocky structure; firm, slightly sticky and plastic; few fine roots; few fine tubular pores; many faint dark red (2.5YR 3/6) clay films on faces of peds; about 25 percent quartzite gravel and 10 percent quartzite cobbles; strongly acid; clear wavy boundary.

Bt4—44 to 65 inches; red (2.5YR 4/8) clay; weak thick platy structure parting to moderate fine subangular blocky; firm, slightly sticky and slightly plastic; common faint red (2.5YR 4/6) clay films on faces of peds; about 10 percent quartzite gravel and 2 percent quartzite cobbles; strongly acid.

The thickness of the solum and the depth to bedrock are more than 60 inches. The content of rock fragments ranges from 0 to 30 percent in the A and E horizons and from 0 to 40 percent in individual subhorizons of the Bt horizon. Reaction is very strongly acid or strongly acid throughout the profile in unlimed areas.

The A horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 to 4. The E horizon has hue of 7.5YR or 10YR and value and chroma of 4 to 6. It is fine sandy loam or loam in the fine-earth fraction.

The Bt horizon has hue of 2.5YR to 7.5YR, value of 4 or 5, and chroma of 4 to 8. It is silty clay loam, clay loam, or clay in the fine-earth fraction.

Tygart Series

Soils of the Tygart series are very deep and somewhat poorly drained. They formed in old alluvium derived from sandstone, shale, and small amounts of limestone. They are on stream terraces along the larger streams and rivers. Slope ranges from 2 to 7 percent.

Tygart soils are near Moomaw, Purdy, Weikert, and Zoar soils. Tygart soils are more poorly drained than Moomaw and Zoar soils. Also, they do not have a fragipan, unlike Moomaw soils. They are better drained than Purdy soils.

Typical pedon of Tygart silt loam, 2 to 7 percent slopes, about 1¼ miles northwest of Gala and 800 feet west of the James River, at an elevation of 960 feet:

Ap—0 to 7 inches; brown (10YR 4/3) silt loam; moderate fine and medium granular structure; friable, slightly sticky and slightly plastic; common very fine and fine and few medium roots; moderately acid; abrupt smooth boundary.

BA—7 to 12 inches; brown (10YR 5/3) silty clay loam; few medium prominent yellowish brown (10YR 5/8) mottles; moderate very fine and fine subangular blocky structure; friable, slightly sticky and slightly plastic; common very fine and fine and few medium roots; strongly acid; abrupt smooth boundary.

Bt—12 to 17 inches; mottled gray (10YR 6/1) and yellowish brown (10YR 5/8) silty clay; moderate medium subangular blocky structure; firm, sticky and plastic; few very fine roots; few distinct clay films on faces of peds; strongly acid; clear smooth boundary.

Btg1—17 to 24 inches; grayish brown (10YR 5/2) clay; common coarse prominent brownish yellow (10YR 6/8) mottles; moderate medium subangular blocky structure; firm, sticky and plastic; few very fine roots; few distinct clay films on faces of peds; very strongly acid; clear smooth boundary.

Btg2—24 to 34 inches; gray (10YR 5/1) clay; common coarse yellowish brown (10YR 5/8) and few medium faint dark gray (10YR 4/1) mottles; moderate medium and coarse subangular blocky structure; very firm, sticky and very plastic; few very fine roots; few distinct clay films on faces of peds; very strongly acid; gradual wavy boundary.

Btg3—34 to 49 inches; mottled gray (10YR 5/1), red (2.5YR 5/8), light gray (N 7/0), and yellowish brown (10YR 5/8) clay; moderate medium and coarse subangular blocky structure; very firm, sticky and very plastic; few very fine roots; few distinct clay films on faces of coarse peds; very strongly acid; clear wavy boundary.

Cg—49 to 65 inches; mottled light gray (10YR 6/1), yellowish brown (10YR 5/8), and gray (10YR 5/1) silty clay loam; massive; firm, sticky and plastic; few very fine roots; very strongly acid.

The thickness of the solum ranges from 35 to 60 inches. The depth to bedrock is more than 60 inches. In unlimed areas reaction ranges from very strongly acid to moderately acid in the A horizon and from extremely acid to strongly acid in the B and C horizons.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The BA horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 3 to 6. It is silty clay loam or clay loam.

The upper part of the Bt horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 to 8 and is mottled. The lower part has hue of 10YR or 2.5Y or is neutral in hue. It has value of 5 or 6 and chroma of 0 to 2. It is mottled in shades of brown or red. This horizon is clay loam, silty clay loam, silty clay, or clay.

The C horizon has hue of 10YR or 2.5Y or is neutral in hue. It has value of 5 or 6 and chroma of 0 to 2. It is silty clay loam, silty clay, or clay.

Udorthents

Udorthents are deep or very deep, well drained or somewhat excessively drained, nearly level to very steep, loamy and clayey soils, mainly on summits and side slopes in the uplands. They consist mostly of overburden and waste rock that have been stockpiled during quarrying or mining and soil material that has been cut and filled during road or building construction. These soils are in or near quarries and mines, along highways, and near large buildings. Slope ranges from 0 to 45 percent.

Udorthents are near Berks, Carbo, Chilhowie, Frederick, Groseclose, Laidig, and Tumbling soils, all of which have a well defined subsoil.

Because of the variability of the Udorthents, a typical pedon is not given. These soils are more than 40 inches deep. They range mainly from slightly alkaline to strongly acid. They are loam to clay in the fine-earth fraction. The content of limestone boulders and sandstone fragments ranges from 10 to 50 percent.

The surface layer has hue of 2.5YR to 10YR, value of 3 to 5, and chroma of 3 to 6. The thickness of this layer commonly is about 2 to 5 inches, but it ranges from 2 to 10 inches.

The lower layers extend to a depth of more than 40 inches. They have hue of 2.5YR to 10YR, value of 3 to 6, and chroma of 4 to 8.

Weikert Series

Soils of the Weikert series are shallow and somewhat excessively drained. They formed in material weathered from shale, siltstone, and sandstone. They are on uplands. Slope ranges from 7 to 80 percent.

Weikert soils are near Berks, Gilpin, and Sequoia soils. Weikert soils are more shallow over bedrock than the nearby soils. Also, they have less clay in the subsoil than Sequoia soils.

Typical pedon of Weikert channery silt loam, in an area of Berks-Weikert complex, 30 to 60 percent slopes, about 3¾ miles east of Glen Wilton, 1,200 feet north of the intersection of U.S. Highway 200 and Virginia Highway 696, and 1¾ miles east of U.S. Highway 220, on Anthony Knobs, at an elevation of 1,600 feet:

Oi—2.5 inches to 1 inch; loose leaves, twigs, and pine needles.

Oe—1.5 inches to 0; partially decomposed organic matter.

A—0 to 4 inches; yellowish brown (10YR 5/4) channery silt loam; moderate fine granular structure; friable, slightly sticky and slightly plastic; many fine, medium, and coarse roots; about 25 percent shale channers; very strongly acid; clear smooth boundary.

Bw—4 to 10 inches; brownish yellow (10YR 6/6) very channery silt loam; moderate fine subangular blocky structure; friable, slightly sticky and slightly plastic; common fine and medium roots; about 40 percent shale channers; very strongly acid; clear wavy boundary.

C—10 to 16 inches; light yellowish brown (10YR 6/4) extremely channery silt loam; massive; friable, slightly sticky and slightly plastic; few fine roots; about 70 percent shale channers; very strongly acid; abrupt wavy boundary.

R—16 inches; shale bedrock.

The thickness of the solum ranges from 8 to 20 inches. The depth to bedrock ranges from 10 to 20 inches. The content of shale, siltstone, or fine grained sandstone fragments ranges from 15 to 50 percent in the A horizon, from 35 to 60 percent in the Bw horizon, and from 60 to 85 percent in the C horizon. Reaction is very strongly acid to moderately acid throughout the profile in unlimed areas.

The A horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4. The Bw and C horizons are silt loam or loam in the fine-earth fraction. The Bw horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 4 to 6. The C horizon has hue of 7.5YR or 10YR and value and chroma of 4 to 6. The bedrock is shale, siltstone, or fine grained sandstone.

Wolfgap Series

Soils of the Wolfgap series are very deep and well drained. They formed in alluvium derived from limestone, shale, and sandstone. They are on flood plains and low stream terraces. Slope ranges from 0 to 5 percent.

Wolfgap soils are near Botetourt, Gladehill, Irongate, and Lindside soils. Wolfgap soils have more clay and less sand in the subsoil than Gladehill soils. They are better drained than Botetourt, Irongate, and Lindside soils.

Typical pedon of Wolfgap loam, 2 to 5 percent slopes, rarely flooded, about 1 mile northwest of Haymakertown, 200 yards southwest of the intersection of Virginia Highways 600 and 665, and 150 feet south of Catawba Creek, at an elevation of 1,250 feet:

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

Bw1—10 to 22 inches; dark yellowish brown (10YR 4/6) loam; strong medium and coarse subangular blocky structure; friable, slightly sticky and slightly plastic; common fine and very fine roots; common distinct brown (7.5YR 4/4) coatings on faces of peds; about 2 percent cobbles and 2 percent gravel; neutral; clear smooth boundary.

Bw2—22 to 31 inches; dark yellowish brown (10YR 4/4) loam; moderate medium subangular blocky structure; friable, slightly sticky and slightly plastic; few very fine roots; common distinct brown (7.5YR 4/4) coatings on faces of peds; about 5 percent gravel; neutral; clear smooth boundary.

Bw3—31 to 42 inches; dark yellowish brown (10YR 4/4) sandy clay loam; weak medium and coarse subangular blocky structure; friable, slightly sticky and slightly plastic; few fine roots; few faint dark yellowish brown (10YR 3/4) coatings on faces of peds; neutral; clear smooth boundary.

C—42 to 51 inches; dark yellowish brown (10YR 4/4) gravelly sandy clay loam; massive; very friable, slightly sticky and slightly plastic; few very fine roots; about 15 percent gravel; neutral; abrupt smooth boundary.

2C—51 to 66 inches; dark yellowish brown (10YR 4/4) gravelly sandy loam; massive; very friable, nonsticky and nonplastic; about 15 percent gravel and 10 percent cobbles; neutral.

The thickness of the solum ranges from 30 to more than 60 inches. The depth to bedrock is more than 60 inches. The content of gravel and cobbles ranges from 0 to 25 percent in the Ap and Bw horizons, from 0 to 35 percent in the C horizon, and from 15 to 80 percent in the 2C horizon. Reaction is slightly acid to moderately alkaline throughout the profile.

The Ap horizon has hue of 7.5YR or 10YR and value and chroma of 2 or 3.

The Bw horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. It is loam, silt loam, or clay loam in the fine-earth fraction.

The C horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 3 to 6. It is loam, sandy clay loam, or clay loam in the fine-earth fraction.

Zoar Series

Soils of the Zoar series are very deep and moderately well drained. They formed in old alluvium derived from shale, sandstone, and small amounts of limestone. They are on stream terraces throughout the survey area. Slope ranges from 2 to 7 percent.

Zoar soils are near Moomaw, Purdy, and Tygart, soils. Unlike Moomaw soils, Zoar soils do not have a fragipan. They are better drained than Tygart and Purdy soils.

Typical pedon of Zoar silt loam, 2 to 7 percent slopes, about 2 miles north of Fincastle, 0.5 mile west of the intersection of Virginia Highways 600 and 688, and 50 feet west along a natural gas pipeline, at an elevation of 1,100 feet:

Ap—0 to 8 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium and coarse granular structure; friable, slightly sticky and nonplastic; common very fine and fine roots; strongly acid; clear smooth boundary.

Bt1—8 to 19 inches; yellowish brown (10YR 5/6) silty clay loam; few fine faint light yellowish brown (10YR 6/4) mottles; moderate fine subangular blocky structure; friable, slightly sticky and slightly plastic; few very fine and fine roots; few faint clay films on faces of peds; strongly acid; clear smooth boundary.

Bt2—19 to 28 inches; yellowish brown (10YR 5/6) silty clay; few fine distinct light brownish gray (10YR 6/2) and few fine faint strong brown (7.5YR 5/6) mottles; moderate fine and medium subangular blocky structure; firm, sticky and plastic; few very fine roots; common distinct clay films on faces of peds; strongly acid; gradual wavy boundary.

Bt3—28 to 48 inches; strong brown (7.5YR 5/6) silty clay; many fine distinct light gray (10YR 7/1) and pale brown (10YR 6/3) mottles; moderate medium subangular blocky structure; firm, sticky and plastic; few very fine roots; common distinct clay films on faces of peds; strongly acid; gradual wavy boundary.

C—48 to 65 inches; mottled yellowish brown (10YR 5/6), light gray (10YR 7/1), and yellowish red (5YR 5/6) silty clay; massive; very firm, sticky and plastic; about 2 percent rounded gravel; very strongly acid.

The thickness of the solum ranges from 30 to 50 inches. The depth to bedrock is more than 60 inches. The content of gravel ranges from 0 to 3 percent throughout the profile. Reaction is strongly acid or very strongly acid throughout the profile in unlimed areas.

The Ap horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 3 or 4. It is silt loam or loam.

The E horizon, if it occurs, has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is silt loam or loam.

The Bt horizon has hue of 5YR to 10YR, value of 5 or 6, and chroma of 6 to 8. It is mottled in shades of gray, brown, or red in the lower part. This horizon is silty clay loam or silty clay.

The C horizon is mottled with hue of 5YR to 10YR, value of 4 to 7, and chroma of 1 to 6. It is silty clay loam, silty clay, or clay.

Formation of the Soils

This section describes the factors that have affected the formation of the soils in Botetourt County. It also describes the processes of horizon differentiation.

Factors of Soil Formation

Soil forms through weathering and other processes that act on parent material. The characteristics of the soil at any given point depend on the interaction of parent material, climate, plants and animals, relief, and time.

Climate and plants and animals are the active forces of soil formation. They act on the parent material that has accumulated through the weathering of rocks and slowly change it into a soil. All five factors contribute to the formation of every soil. The relative importance of each differs from place to place. In extreme cases one factor dominates soil formation and determines most of the soil properties. In general, however, the combined action of the five factors determines the character of each soil.

Parent Material

Parent material is the unconsolidated mass in which a soil forms. It is largely responsible for the chemical and mineralogical composition of the soil and the rate of the soil-forming processes. The soils in Botetourt County formed in residual, alluvial, and colluvial material.

The most common residual material in the county weathered from limestone, shale, sandstone, siltstone, or granite. Soils that formed in material weathered from limestone, including dolomite, and from shale are most extensive in the major valley in the county. They have a wide range of characteristics. The soils that formed in material weathered limestone typically have a silty surface layer and a clayey subsoil. Examples are Groseclose and Frederick soils. Weikert and Berks soils formed in acid shale and siltstone residuum, and Dekalb and Lehew soils formed in acid sandstone residuum. Soils that formed in granite residuum, such as Edneytown and Peaks soils, are confined to the Blue Ridge in this county.

The alluvial material in the county is of local origin along the smaller streams and of local and general origin along the major rivers. Soils on alluvial bottom land vary widely in texture and degree of development. Examples are Derroc, Gladehill, Lindside, and Wolfgap soils.

The colluvial material in the county is dominantly on the lower mountain slopes. The soils that formed in this material are primarily coarse textured or medium textured. Examples are Laidig, Oriskany, and Tumbling soils.

Climate

Precipitation and temperature are the main climatic factors that influence soil formation. Water dissolves minerals, promotes biological activity, and transports mineral and organic residue through the soil. Temperature determines the types of physical, chemical, and biological activities that take place in the soil and the speed at which they act.

Because the amount of precipitation exceeds the amount that is lost through evapotranspiration, the soils in Botetourt County have been leached. Much of the soluble material that was originally in the soils or was released through weathering has been removed. The material has not been removed, however, from Massanetta and other alluvial soils that are recharged with carbonates by limestone springs. Precipitation is mainly responsible for the clayey subsoil that characterizes most of the soils in the county. In addition to leaching soluble material, water percolating through the soils moves small amounts of clay from the surface layer to the subsoil. Consequently, the soils in the county have more clay in the subsoil than in the surface layer.

Plant and Animal Life

Vegetation influences the amount of organic matter in the soil, the color of the surface layer, and to some extent the content of plant nutrients. Earthworms and burrowing animals help to keep the soil open and porous. Micro-organisms decompose the vegetation and dead animal matter, thus releasing plant nutrients. The

native vegetation in Botetourt County consisted mainly of hardwoods. The soils that formed under this vegetation are generally less acid than those that formed under coniferous vegetation.

Human activities, including the clearing of forests, cultivation, the introduction of new plants, and the application of measures that change natural drainage, have had an effect on soil formation. The most significant effects of these activities are evident in areas where the upper layers of the soil have been mixed and a plow layer has formed, where cultivation has accelerated erosion on strongly sloping soils, and where applications of lime and fertilizer have change the content of plant nutrients, especially in the upper layers of the soils.

Relief

The relief of an area is largely determined by the underlying geologic formations, the geologic history of the general region, and the effects of dissection by rivers and streams. Relief influences soil formation through its effects on soil moisture, erosion, temperature, and plant cover.

Botetourt County is bounded on all sides by mountains. The elevation on the Blue Ridge approaches or exceeds 4,000 feet. The mountains are underlain by resistant rocks, such as granite, sandstone, and quartzite. Relief in the valleys is affected by the underlying geology. The lowest areas with the least relief are underlain by Edinburg shale. The more hilly areas are characteristically underlain by other rocks, such as Beekmantown and Chepultepec dolomite, which generally has chert beds. The areas of shale, such as those underlain by Brallier shale, have a more well defined drainage pattern than the other areas.

Most of the soils on uplands are naturally well drained. The soils on terraces and flood plains are well drained to poorly drained. Soil drainage is commonly related to the position of the soils on the landscape. Soils in low, nearly level areas, for example, commonly are poorly drained, whereas soils in the more sloping areas typically are well drained.

Time

The degree of horizon differentiation within a soil is related to the amount of time that the soil has been subject to the other soil-forming factors. A soil that is characterized by little or no horizon development is considered young, whereas one that has strongly developed horizons is considered old.

The oldest soils in Botetourt County are mainly those that formed in material weathered from shale and limestone. Examples are Frederick and Groseclose soils. In general, these soils are in the less sloping, relatively stable landscape positions, formed in easily weathered material, and have strongly differentiated horizons. The soils that formed in recent alluvium, such as Derroc soils, have been in place only a relatively short time and show little or no evidence of profile development other than an accumulation of organic matter in the surface layer. The soils on terraces, such as Alonzville and Botetourt soils, are generally intermediate in degree of horizon development between the old residual soils and the very young alluvial soils. On very steep slopes, geologic erosion has removed soil material in a relatively short period and the soils generally have not in place long enough for the development of distinct horizons.

Morphology of the Soils

The results of the soil-forming factors are evidenced by the different layers, or horizons, in a soil profile. The profile extends from the surface down to material that is little altered by the soil-forming processes.

Most soils have four major horizons, which are called the A, E, B, and C horizons. Subdivisions of these horizons are indicated by numbers or lowercase letters. An example is a Bt horizon, which is a B horizon that has an accumulation of clay.

The A horizon has more organic matter than any other layer in the profile. The E horizon is the layer of maximum leaching, or eluviation, of clay and iron. A distinct E horizon is evident in Laidig, Oriskany, and other forested soils on the mountains in Botetourt County.

The B horizon underlies the A horizon and is commonly called the subsoil. It is the horizon of maximum accumulation, or illuviation, of clay, iron, aluminum, or other compounds that are leached from the surface layer. In some soils the B horizon forms through alteration of the soil material in place with very little illuviation. The alteration may be caused by the oxidation and reduction of iron or by the weathering of clay. The B horizon commonly has blocky structure and is firmer than the A horizon. Also, in well drained soils, it is brighter colored. Frederick soils are an example of soils that have a well developed B horizon.

The C horizon is below the B horizon or is below the A horizon in soils that do not have a B horizon. It consists of material that is little altered by the soil-forming processes but that may be modified by weathering. In some soils, bedrock directly underlies the B horizon and a C horizon does not occur.

In Botetourt County several processes are involved in the formation of soil horizons. Among these are the accumulation of organic matter, the leaching of soluble

salts, the reduction and transfer of iron, the formation and translocation of clay, and the layering of parent material. These processes are continually taking place, generally at the same time throughout the profile.

The accumulation of organic matter in the A horizon occurs as plant residue decomposes. In many areas in Botetourt County, this horizon has been eroded or has been mixed with material from the underlying horizons through cultivation. The content of organic matter in the surface layer ranges from low in coarse textured soils, such as Derroc soils, to high in medium textured soils on flood plains, such as Massanetta soils.

In order for soils to have a distinct subsoil, some of the lime and other soluble salts must be leached and clay, iron, organic matter, and other material must be translocated from the surface layer to the subsoil. Among the factors that affect leaching are the kind of salts originally in the soils, the annual precipitation, and the soil texture. Most of the soils in the county are leached. Exceptions are alluvial soils that are recharged with carbonates by limestone springs and soils that are shallow over calcareous bedrock.

The chemical reduction and transfer of iron can occur in areas where drainage is impeded. The naturally wet soils in Botetourt County are gray in one or more of their horizons as a result of the reduction of iron. Newark and Purdy soils are examples of wet soils that have a high water table.

Iron that has been reduced in areas where the soil is poorly aerated generally becomes mobile and commonly is removed from the soil. Part of the mobile iron moves within the original horizon or to another horizon. Part of the iron is segregated and reoxidized in the form of red, yellowish red, strong brown, or yellowish brown mottles, which are common in some horizons in areas where drainage is impeded. The reduction, segregation, and reoxidation of iron have resulted in mottles in the subsoil of Ernest soils.

When silicate clay forms from primary material, some iron generally is freed as hydrated oxide. Depending on the degree of hydration, the oxide normally is reddish. The hydrated iron oxide causes most of the well developed, freely aerated soils in the county to be bright brown and red. The color of the subsoil in Shottower soils, for example, is the result of free iron oxide.

The weathering of primary minerals to silicate clay minerals, largely through hydrolysis, results in the formation of kaolinitic clay. Kaolinite is the most common clay mineral in the soils of Botetourt County. Other kinds of clay, such as montmorillonite and illite, are in the soils in smaller amounts. In a few of the soils, such as Carbo and Chilhowie soils, the B horizon has montmorillonitic clay.

Layering influences the formation of soil horizons in several ways. The formation of silicate clays varies directly with the amount of weatherable minerals in each layer. A layer that has a high content of slowly weathered quartz sand forms less silicate clay than a layer that has a high content of easily weathered silt-sized minerals. Water commonly moves more slowly between layers of different textures. As a result, the upper layer temporarily has excess water. As the water slows down, minerals carried down through percolation are deposited or are precipitated, commonly forming either a compact layer or a layer of clay that is slowly permeable or very slowly permeable. If the compact layer is high in content of sand or silt, it is called a fragipan. Shrinking and swelling in the fragipan during alternating wet and dry periods may account for the packing of soil particles and for a gross polygonal pattern of cracks. Clay, silica, and oxides of aluminum are the most likely cementing agents causing brittleness and hardness in the pan. Moomaw and Laidig are examples of soils that have a well developed fragipan.

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

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.

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

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

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.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or 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 in such an intricate pattern or so small in area that it is not practical to map them separately at the

selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A 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. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most

mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.
Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by 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, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

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.*

Fine textured soil. Sandy clay, silty clay, or clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

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.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

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 and mottles.

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 up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 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 (geology). 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.

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 and the more decomposed sapric material.

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. The major horizons 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, any plowed or disturbed surface layer.

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 O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon 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) granular, 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 horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

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

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:
Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.
Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.
Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.
Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.
Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.
Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.
Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.
Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.
Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 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 strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

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.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material. (See Sapric soil material.)

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.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

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.

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 affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 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. For example, slope, stoniness, and thickness.

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.

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.

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 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.

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.

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:

Extremely acid	below 4.5
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

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 is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in

diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-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 (soil science). Unconsolidated residual material underlying the soil and grading to hard bedrock below.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the substratum. 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. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

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.

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

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 substratum. 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 which provide vegetative barriers to soil blowing 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 grain* (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 soil blowing 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. Breaking up a compact subsoil by pulling a special chisel through the soil.

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 about 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. It includes all subdivisions of these horizons.

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.

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.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

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.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1930-89 at Buchanan, 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	More than--	Less than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January-----	47.2	26.1	36.7	72	1	77	3.00	4.11	1.71	7	5
February----	50.7	27.1	38.9	75	4	91	2.86	4.07	1.53	6	6
March-------	59.5	33.6	46.6	84	12	242	3.64	4.79	2.10	8	4
April-------	70.5	42.0	56.3	90	24	489	3.15	3.96	2.09	7	0
May---------	79.0	51.0	65.0	94	30	774	3.85	5.19	2.28	8	0
June--------	85.2	59.1	72.2	98	41	965	3.94	5.09	2.33	7	0
July--------	88.0	63.2	75.6	100	49	1,102	4.32	5.54	2.76	8	0
August------	86.9	62.3	74.6	98	47	1,072	4.28	6.29	2.11	7	0
September---	81.2	55.7	68.5	96	36	854	3.46	5.33	1.48	5	0
October-----	71.2	44.1	57.6	89	24	545	4.98	8.07	1.32	5	0
November----	59.2	34.5	46.8	80	14	238	2.99	4.62	1.40	6	1
December----	48.9	27.6	38.2	72	4	91	3.03	4.39	1.65	6	4
Yearly:											
Average---	69.0	43.9	56.4	---	---	---	---	---	---	---	---
Extreme---	---	---	---	101	-2	---	---	---	---	---	---
Total-----	---	---	---	---	---	6,540	43.50	52.61	34.36	80	20

* 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 1930-89 at Buchanan, Virginia)

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. 4	Apr. 23	May 6
2 years in 10 later than--	Mar. 31	Apr. 21	May 4
5 years in 10 later than--	Mar. 21	Apr. 10	Apr. 26
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 24	Oct. 8	Oct. 3
2 years in 10 earlier than--	Oct. 29	Oct. 15	Oct. 6
5 years in 10 earlier than--	Nov. 9	Oct. 28	Oct. 15

TABLE 3.--GROWING SEASON

(Recorded in the period 1930-89 at Buchanan, 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	211	184	153
8 years in 10	219	188	162
5 years in 10	230	200	175
2 years in 10	247	213	191
1 year in 10	256	218	196

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
1B	Alonzville loam, 2 to 7 percent slopes	1,442	0.5
1C	Alonzville loam, 7 to 15 percent slopes	416	0.1
2C	Bailegap fine sandy loam, 7 to 15 percent slopes	278	0.1
3C	Bailegap cobbly fine sandy loam, 7 to 15 percent slopes	394	0.1
3D	Bailegap cobbly fine sandy loam, 15 to 30 percent slopes	1,492	0.5
3E	Bailegap cobbly fine sandy loam, 30 to 60 percent slopes	1,245	0.4
4C	Berks-Weikert complex, 7 to 15 percent slopes	3,621	1.3
4D	Berks-Weikert complex, 15 to 30 percent slopes	8,805	3.1
4E	Berks-Weikert complex, 30 to 60 percent slopes	30,798	10.8
5B	Botetourt loam, 2 to 7 percent slopes, rarely flooded	1,336	0.5
6C	Botetourt loam, 7 to 15 percent slopes	251	0.1
7C	Carbo silty clay loam, 7 to 15 percent slopes, very rocky	2,081	0.7
7D	Carbo silty clay loam, 15 to 30 percent slopes, very rocky	3,621	1.3
8C	Carbo-Opequon-Rock outcrop complex, 2 to 15 percent slopes	1,659	0.6
8E	Carbo-Opequon-Rock outcrop complex, 15 to 45 percent slopes	12,513	4.3
9C	Chilhowie silty clay loam, 7 to 15 percent slopes, rocky	2,350	0.8
9D	Chilhowie silty clay loam, 15 to 30 percent slopes, rocky	4,537	1.6
10E	Chilhowie channery silty clay loam, 30 to 60 percent slopes, rocky	3,611	1.3
11C	Chiswell-Groseclose complex, 7 to 15 percent slopes	1,224	0.4
11D	Chiswell-Groseclose complex, 15 to 30 percent slopes	2,087	0.7
11E	Chiswell-Groseclose complex, 30 to 60 percent slopes	3,698	1.3
12C	Dekalb channery fine sandy loam, 2 to 15 percent slopes, very stony	479	0.2
12D	Dekalb channery fine sandy loam, 15 to 30 percent slopes, very stony	1,761	0.6
12E	Dekalb channery fine sandy loam, 30 to 60 percent slopes, very stony	8,341	2.9
13E	Dekalb-Rock outcrop complex, 10 to 35 percent slopes	2,118	0.7
13F	Dekalb-Rock outcrop complex, 35 to 80 percent slopes	11,099	3.9
14A	Derroc cobbly loam, 0 to 4 percent slopes, occasionally flooded	2,665	0.9
15A	Derroc very cobbly loam, 0 to 4 percent slopes, frequently flooded	849	0.3
16C	Edneytown loam, 2 to 15 percent slopes, very stony	96	*
16D	Edneytown loam, 15 to 30 percent slopes, very stony	1,245	0.4
16E	Edneytown loam, 30 to 60 percent slopes, very stony	2,000	0.7
17B	Ernest silt loam, 0 to 7 percent slopes	874	0.3
17C	Ernest silt loam, 7 to 15 percent slopes	1,098	0.4
18C	Ernest cobbly loam, 0 to 15 percent slopes, very stony	1,020	0.4
19B	Flatwoods silt loam, 2 to 7 percent slopes	1,368	0.5
19C	Flatwoods silt loam, 7 to 15 percent slopes	2,393	0.8
20B	Frederick loam, 2 to 7 percent slopes	690	0.2
20C	Frederick loam, 7 to 15 percent slopes	7,124	2.5
20D	Frederick loam, 15 to 30 percent slopes	4,390	1.5
21C	Frederick silty clay loam, 7 to 15 percent slopes, severely eroded	578	0.2
21D	Frederick silty clay loam, 15 to 30 percent slopes, severely eroded	1,231	0.4
22C	Frederick gravelly loam, 7 to 15 percent slopes	5,177	1.8
22D	Frederick gravelly loam, 15 to 30 percent slopes	7,278	2.6
22E	Frederick gravelly loam, 30 to 45 percent slopes	1,138	0.4
23C	Frederick very gravelly loam, 7 to 15 percent slopes	1,689	0.6
23D	Frederick very gravelly loam, 15 to 30 percent slopes	3,293	1.2
24C	Frederick loam, 7 to 15 percent slopes, very rock	4,431	1.6
24D	Frederick loam, 15 to 30 percent slopes, very rocky	11,976	4.2
25C	Frederick-Urban land complex, 2 to 15 percent slopes	287	0.1
25D	Frederick-Urban land complex, 15 to 30 percent slopes	257	0.1
26C	Gilpin silt loam, 7 to 15 percent slopes	1,036	0.4
27A	Gladehill fine sandy loam, 0 to 3 percent slopes, occasionally flooded	2,815	1.0
28B	Groseclose silt loam, 2 to 7 percent slopes	290	0.1
28C	Groseclose silt loam, 7 to 15 percent slopes	4,479	1.6
28D	Groseclose silt loam, 15 to 30 percent slopes	5,702	2.0
29C	Groseclose silty clay loam, 7 to 15 percent slopes, severely eroded	418	0.1
29D	Groseclose silty clay loam, 15 to 30 percent slopes, severely eroded	735	0.3
30C	Groseclose-Litz complex, 7 to 15 percent slopes	1,892	0.7
30D	Groseclose-Litz complex, 15 to 30 percent slopes	5,378	1.9
30E	Groseclose-Litz complex, 30 to 45 percent slopes	1,671	0.6
31C	Hayesville loam, 7 to 15 percent slopes	340	0.1
31D	Hayesville loam, 15 to 30 percent slopes	141	*

See footnote at end of table.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
32A	Irongate loam, 0 to 3 percent slopes, occasionally flooded	622	0.2
33B	Laidig fine sandy loam, 2 to 7 percent slopes	290	0.1
33C	Laidig fine sandy loam, 7 to 15 percent slopes	1,597	0.6
34B	Laidig cobbly fine sandy loam, 2 to 7 percent slopes	581	0.2
34C	Laidig cobbly fine sandy loam, 7 to 15 percent slopes	3,124	1.1
34D	Laidig cobbly fine sandy loam, 15 to 30 percent slopes	1,341	0.5
35C	Laidig cobbly fine sandy loam, 2 to 15 percent slopes, very stony	2,671	0.9
35D	Laidig cobbly fine sandy loam, 15 to 30 percent slopes, very stony	5,212	1.8
35E	Laidig cobbly fine sandy loam, 30 to 45 percent slopes, very stony	689	0.2
36D	Lehew-Dekalb complex, 15 to 30 percent slopes, extremely stony	787	0.3
36E	Lehew-Dekalb complex, 30 to 60 percent slopes, extremely stony	3,841	1.4
37C	Lily gravelly sandy loam, 2 to 15 percent slopes, very stony	256	0.1
37D	Lily gravelly sandy loam, 15 to 30 percent slopes, very stony	676	0.2
37E	Lily gravelly sandy loam, 30 to 60 percent slopes, very stony	2,833	1.0
38A	Lindside silt loam, 0 to 2 percent slopes, occasionally flooded	1,931	0.7
39A	Massanetta silt loam, 0 to 3 percent slopes, occasionally flooded	446	0.2
40B	Moomaw loam, 2 to 7 percent slopes	4,138	1.5
40C	Moomaw loam, 7 to 15 percent slopes	1,642	0.6
41C	Oriskany very cobbly sandy loam, 2 to 15 percent slopes, extremely bouldery	1,593	0.6
41D	Oriskany very cobbly sandy loam, 15 to 30 percent slopes, extremely bouldery	1,943	0.7
42E	Oriskany extremely cobbly sandy loam, 30 to 60 percent slopes, rubbly	595	0.2
43E	Peaks gravelly sandy loam, 30 to 60 percent slopes, very stony	323	0.1
43F	Peaks gravelly sandy loam, 60 to 80 percent slopes, very stony	812	0.3
44	Pits, quarries	537	0.2
45A	Purdy silty clay loam, 0 to 4 percent slopes	942	0.3
46F	Rock outcrop-Opequon complex, 45 to 100 percent slopes	1,120	0.4
47C	Rushtown very channery silt loam, 3 to 15 percent slopes	620	0.2
48C	Sequoia silt loam, 7 to 15 percent slopes	496	0.2
48D	Sequoia silt loam, 15 to 30 percent slopes	1,668	0.6
49C	Shelocta gravelly silt loam, 7 to 15 percent slopes	207	0.1
49D	Shelocta gravelly silt loam, 15 to 30 percent slopes	195	0.1
50B	Shottower loam, 2 to 7 percent slopes	624	0.2
50C	Shottower loam, 7 to 15 percent slopes	1,652	0.6
51C	Shottower cobbly loam, 7 to 15 percent slopes	495	0.2
51D	Shottower cobbly loam, 15 to 30 percent slopes	1,649	0.6
52C	Thurmont loam, 2 to 15 percent slopes, very stony	433	0.2
52D	Thurmont loam, 15 to 30 percent slopes, very stony	557	0.2
53B	Timberville silt loam, 2 to 7 percent slopes, occasionally flooded	2,414	0.8
54A	Toms silt loam, 0 to 4 percent slopes, rarely flooded	453	0.2
55B	Tumbling loam, 2 to 7 percent slopes	474	0.2
55C	Tumbling loam, 7 to 15 percent slopes	2,257	0.8
55D	Tumbling loam, 15 to 30 percent slopes	889	0.3
56C	Tumbling cobbly loam, 7 to 15 percent slopes	2,658	0.9
56D	Tumbling cobbly loam, 15 to 30 percent slopes	3,172	1.1
57C	Tumbling cobbly loam, 2 to 15 percent slopes, very stony	1,498	0.5
57D	Tumbling cobbly loam, 15 to 30 percent slopes, very stony	4,000	1.4
58C	Tumbling-Urban land complex, 2 to 15 percent slopes	776	0.3
59B	Tygart silt loam, 2 to 7 percent slopes	761	0.3
60	Udorthents	462	0.2
61	Udorthents-Urban land complex	1,917	0.7
62F	Weikert-Rock outcrop complex, 45 to 80 percent slopes	6,826	2.4
63A	Wolfgap loam, 0 to 2 percent slopes, occasionally flooded	1,715	0.6
64A	Wolfgap loam, 0 to 2 percent slopes, rarely flooded	1,233	0.4
64B	Wolfgap loam, 2 to 5 percent slopes, rarely flooded	1,440	0.5
65B	Zoar silt loam, 2 to 7 percent slopes	689	0.2
	Water areas more than 40 acres in size	800	0.3
	Water areas less than 40 acres in size	1,624	0.6
	Total	284,497	100.0

* Less than 0.1 percent.

TABLE 5.--PRIME FARMLAND

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland)

Map symbol	Soil name
1B	Alonzville loam, 2 to 7 percent slopes
5B	Botetourt loam, 2 to 7 percent slopes, rarely flooded
20B	Frederick loam, 2 to 7 percent slopes
27A	Gladehill fine sandy loam, 0 to 3 percent slopes, occasionally flooded
32A	Irongate loam, 0 to 3 percent slopes, occasionally flooded
33B	Laidig fine sandy loam, 2 to 7 percent slopes
38A	Lindside silt loam, 0 to 2 percent slopes, occasionally flooded
39A	Massanetta silt loam, 0 to 3 percent slopes, occasionally flooded
40B	Moomaw loam, 2 to 7 percent slopes
53B	Timberville silt loam, 0 to 7 percent slopes, occasionally flooded
55B	Tumbling loam, 2 to 7 percent slopes
63A	Wolfgap loam, 0 to 2 percent slopes, occasionally flooded
64A	Wolfgap loam, 0 to 2 percent slopes, rarely flooded
64B	Wolfgap loam, 2 to 5 percent slopes, rarely flooded
65B	Zoar silt loam, 2 to 7 percent slopes

TABLE 6.--LAND CAPABILITY 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	Wheat	Pasture	Kentucky bluegrass
		Bu	Tons	Tons	Tons	Bu	AUM*	AUM*
1B---------- Alonzville	IIe	115	23	3.5	4.5	45	9.3	6.1
1C---------- Alonzville	IIIe	105	21	3.5	4.5	40	9.0	5.9
2C---------- Bailegap	IIIe	85	17	3.0	---	45	8.0	5.4
3C---------- Bailegap	IVs	80	16	2.5	---	40	6.6	4.3
3D---------- Bailegap	VIs	---	---	---	---	---	6.4	4.2
3E---------- Bailegap	VIIe	---	---	---	---	---	---	---
4C**---------- Berks-Weikert	IVe	65	13	2.3	2.5	28	6.1	4.0
4D**---------- Berks-Weikert	VIe	---	---	2.1	2.2	---	5.6	3.7
4E**---------- Berks-Weikert	VIIe	---	---	---	---	---	---	---
5B---------- Botetourt	IIe	110	22	3.0	---	35	8.0	5.4
6C---------- Botetourt	IIIe	95	19	2.5	---	30	6.6	4.3
7C---------- Carbo	VIs	---	---	3.0	---	---	8.0	5.4
7D---------- Carbo	VIs	---	---	---	---	---	7.2	4.8
8C**---------- Carbo-Opequon-Rock outcrop	VIIs	---	---	---	---	---	5.3	3.6
8E**---------- Carbo-Opequon-Rock outcrop	VIIs	---	---	---	---	---	5.0	3.4
9C---------- Chilhowie	IVe	70	15	2.5	---	30	6.6	4.3
9D---------- Chilhowie	VIe	---	---	---	---	---	---	4.0
10E---------- Chilhowie	VIIe	---	---	---	---	---	---	---

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Corn silage	Grass-legume hay	Alfalfa hay	Wheat	Pasture	Kentucky bluegrass
		Bu	Tons	Tons	Tons	Bu	AUM*	AUM*
11C**---------- Chiswell-Groseclose	IVe	71	---	2.2	---	---	5.9	4.0
11D**---------- Chiswell-Groseclose	VIe	---	---	2.1	---	---	5.6	3.7
11E**---------- Chiswell-Groseclose	VIIe	---	---	---	---	---	---	---
12C, 12D-------- Dekalb	VIIs	---	---	---	---	---	4.2	2.8
12E---------- Dekalb	VIIe	---	---	---	---	---	---	---
13E**---------- Dekalb-Rock outcrop	VIIs	---	---	---	---	---	---	---
13F**---------- Dekalb-Rock outcrop	VIIs	---	---	---	---	---	---	---
14A---------- Derroc	IIIs	70	13	1.8	2.0	30	4.8	3.2
15A---------- Derroc	IVs	65	12	1.5	1.8	25	4.0	2.6
16C---------- Edneytown	VIIs	---	---	---	---	---	6.8	4.6
16D---------- Edneytown	VIIs	---	---	---	---	---	---	---
16E---------- Edneytown	VIIe	---	---	---	---	---	---	---
17B---------- Ernest	IIe	100	20	3.0	---	40	8.0	5.4
17C---------- Ernest	IIIe	80	16	3.0	---	35	8.0	5.4
18C---------- Ernest	VIs	---	---	---	---	---	5.8	3.8
19B---------- Flatwoods	IIIe	70	14	3.0	---	40	8.0	5.4
19C---------- Flatwoods	IVe	60	12	2.5	---	35	6.6	4.3
20B---------- Frederick	IIe	130	26	3.5	4.5	50	9.3	6.1

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Corn silage	Grass-legume hay	Alfalfa hay	Wheat	Pasture	Kentucky bluegrass
		Bu	Tons	Tons	Tons	Bu	AUM*	AUM*
20C---------- Frederick	IIIe	120	24	3.0	4.5	45	8.0	5.4
20D---------- Frederick	IVe	80	16	3.0	4.0	35	7.5	5.0
21C---------- Frederick	IVe	90	18	3.0	4.0	30	7.8	5.2
21D---------- Frederick	VIe	---	---	---	---	---	7.2	4.8
22C---------- Frederick	IIIe	100	20	3.0	4.5	40	8.0	5.4
22D---------- Frederick	IVe	80	16	3.0	4.0	35	7.5	5.0
22E---------- Frederick	VIIe	---	---	---	---	---	6.6	4.4
23C---------- Frederick	IVs	---	---	1.5	1.5	---	4.0	2.6
23D---------- Frederick	VIs	---	---	---	---	---	3.2	2.1
24C---------- Frederick	VIs	---	---	2.7	4.0	---	8.0	5.4
24D---------- Frederick	VIs	---	---	2.7	3.5	---	7.5	5.0
25C**. Frederick-Urban land								
25D**. Frederick-Urban land								
26C---------- Gilpin	IIIe	85	17	3.0	3.5	35	8.0	5.4
27A---------- Gladehill	IIe	120	24	4.0	5.0	45	10.6	7.0
28B---------- Groseclose	IIe	125	25	3.7	4.0	55	9.8	6.5
28C---------- Groseclose	IIIe	110	22	3.2	3.5	45	8.5	5.6
28D---------- Groseclose	IVe	80	---	3.0	3.0	---	8.0	5.3
29C---------- Groseclose	IVe	90	18	2.7	2.5	35	7.2	4.8

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Corn silage	Grass-legume hay	Alfalfa hay	Wheat	Pasture	Kentucky bluegrass
		Bu	Tons	Tons	Tons	Bu	AUM*	AUM*
29D---------- Groseclose	VIe	---	---	---	---	---	6.2	4.1
30C**---------- Groseclose-Litz	IIIe	92	18	2.9	3.3	41	7.7	5.1
30D**---------- Groseclose-Litz	IVe	70	---	2.6	3.0	---	6.9	4.6
30E**---------- Groseclose-Litz	VIIe	---	---	---	---	---	---	---
31C---------- Hayesville	IIIe	90	18	3.0	3.2	45	8.0	5.4
31D---------- Hayesville	IVe	---	---	---	---	---	6.6	4.0
32A---------- Irongate	IIw	130	26	3.5	---	45	9.3	6.1
33B---------- Laidig	IIe	100	20	3.0	4.0	40	8.0	5.4
33C---------- Laidig	IIIe	95	19	3.0	4.0	35	7.5	5.0
34B---------- Laidig	IIIs	100	20	3.0	4.0	40	8.0	5.4
34C---------- Laidig	IVs	95	19	3.0	4.0	35	7.5	5.0
34D---------- Laidig	VIs	85	17	2.5	3.5	30	6.6	4.4
35C---------- Laidig	VIIs	---	---	---	---	---	4.5	3.0
35D---------- Laidig	VIIs	---	---	---	---	---	4.0	2.6
35E---------- Laidig	VIIe	---	---	---	---	---	---	---
36D**---------- Lehew-Dekalb	VIIs	---	---	---	---	---	---	---
36E**---------- Lehew-Dekalb	VIIe	---	---	---	---	---	---	---
37C, 37D-------- Lily	VIIs	---	---	---	---	---	4.5	3.0
37E---------- Lily	VIIe	---	---	---	---	---	4.0	2.8
38A---------- Lindside	IIw	125	25	3.5	---	40	9.3	6.1

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Corn silage	Grass-legume hay	Alfalfa hay	Wheat	Pasture	Kentucky bluegrass
		Bu	Tons	Tons	Tons	Bu	AUM*	AUM*
39A---------- Massanetta	IIw	100	20	3.0	---	---	8.0	5.4
40B---------- Moomaw	IIe	100	20	3.0	---	---	8.0	5.4
40C---------- Moomaw	IIIe	90	18	3.0	---	---	7.5	5.0
41C, 41D-------- Oriskany	VIIs	---	---	---	---	---	---	---
42E---------- Oriskany	VIIIs	---	---	---	---	---	---	---
43E, 43F-------- Peaks	VIIe	---	---	---	---	---	---	---
44**. Pits								
45A---------- Purdy	IVw	80	16	2.5	---	---	6.6	4.4
46F**---------- Rock outcrop-Opequon	VIIs	---	---	---	---	---	---	---
47C---------- Rushtown	IVe	70	14	2.5	---	25	6.6	4.4
48C---------- Sequoia	IVe	55	11	2.5	2.5	40	6.6	4.4
48D---------- Sequoia	VIe	---	---	2.3	---	---	6.1	4.1
49C---------- Shelocta	IIIe	100	20	3.0	4.0	40	8.0	5.4
49D---------- Shelocta	IVe	---	---	---	---	---	6.1	4.1
50B---------- Shottower	IIe	120	22	3.5	4.5	50	9.3	6.1
50C---------- Shottower	IIIe	115	21	3.5	4.5	45	9.0	6.0
51C---------- Shottower	IVs	90	18	3.0	4.0	40	8.0	5.4
51D---------- Shottower	VIs	---	---	2.5	3.5	---	6.6	4.4
52C, 52D-------- Thurmont	VIIs	---	---	---	---	---	6.4	4.2

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Corn silage	Grass-legume hay	Alfalfa hay	Wheat	Pasture	Kentucky bluegrass
		Bu	Tons	Tons	Tons	Bu	AUM*	AUM*
53B---------- Timberville	IIe	125	25	4.0	4.5	45	10.6	7.1
54A---------- Toms	IVw	80	16	3.0	---	35	8.0	5.4
55B---------- Tumbling	IIe	100	18	3.5	4.5	50	9.3	6.1
55C---------- Tumbling	IIIe	95	16	3.2	4.5	45	8.5	5.6
55D---------- Tumbling	IVe	80	14	3.0	4.0	40	8.0	5.4
56C---------- Tumbling	IVs	80	14	3.0	4.1	40	8.0	5.4
56D---------- Tumbling	VIs	---	---	2.8	3.6	---	7.4	5.0
57C, 57D-------- Tumbling	VIIs	---	---	---	---	---	7.0	4.7
58C**. Tumbling-Urban land								
59B---------- Tygart	IVw	95	19	3.0	3.0	---	8.0	5.4
60. Udorthents								
61**. Udorthents-Urban land								
62F********** Weikert-Rock outcrop	VIIs	---	---	---	---	---	---	---
63A, 64A-------- Wolfgap	I	145	29	4.5	4.5	45	12.0	8.0
64B---------- Wolfgap	IIe	145	29	4.5	4.5	45	12.0	8.0
65B---------- Zoar	IIe	90	18	3.0	---	40	8.0	5.4

* 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 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available)

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
1B, 1C Alonzville	11A	Slight	Slight	Slight	Slight	Slight	Eastern white pine	89	11	Eastern white pine, yellow-poplar, shortleaf pine.
							Northern red oak	70	4	
							Yellow-poplar	90	6	
							Virginia pine	60	6	
2C Bailegap	4A	Slight	Slight	Slight	Slight	Moderate	Northern red oak	70	4	Eastern white pine, yellow-poplar, shortleaf pine.
							Yellow-poplar	80	5	
							Eastern white pine	80	10	
3C Bailegap	4R	Slight	Slight	Moderate	Slight	Moderate	Northern red oak	70	4	Eastern white pine.
							Yellow-poplar	80	5	
							Eastern white pine	80	10	
3D Bailegap	4F	Moderate	Moderate	Moderate	Slight	Moderate	Northern red oak	70	4	Eastern white pine, shortleaf pine.
							Yellow-poplar	80	5	
							Eastern white pine	80	10	
3E Bailegap	4R	Severe	Severe	Moderate	Slight	Moderate	Northern red oak	70	4	Eastern white pine, shortleaf pine.
							Yellow-poplar	80	5	
							Eastern white pine	80	10	
4C**:										
Berks	4F	Slight	Slight	Moderate	Slight	Slight	Northern red oak	70	4	Virginia pine, eastern white pine.
							Black oak	70	4	
							Virginia pine	70	8	
Weikert	3D	Slight	Slight	Severe	Moderate	Moderate	Northern red oak	59	3	Virginia pine, shortleaf pine, eastern white pine.
							Virginia pine	56	6	
4D**:										
Berks	4F	Slight	Moderate	Moderate	Slight	Slight	Northern red oak	70	4	Virginia pine, eastern white pine.
							Black oak	70	4	
							Virginia pine	70	8	
Weikert	3D	Slight	Moderate	Severe	Moderate	Moderate	Northern red oak	64	3	Eastern white pine, shortleaf pine, Virginia pine.
							Virginia pine	60	6	

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
4E**:										
Berks	4R	Moderate	Severe	Moderate	Slight	Slight	Northern red oak	70	4	Virginia pine, eastern white pine.
							Black oak	70	4	
							Virginia pine	70	8	
Weikert	3R	Moderate	Severe	Severe	Moderate	Moderate	Northern red oak	64	3	Eastern white pine, shortleaf pine, Virginia pine.
							Virginia pine	60	6	
5B, 6C Botetourt	4A	Slight	Slight	Slight	Slight	Moderate	Northern red oak	75	4	Eastern white pine, yellow-poplar, shortleaf pine.
							Virginia pine	65	7	
							Yellow-poplar	95	7	
7C Carbo	6C	Slight	Moderate	Slight	Moderate	Slight	Virginia pine	55	6	Virginia pine, yellow-poplar, black walnut.
							Yellow-poplar	80	5	
							Eastern white pine	80	10	
7D Carbo	6R	Moderate	Moderate	Slight	Moderate	Slight	Virginia pine	55	6	Virginia pine, yellow-poplar, black walnut.
							Yellow-poplar	80	5	
							Eastern white pine	80	10	
8C**:										
Carbo	6C	Slight	Moderate	Slight	Moderate	Slight	Virginia pine	55	6	Virginia pine, yellow-poplar, black walnut.
							Yellow-poplar	80	5	
							Eastern white pine	80	10	
Opequon	6C	Moderate	Moderate	Severe	Severe	Moderate	Virginia pine	53	6	Virginia pine, eastern white pine.
							Northern red oak	60	3	
							White oak	60	3	
Rock outcrop.										
8E**:										
Carbo	6R	Moderate	Moderate	Slight	Moderate	Slight	Virginia pine	55	6	Virginia pine, yellow-poplar, black walnut.
							Yellow-poplar	80	5	
							Eastern white pine	80	10	
Opequon	6R	Severe	Severe	Severe	Severe	Moderate	Virginia pine	53	6	Virginia pine, eastern white pine.
							Northern red oak	60	3	
							White oak	60	3	
Rock outcrop.										

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
9C---------- Chilhowie	6C	Slight	Moderate	Moderate	Moderate	Slight	Virginia pine-------	60	6	Eastern white pine, Virginia pine.
							Shortleaf pine------	60	6	
9D---------- Chilhowie	6R	Moderate	Moderate	Moderate	Moderate	Slight	Virginia pine-------	60	6	Eastern white pine, Virginia pine.
							Shortleaf pine------	60	6	
10E---------- Chilhowie	6R	Severe	Severe	Moderate	Moderate	Slight	Virginia pine-------	60	6	Eastern white pine, Virginia pine.
							Shortleaf pine------	60	6	
11C**:										
Chiswell----------	4D	Slight	Slight	Moderate	Moderate	Moderate	Northern red oak----	74	4	Eastern white pine.
							Virginia pine-------	61	6	
							Yellow-poplar-------	93	7	
Groseclose--------	5A	Slight	Slight	Slight	Slight	Moderate	Northern red oak----	85	5	Eastern white pine, yellow-poplar.
							White oak----------	85	5	
							Eastern white pine--	90	12	
							Yellow-poplar-------	86	6	
11D**:										
Chiswell----------	4R	Moderate	Moderate	Moderate	Moderate	Moderate	Northern red oak----	74	4	Eastern white pine.
							Virginia pine-------	61	6	
							Yellow-poplar-------	93	7	
Groseclose--------	5R	Moderate	Moderate	Moderate	Slight	Moderate	Northern red oak----	85	5	Eastern white pine, yellow-poplar.
							Yellow-poplar-------	86	6	
							White oak----------	85	5	
							Eastern white pine--	90	12	
11E**:										
Chiswell----------	4R	Severe	Severe	Moderate	Moderate	Moderate	Northern red oak----	74	4	Eastern white pine.
							Virginia pine-------	61	6	
							Yellow-poplar-------	93	7	
Groseclose--------	5R	Severe	Severe	Moderate	Slight	Moderate	Northern red oak----	85	5	Eastern white pine, yellow-poplar.
							Yellow-poplar-------	86	6	
							White oak----------	85	5	
							Eastern white pine--	90	12	
12C---------- Dekalb	3F	Slight	Slight	Moderate	Slight	Slight	Northern red oak----	57	3	Eastern white pine, Virginia pine.
12D---------- Dekalb	2F	Slight	Moderate	Moderate	Moderate	Slight	Northern red oak----	52	2	Eastern white pine, Virginia pine.

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
12E---------- Dekalb	2R	Moderate	Severe	Moderate	Moderate	Slight	Northern red oak----	52	2	Eastern white pine, Virginia pine.
13E**:										
Dekalb----------	2F	Slight	Moderate	Moderate	Moderate	Slight	Northern red oak----	52	2	Eastern white pine, Virginia pine.
Rock outcrop.										
13F**:										
Dekalb----------	2R	Moderate	Severe	Moderate	Moderate	Slight	Northern red oak----	52	2	Eastern white pine, Virginia pine, white spruce, Norway spruce.
Rock outcrop.										
14A, 15A---------- Derroc	12F	Slight	Slight	Slight	Slight	Severe	Eastern white pine--	90	12	Eastern white pine, yellow-poplar, shortleaf pine.
							Northern red oak----	70	4	
							Yellow-poplar-------	90	6	
							Virginia pine-------	60	6	
16C---------- Edneytown	10A	Slight	Slight	Slight	Slight	Moderate	Eastern white pine--	80	10	Eastern white pine, shortleaf pine, yellow-poplar.
							Northern red oak----	70	3	
							Shortleaf pine------	70	8	
							Virginia pine-------	70	8	
							Yellow-poplar-------	90	6	
							White oak----------	60	3	
16D---------- Edneytown	10R	Moderate	Moderate	Slight	Slight	Moderate	Eastern white pine--	80	10	Eastern white pine, shortleaf pine, yellow-poplar.
							Northern red oak----	70	3	
							Shortleaf pine------	70	8	
							Virginia pine-------	70	8	
							Yellow-poplar-------	90	6	
							White oak----------	60	3	
16E---------- Edneytown	10R	Severe	Severe	Slight	Slight	Moderate	Eastern white pine--	80	10	Eastern white pine, shortleaf pine, yellow-poplar.
							Northern red oak----	70	3	
							Shortleaf pine------	70	8	
							Virginia pine-------	70	8	
							Yellow-poplar-------	90	6	
							White oak----------	60	3	

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
17B---------- Ernest	4W	Slight	Moderate	Slight	Slight	Severe	Northern red oak----	80	4	Eastern white pine.
							Yellow-poplar-------	89	6	
							White ash----------	80	4	
							Black walnut--------	---	--	
							Sugar maple---------	80	4	
							Black cherry--------	80	4	
17C, 18C---------- Ernest	4W	Moderate	Moderate	Slight	Slight	Severe	Northern red oak----	80	4	Eastern white pine.
							Yellow-poplar-------	89	6	
							White ash----------	80	4	
							Black walnut--------	---	--	
							Sugar maple---------	80	4	
							Black cherry--------	80	4	
19B, 19C---------- Flatwoods	7D	Slight	Moderate	Slight	Moderate	Moderate	Virginia pine-------	64	7	Virginia pine, eastern white pine.
							White oak----------	62	3	
							Scarlet oak---------	67	3	
20B, 20C---------- Frederick	4C	Slight	Moderate	Slight	Slight	Moderate	Northern red oak----	76	4	Eastern white pine, yellow-poplar, black walnut, Scotch pine.
							Yellow-poplar-------	86	6	
							Black locust--------	80	4	
							White oak----------	76	4	
							Black walnut--------	76	4	
20D---------- Frederick	4R	Moderate	Moderate	Slight	Slight	Moderate	Northern red oak----	76	4	Eastern white pine, yellow-poplar, black walnut, Scotch pine.
							Yellow-poplar-------	86	6	
							Black locust--------	80	4	
							White oak----------	76	4	
							Black walnut--------	76	4	
21C---------- Frederick	4C	Slight	Moderate	Moderate	Slight	Moderate	Northern red oak----	76	4	Eastern white pine, yellow-poplar, black walnut, Scotch pine.
							Yellow-poplar-------	86	6	
							Black locust--------	80	4	
							White oak----------	76	4	
							Black walnut--------	76	4	
21D---------- Frederick	4R	Moderate	Moderate	Moderate	Slight	Moderate	Northern red oak----	76	4	Eastern white pine, yellow-poplar, black walnut, Scotch pine.
							Yellow-poplar-------	86	6	
							Black locust--------	80	4	
							White oak----------	76	4	
							Black walnut--------	76	4	

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
22C---------- Frederick	4C	Slight	Moderate	Moderate	Slight	Moderate	Northern red oak----	76	4	Eastern white pine, yellow-poplar, black walnut, Scotch pine.
							Yellow-poplar-------	86	6	
							Black locust--------	80	4	
							White oak----------	76	4	
							Black walnut--------	76	4	
22D---------- Frederick	4S	Moderate	Moderate	Moderate	Slight	Moderate	Northern red oak----	76	4	Eastern white pine, yellow-poplar, black walnut, Scotch pine.
							Yellow-poplar-------	86	6	
							Black locust--------	80	4	
							White oak----------	76	4	
							Black walnut--------	76	4	
22E---------- Frederick	4R	Severe	Severe	Moderate	Slight	Moderate	Northern red oak----	76	4	Eastern white pine, yellow-poplar, black walnut, Scotch pine.
							Yellow-poplar-------	86	6	
							Black locust--------	80	4	
							White oak----------	76	4	
							Black walnut--------	76	4	
23C---------- Frederick	4S	Slight	Moderate	Severe	Slight	Moderate	Northern red oak----	76	4	Eastern white pine, yellow-poplar, black walnut, Scotch pine.
							Yellow-poplar-------	86	6	
							Black locust--------	80	4	
							White oak----------	76	4	
							Black walnut--------	76	4	
23D---------- Frederick	4R	Moderate	Moderate	Severe	Slight	Moderate	Northern red oak----	76	4	Eastern white pine, yellow-poplar, black walnut, Scotch pine.
							Yellow-poplar-------	86	6	
							Black locust--------	80	4	
							White oak----------	76	4	
							Black walnut--------	76	4	
24C---------- Frederick	4C	Slight	Moderate	Slight	Slight	Moderate	Northern red oak----	76	4	Eastern white pine, yellow-poplar, black walnut, Scotch pine.
							Yellow-poplar-------	86	6	
							Black locust--------	80	4	
							White oak----------	76	4	
							Black walnut--------	76	4	
24D---------- Frederick	4R	Moderate	Moderate	Slight	Slight	Moderate	Northern red oak----	76	4	Eastern white pine, yellow-poplar, black walnut, Scotch pine.
							Yellow-poplar-------	86	6	
							Black locust--------	80	4	
							White oak----------	76	4	
							Black walnut--------	76	4	

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
25C**:										
Frederick	4C	Slight	Moderate	Slight	Slight	Moderate	Northern red oak	76	4	Eastern white pine, yellow-poplar, black walnut, Scotch pine.
							Yellow-poplar	86	6	
							Black locust	80	4	
							White oak	76	4	
							Black walnut	76	4	
Urban land.										
25D**:										
Frederick	4R	Moderate	Moderate	Slight	Slight	Moderate	Northern red oak	76	4	Eastern white pine, yellow-poplar, black walnut, Scotch pine.
							Yellow-poplar	86	6	
							Black locust	80	4	
							White oak	76	4	
							Black walnut	76	4	
Urban land.										
26C Gilpin	4A	Slight	Slight	Slight	Slight	Moderate	Northern red oak	80	4	Japanese larch, Virginia pine, eastern white pine.
							Yellow-poplar	95	7	
27A Gladehill	7A	Slight	Slight	Slight	Slight	Slight	Yellow-poplar	95	7	Yellow-poplar, eastern white pine, black walnut.
							Northern red oak	80	4	
							Virginia pine	70	8	
28B, 28C Groseclose	5A	Slight	Slight	Slight	Slight	Moderate	Northern red oak	85	5	Eastern white pine, yellow-poplar.
							White oak	85	5	
							Eastern white pine	90	12	
							Yellow-poplar	86	6	
28D Groseclose	5R	Moderate	Moderate	Moderate	Slight	Moderate	Northern red oak	85	5	Eastern white pine, yellow-poplar.
							Yellow-poplar	86	6	
							White oak	85	5	
							Eastern white pine	90	12	
29C Groseclose	5A	Slight	Slight	Slight	Slight	Moderate	Northern red oak	85	5	Eastern white pine, yellow-poplar.
							White oak	85	5	
							Eastern white pine	90	12	
							Yellow-poplar	86	6	

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
29D---------- Groseclose	5R	Moderate	Moderate	Moderate	Slight	Moderate	Northern red oak----	85	5	Eastern white pine, yellow-poplar.
							Yellow-poplar-------	86	6	
							White oak----------	85	5	
							Eastern white pine--	90	12	
30C**:										
Groseclose--------	5A	Slight	Slight	Slight	Slight	Moderate	Northern red oak----	85	5	Eastern white pine, yellow-poplar.
							White oak----------	85	5	
							Eastern white pine--	90	12	
							Yellow-poplar-------	86	6	
Litz----------	4F	Slight	Slight	Moderate	Slight	Moderate	Northern red oak----	74	4	Virginia pine, eastern white pine, shortleaf pine.
							Virginia pine-------	61	6	
							Shortleaf pine------	72	8	
							Yellow-poplar-------	93	7	
30D**:										
Groseclose--------	5R	Moderate	Moderate	Moderate	Slight	Moderate	Northern red oak----	85	5	Eastern white pine, yellow-poplar.
							Yellow-poplar-------	86	6	
							White oak----------	85	5	
							Eastern white pine--	90	12	
Litz----------	4F	Slight	Moderate	Moderate	Slight	Moderate	Northern red oak----	80	4	Virginia pine, eastern white pine, shortleaf pine.
							Virginia pine-------	65	7	
							Yellow-poplar-------	95	7	
30E**:										
Groseclose--------	5R	Severe	Severe	Moderate	Slight	Moderate	Northern red oak----	85	5	Eastern white pine, yellow-poplar.
							Yellow-poplar-------	86	6	
							White oak----------	85	5	
							Eastern white pine--	90	12	
Litz----------	4R	Moderate	Severe	Moderate	Slight	Moderate	Northern red oak----	80	4	Virginia pine, eastern white pine, shortleaf pine.
							Virginia pine-------	65	7	
							Yellow-poplar-------	95	7	
31C---------- Hayesville	11A	Slight	Slight	Slight	Slight	Moderate	Eastern white pine--	85	11	Eastern white pine, shortleaf pine, Scotch pine.
							Yellow-poplar-------	93	7	
							Northern red oak----	70	4	
							Shortleaf pine------	70	8	
							Virginia pine-------	74	8	

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
31D---------- Hayesville	11R	Moderate	Moderate	Slight	Slight	Moderate	Eastern white pine--	85	11	Eastern white pine, shortleaf pine, Scotch pine.
							Yellow-poplar-------	93	7	
							Northern red oak----	70	4	
							Shortleaf pine------	70	8	
							Virginia pine-------	74	8	
32A---------- Irongate	8W	Slight	Moderate	Slight	Slight	Severe	Yellow-poplar-------	102	8	Eastern white pine, yellow-poplar.
							Northern red oak----	86	4	
							Virginia pine-------	74	8	
							Black oak----------	85	4	
							White oak----------	85	4	
							White ash----------	85	4	
33B, 33C---------- Laidig	3A	Slight	Slight	Slight	Slight	Slight	Scarlet oak---------	66	3	Eastern white pine, yellow-poplar, black walnut.
							Northern red oak----	71	4	
							Yellow-poplar-------	89	6	
							Eastern white pine--	80	10	
							Virginia pine-------	70	8	
34B, 34C---------- Laidig	3A	Slight	Slight	Slight	Slight	Slight	Scarlet oak---------	66	3	Eastern white pine, yellow-poplar, black walnut, Virginia pine, black locust.
							Northern red oak----	71	4	
							Yellow-poplar-------	89	6	
							Eastern white pine--	80	10	
							Black oak----------	68	4	
							Scarlet oak---------	66	3	
34D---------- Laidig	4R	Slight	Moderate	Slight	Slight	Slight	Scarlet oak---------	76	4	Eastern white pine, yellow-poplar, black walnut, Virginia pine, black locust.
							Northern red oak----	80	4	
							Yellow-poplar-------	90	6	
							Eastern white pine--	90	12	
							Black oak----------	76	4	
35C---------- Laidig	3A	Slight	Slight	Slight	Slight	Moderate	Scarlet oak---------	66	3	Eastern white pine, yellow-poplar, black walnut, black locust, black cherry.
							Northern red oak----	80	4	
							White oak----------	80	4	
							Yellow-poplar-------	90	6	
							White ash----------	80	4	
							Sugar maple---------	80	4	
							Black cherry--------	80	4	
							Eastern white pine--	90	12	
							Black locust--------	80	--	

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
35D---------- Laidig	4R	Slight	Moderate	Slight	Slight	Moderate	Scarlet oak---------	76	4	Eastern white pine, yellow-poplar, black walnut, black locust, black cherry.
							White oak----------	80	4	
							Yellow-poplar-------	90	6	
							White ash----------	80	4	
							Eastern white pine--	90	12	
							Black locust--------	80	--	
35E---------- Laidig	4R	Moderate	Severe	Slight	Slight	Moderate	Scarlet oak---------	76	4	Eastern white pine, yellow-poplar, black walnut, black locust, black cherry.
							White oak----------	80	4	
							Yellow-poplar-------	90	6	
							White ash----------	80	4	
							Eastern white pine--	90	12	
							Black locust--------	80	--	
36D**:										
Lehew----------	3X	Slight	Moderate	Slight	Slight	Moderate	Northern red oak----	67	3	Eastern white pine, Virginia pine.
							Virginia pine-------	60	6	
							Eastern white pine--	---	--	
Dekalb----------	2X	Slight	Moderate	Moderate	Moderate	Slight	Northern red oak----	52	2	Eastern white pine, Virginia pine.
36E**:										
Lehew----------	3R	Moderate	Severe	Slight	Slight	Moderate	Northern red oak----	67	3	Eastern white pine, Virginia pine.
							Virginia pine-------	60	6	
							Eastern white pine--	---	--	
Dekalb----------	2R	Moderate	Severe	Moderate	Moderate	Slight	Northern red oak----	52	2	Eastern white pine, Virginia pine.
37C---------- Lily	4X	Slight	Moderate	Slight	Slight	Slight	Scarlet oak---------	72	4	Virginia pine, Virginia pine, eastern white pine, shortleaf pine, white oak, yellow-poplar, northern red oak.
							Shortleaf pine------	63	7	
							Virginia pine-------	65	7	
							Black oak----------	---	--	
							White oak----------	69	4	
							Hickory----------	---	--	
							Red maple----------	---	--	
37D---------- Lily	4R	Moderate	Moderate	Slight	Slight	Slight	Scarlet oak---------	72	4	Virginia pine, Virginia pine, eastern white pine, shortleaf pine, white oak, yellow-poplar, northern red oak.
							Shortleaf pine------	63	7	
							Virginia pine-------	65	7	
							Black oak----------	---	--	
							White oak----------	69	4	
							Hickory----------	---	--	
							Red maple----------	---	--	

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
37E---------- Lily	4R	Severe	Severe	Slight	Slight	Slight	Scarlet oak---------	72	4	Virginia pine, Virginia pine, eastern white pine, shortleaf pine, white oak, yellow-poplar, northern red oak.
							Shortleaf pine------	63	7	
							Virginia pine-------	65	7	
							Black oak----------	---	--	
							White oak----------	69	4	
							Hickory----------	---	--	
							Red maple----------	---	--	
38A**---------- Lindside	7A	Slight	Slight	Slight	Slight	Severe	Yellow-poplar-------	95	7	Eastern white pine, yellow-poplar, black walnut, shortleaf pine.
							Northern red oak----	86	5	
							Black walnut--------	---	--	
							White ash----------	85	4	
							White oak----------	85	5	
							Red maple----------	---	--	
39A---------- Massanetta	7W	Slight	Moderate	Slight	Slight	Severe	Yellow-poplar-------	95	7	Black walnut, eastern white pine, yellow-poplar.
							Northern red oak----	85	5	
							Virginia pine-------	85	9	
							Sweetgum----------	95	8	
40B, 40C---------- Moomaw	9A	Slight	Slight	Slight	Slight	Moderate	Eastern white pine--	96	9	Eastern white pine, shortleaf pine, yellow-poplar.
							Northern red oak----	68	4	
							Yellow-poplar-------	90	6	
							Virginia pine-------	60	6	
41C---------- Oriskany	4X	Slight	Moderate	Moderate	Slight	Slight	Northern red oak----	75	4	Yellow-poplar, eastern white pine.
							White oak----------	75	4	
							Yellow-poplar-------	95	7	
41D---------- Oriskany	4X	Moderate	Moderate	Moderate	Slight	Slight	Northern red oak----	75	4	Yellow-poplar, eastern white pine.
							White oak----------	75	4	
							Yellow-poplar-------	95	7	
42E---------- Oriskany	4R	Severe	Severe	Severe	Slight	Slight	Northern red oak----	75	4	Yellow-poplar, eastern white pine.
							White oak----------	75	4	
							Yellow-poplar-------	95	7	
43E, 43F---------- Peaks	3R	Moderate	Severe	Slight	Slight	Moderate	Northern red oak----	67	3	Eastern white pine.
							Virginia pine-------	60	6	
							Eastern white pine--	---	--	
45A---------- Purdy	6W	Slight	Severe	Severe	Severe	Severe	Yellow-poplar-------	90	6	Virginia pine, eastern white pine.
							Shortleaf pine------	75	8	
							Virginia pine-------	75	8	
							Sweetgum----------	85	6	

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
46F**:										
Rock outcrop.										
Opequon	6R	Severe	Severe	Severe	Severe	Moderate	Virginia pine	53	6	Virginia pine, eastern white pine.
							Northern red oak	60	3	
							White oak	60	3	
							Sugar maple	---	--	
47C Rushtown	8F	Slight	Slight	Moderate	Slight	Slight	Eastern white pine	70	8	Eastern white pine, Virginia pine, Japanese larch.
							Northern red oak	60	3	
							Virginia pine	60	6	
							Black oak	60	3	
							Chestnut oak	60	3	
48C Sequoia	8A	Slight	Slight	Slight	Slight	Moderate	Virginia pine	71	8	Shortleaf pine, Virginia pine.
							Northern red oak	70	4	
							Loblolly pine	83	8	
							Shortleaf pine	63	7	
48D Sequoia	8R	Moderate	Moderate	Slight	Slight	Moderate	Virginia pine	71	8	Shortleaf pine, Virginia pine.
							Northern red oak	70	4	
							Loblolly pine	83	8	
							Shortleaf pine	63	7	
49C Shelocta	4A	Slight	Slight	Slight	Slight	Severe	White oak	77	4	Yellow-poplar, black walnut, eastern white pine, shortleaf pine.
							Yellow-poplar	99	7	
							Shortleaf pine	77	9	
							Red maple	81	--	
							Scarlet oak	80	4	
49D Shelocta	4R	Moderate	Moderate	Slight	Slight	Severe	White oak	77	4	Yellow-poplar, black walnut, eastern white pine, shortleaf pine.
							Yellow-poplar	99	7	
							Shortleaf pine	77	9	
							Red maple	81	--	
							Scarlet oak	80	4	
50B, 50C, 51C Shottower	12A	Slight	Slight	Slight	Slight	Moderate	Eastern white pine	95	12	Eastern white pine, yellow-poplar.
							Northern red oak	80	4	
							Yellow-poplar	90	6	
							Shortleaf pine	76	8	

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
51D---------- Shottower	12R	Moderate	Moderate	Slight	Slight	Moderate	Eastern white pine--	95	12	Eastern white pine, yellow-poplar.
							Northern red oak----	80	4	
							Yellow-poplar-------	90	6	
							Shortleaf pine------	76	8	
52C---------- Thurmont	11X	Slight	Moderate	Moderate	Slight	Moderate	Eastern white pine--	88	11	Eastern white pine, yellow-poplar, black walnut.
							Northern red oak----	76	4	
							Yellow-poplar-------	88	6	
							Shortleaf pine------	77	9	
52D---------- Thurmont	11R	Moderate	Moderate	Slight	Slight	Moderate	Eastern white pine--	88	11	Eastern white pine, yellow-poplar, shortleaf pine.
							Northern red oak----	76	4	
							Yellow-poplar-------	88	6	
							Shortleaf pine------	77	9	
53B---------- Timberville	6A	Slight	Slight	Slight	Slight	Severe	Yellow-poplar-------	90	6	Yellow-poplar, black walnut, eastern white pine.
							Northern red oak----	90	5	
							Shortleaf pine------	80	9	
							Virginia pine-------	70	8	
54A---------- Toms	7W	Slight	Moderate	Moderate	Moderate	Severe	Yellow-poplar-------	95	7	Yellow-poplar, eastern white pine.
							Sweetgum----------	95	8	
							Northern red oak----	80	4	
							Red maple----------	---	--	
55B, 55C---------- Tumbling	4A	Slight	Slight	Slight	Slight	Moderate	Northern red oak----	70	4	Eastern white pine, yellow-poplar.
							Yellow-poplar-------	90	6	
							Eastern white pine--	80	10	
55D---------- Tumbling	4R	Moderate	Moderate	Slight	Slight	Moderate	Northern red oak----	70	4	Eastern white pine, yellow-poplar.
							Yellow-poplar-------	90	6	
							Eastern white pine--	80	10	
56C---------- Tumbling	4A	Slight	Slight	Slight	Slight	Moderate	Northern red oak----	70	4	Eastern white pine, yellow-poplar.
							Yellow-poplar-------	90	6	
							Eastern white pine--	80	10	
56D---------- Tumbling	4R	Moderate	Moderate	Slight	Slight	Moderate	Northern red oak----	70	4	Eastern white pine, yellow-poplar.
							Yellow-poplar-------	90	6	
							Eastern white pine--	80	10	
57C---------- Tumbling	4X	Slight	Moderate	Slight	Slight	Moderate	Northern red oak----	70	4	Eastern white pine, yellow-poplar.
							Yellow-poplar-------	90	6	
							Eastern white pine--	80	10	

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
57D---------- Tumbling	4X	Moderate	Moderate	Slight	Slight	Moderate	Northern red oak----	70	4	Eastern white pine, yellow-poplar.
							Yellow-poplar-------	90	6	
							Eastern white pine--	80	10	
58C**:										
Tumbling----------	4A	Slight	Slight	Slight	Slight	Moderate	Northern red oak----	70	4	Eastern white pine, yellow-poplar.
							Yellow-poplar-------	90	6	
							Eastern white pine--	80	10	
Urban land.										
59B---------- Tygart	4W	Slight	Severe	Severe	Moderate	Severe	Northern red oak----	80	4	Eastern white pine, Virginia pine.
							Yellow-poplar-------	90	6	
							Red maple----------	---	--	
							White ash----------	80	4	
							Black oak----------	80	4	
62F**:										
Weikert----------	3R	Moderate	Severe	Severe	Moderate	Slight	Northern red oak----	64	3	Eastern white pine, Virginia pine.
							Virginia pine-------	60	6	
Rock outcrop.										
63A, 64A, 64B------ Wolfgap	10A	Slight	Slight	Slight	Slight	Slight	Yellow-poplar-------	120	10	Eastern white pine, yellow-poplar, black walnut.
							Northern red oak----	80	4	
							Virginia pine-------	70	8	
65B---------- Zoar	10W	Slight	Moderate	Slight	Slight	Moderate	Eastern white pine--	80	10	Eastern white pine, shortleaf pine, Virginia pine, yellow-poplar.
							Northern red oak----	70	4	
							Yellow-poplar-------	80	5	
							Virginia pine-------	70	8	
							Black oak----------	70	4	
							White oak----------	70	4	
							Red maple----------	---	--	

* Productivity class is the yield in cubic meters per hectare 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 8.--RECREATIONAL DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1B Alonzville	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
1C Alonzville	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
2C Bailegap	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
3C Bailegap	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: large stones, slope.	Moderate: large stones.	Severe: large stones.
3D Bailegap	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Moderate: large stones, slope.	Severe: slope, large stones.
3E Bailegap	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: slope.	Severe: slope, large stones.
4C*:					
Berks	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: small stones, slope.	Slight	Severe: small stones.
Weikert	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: slope, small stones.	Slight	Severe: droughty, depth to rock.
4D*:					
Berks	Severe: slope.	Severe: slope.	Severe: small stones, slope.	Moderate: slope.	Severe: slope, small stones.
Weikert	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Moderate	Severe: droughty, depth to rock.
4E*:					
Berks	Severe: slope.	Severe: slope.	Severe: small stones, slope.	Severe: slope.	Severe: slope, small stones.
Weikert	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe	Severe: droughty, depth to rock.
5B Botetourt	Severe: flooding.	Moderate: wetness.	Moderate: slope, small stones, wetness.	Moderate: wetness.	Moderate: wetness, droughty.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
6C Botetourt	Moderate: slope, wetness.	Moderate: slope, wetness.	Severe: slope.	Moderate: wetness.	Moderate: wetness, droughty, slope.
7C Carbo	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope, depth to rock.
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.
Opequon	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.	Severe: depth to rock.
Rock outcrop	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: depth to rock.
8E*:					
Carbo	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Opequon	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.	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: depth to rock.
9C Chilhowie	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: large stones, slope.
9D Chilhowie	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
10E Chilhowie	Severe: slope.	Severe: slope.	Severe: slope, small stones, too clayey.	Severe: slope.	Severe: droughty, slope, too clayey.
11C*:					
Chiswell	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, small stones, depth to rock.	Slight	Severe: depth to rock.
Groseclose	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: small stones, slope.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
11D*:					
Chiswell	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Moderate: slope.	Severe: depth to rock, slope.
Groseclose	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: small stones, slope.
11E*:					
Chiswell	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: depth to rock, slope.
Groseclose	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: small stones, slope.
12C Dekalb	Severe: small stones.	Severe: small stones.	Severe: slope, small stones, large stones.	Moderate: large stones.	Severe: small stones.
12D Dekalb	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones, large stones.	Moderate: slope, large stones.	Severe: slope, small stones.
12E Dekalb	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones, large stones.	Severe: slope.	Severe: slope, small stones.
13E*:					
Dekalb	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones, large stones.	Moderate: slope, large stones.	Severe: slope, small stones.
Rock outcrop	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope.	Severe: depth to rock.
13F*:					
Dekalb	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones, large stones.	Severe: slope.	Severe: slope, small stones.
Rock outcrop	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: depth to rock.
14A Derroc	Severe: flooding.	Moderate: large stones, small stones.	Severe: large stones, small stones.	Moderate: large stones.	Severe: large stones.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
15A Derroc	Severe: flooding, large stones.	Severe: large stones.	Severe: large stones, small stones, flooding.	Severe: large stones.	Severe: large stones, flooding.
16C Edneytown	Severe: large stones.	Severe: large stones.	Severe: large stones, slope.	Severe: large stones.	Severe: large stones.
16D Edneytown	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, slope.	Severe: large stones.	Severe: large stones, slope.
16E Edneytown	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, slope.	Severe: slope, large stones.	Severe: large stones, slope.
17B Ernest	Moderate: percs slowly, wetness.	Moderate: wetness, percs slowly.	Moderate: slope, small stones.	Severe: erodes easily.	Moderate: large stones, small stones.
17C Ernest	Moderate: slope, wetness.	Moderate: slope, wetness.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, small stones, slope.
18C Ernest	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: large stones, slope, small stones.	Moderate: wetness.	Moderate: small stones, large stones, slope.
19B Flatwoods	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, small stones.	Moderate: wetness.	Moderate: wetness, depth to rock.
19C Flatwoods	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Moderate: wetness.	Moderate: wetness, slope, depth to rock.
20B Frederick	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
20C Frederick	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
20D Frederick	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
21C Frederick	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
21D Frederick	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
22C Frederick	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: slope, small stones.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
22D Frederick	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
22E Frederick	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
23C Frederick	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Slight	Severe: small stones.
23D Frederick	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Moderate: slope.	Severe: slope, small stones.
24C Frederick	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
24D Frederick	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
25C*:					
Frederick	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Urban land	Variable	Variable	Variable	Variable	Variable.
25D*:					
Frederick	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Urban land	Variable	Variable	Variable	Variable	Variable.
26C Gilpin	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope, thin layer.
27A Gladehill	Severe: flooding.	Slight	Moderate: small stones, flooding.	Slight	Moderate: droughty, flooding.
28B Groseclose	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Slight	Slight.
28C Groseclose	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
28D Groseclose	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
29C Groseclose	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.
29D Groseclose	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
30C*:					
Groseclose	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Litz	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Severe: small stones.	Severe: small stones.
30D*:					
Groseclose	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Litz	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones.	Severe: small stones, slope.
30E*:					
Groseclose	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Litz	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones, slope.
31C Hayesville	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
31D Hayesville	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
32A Irongate	Severe: flooding.	Moderate: wetness.	Moderate: small stones, flooding.	Moderate: wetness.	Moderate: wetness, flooding.
33B Laidig	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Slight	Moderate: droughty.
33C Laidig	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: droughty, slope.
34B Laidig	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones.
34C Laidig	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: small stones, slope.
34D Laidig	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
35C Laidig	Moderate: slope, large stones, small stones.	Moderate: slope, small stones, large stones.	Severe: slope, large stones, small stones.	Slight	Moderate: slope, large stones, small stones.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
35D---------- Laidig	Severe: slope.	Severe: slope.	Severe: slope, large stones, small stones.	Moderate: slope.	Severe: slope.
35E---------- Laidig	Severe: slope.	Severe: slope.	Severe: slope, large stones, small stones.	Severe: slope.	Severe: slope.
36D*:					
Lehew----------	Severe: slope, large stones, small stones.	Severe: slope, large stones, small stones.	Severe: slope, small stones, large stones.	Moderate: large stones, slope.	Severe: small stones, large stones, slope.
Dekalb----------	Severe: slope, large stones, small stones.	Moderate: slope, large stones, small stones.	Severe: slope, small stones, large stones.	Moderate: slope, large stones.	Severe: slope, small stones.
36E*:					
Lehew----------	Severe: slope, large stones, small stones.	Severe: slope, large stones, small stones.	Severe: slope, small stones, large stones.	Severe: slope.	Severe: small stones, large stones, slope.
Dekalb----------	Severe: slope, large stones, small stones.	Moderate: slope, large stones, small stones.	Severe: slope, small stones, large stones.	Severe: slope.	Severe: slope, small stones.
37C---------- Lily	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: large stones, slope.	Slight----------	Moderate: large stones, slope, depth to rock.
37D---------- Lily	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Moderate: slope.	Severe: slope.
37E---------- Lily	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: slope.	Severe: slope.
38A*---------- Lindside	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Moderate: wetness.	Moderate: flooding.
39A---------- Massanetta	Severe: flooding.	Moderate: wetness.	Moderate: small stones, wetness.	Slight----------	Moderate: flooding.
40B---------- Moomaw	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, small stones, wetness.	Moderate: wetness.	Moderate: wetness.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
40C Moomaw	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Moderate: wetness.	Moderate: wetness, slope.
41C Oriskany	Severe: large stones.	Severe: large stones.	Severe: large stones, slope, small stones.	Severe: large stones.	Severe: large stones, droughty.
41D Oriskany	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, slope, small stones.	Severe: large stones.	Severe: large stones, droughty, slope.
42E Oriskany	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: large stones, slope.	Severe: large stones, droughty, slope.
43E, 43F Peaks	Severe: slope, small stones.	Severe: slope, small stones.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: small stones, slope.
44* Pits	Variable	Variable	Variable	Variable	Variable.
45A Purdy	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, erodes easily.	Severe: wetness.
46F*:					
Rock outcrop	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: depth to rock.
Opequon	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.	Severe: slope, depth to rock.
47C Rushtown	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Slight	Severe: small stones.
48C Sequoia	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
48D Sequoia	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
49C Shelocta	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: small stones, slope.
49D Shelocta	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
50B Shottower	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
50C Shottower	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
51C Shottower	Moderate: slope, large stones, small stones.	Moderate: slope, large stones, small stones.	Severe: large stones, slope, small stones.	Moderate: large stones.	Severe: large stones.
51D Shottower	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Moderate: large stones, slope.	Severe: slope, large stones.
52C Thurmont	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: large stones, slope.	Slight	Moderate: large stones, slope.
52D Thurmont	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Moderate: slope.	Severe: slope.
53B Timberville	Severe: flooding.	Slight	Moderate: slope, small stones.	Slight	Moderate: flooding.
54A Toms	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
55B Tumbling	Slight	Slight	Moderate: small stones.	Slight	Slight.
55C Tumbling	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
55D Tumbling	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
56C Tumbling	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: slope, large stones.	Slight	Moderate: slope, large stones.
56D Tumbling	Severe: slope.	Severe: slope.	Severe: slope, large stones.	Moderate: slope.	Severe: slope.
57C Tumbling	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: large stones, slope, small stones.	Slight	Moderate: small stones, large stones, slope.
57D Tumbling	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Moderate: slope.	Severe: slope.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
58C*:					
Tumbling	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Urban land	Variable	Variable	Variable	Variable	Variable.
59B Tygart	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, erodes easily.	Severe: wetness.
60 Udorthents	Variable	Variable	Variable	Variable	Variable.
61*:					
Udorthents	Variable	Variable	Variable	Variable	Variable.
Urban land	Variable	Variable	Variable	Variable	Variable.
62F*:					
Weikert	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe	Severe: droughty, depth to rock.
Rock outcrop	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: depth to rock.
63A, 64A, 64B Wolfgap	Severe: flooding.	Moderate: flooding.	Moderate: flooding.	Slight	Moderate: droughty.
65B Zoar	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Slight.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--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
1B Alonzville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
1C Alonzville	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
2C Bailegap	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
3C Bailegap	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
3D Bailegap	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
3E Bailegap	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
4C*:										
Berks	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
Weikert	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
4D*:										
Berks	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
Weikert	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
4E*:										
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.
5B Botetourt	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
6C Botetourt	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	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.
8C*:										
Carbo	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
8C*:										
Opequon	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.
8E*:										
Carbo	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Opequon	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.
9C, 9D Chilhowie	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Poor	Very poor.
10E Chilhowie	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.
11C*:										
Chiswell	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
Groseclose	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
11D*:										
Chiswell	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Groseclose	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
11E*:										
Chiswell	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Groseclose	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
12C, 12D Dekalb	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
12E Dekalb	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
13E*:										
Dekalb	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Rock outcrop	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
13F*:										
Dekalb	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
13F*:										
Rock outcrop	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
14A Derroc	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
15A Derroc	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
16C Edneytown	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
16D Edneytown	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
16E Edneytown	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
17B Ernest	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
17C Ernest	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
18C Ernest	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
19B Flatwoods	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
19C Flatwoods	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
20B Frederick	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
20C Frederick	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
20D Frederick	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
21C Frederick	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
21D Frederick	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
22C Frederick	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
22D Frederick	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
22E Frederick	Very poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
23C Frederick	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
23D---------- Frederick	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
24C---------- Frederick	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
24D---------- Frederick	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
25C*:										
Frederick---------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Urban land.										
25D*:										
Frederick---------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Urban land.										
26C---------- Gilpin	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
27A---------- Gladehill	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
28B---------- Groseclose	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
28C---------- Groseclose	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
28D---------- Groseclose	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
29C---------- Groseclose	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
29D---------- Groseclose	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
30C*:										
Groseclose--------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Litz----------	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
30D*:										
Groseclose--------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Litz----------	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
30E*:										
Groseclose--------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
30E*:										
Litz	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
31C Hayesville	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
31D Hayesville	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
32A Irongate	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
33B Laidig	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
33C Laidig	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
34B Laidig	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
34C Laidig	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
34D Laidig	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
35C, 35D Laidig	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
35E Laidig	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
36D*:										
Lehew	Very poor.	Very poor.	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Dekalb	Very poor.	Very poor.	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
36E*:										
Lehew	Very poor.	Very poor.	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Dekalb	Very poor.	Very poor.	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
37C Lily	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
37D Lily	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
37E Lily	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
38A* Lindside	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
39A---------- Massanetta	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
40B---------- Moomaw	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
40C---------- Moomaw	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
41C, 41D---------- Oriskany	Very poor.	Very poor.	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
42E---------- Oriskany	Very poor.	Very poor.	Very poor.	Fair	Fair	Very poor.	Very poor.	Very poor.	Fair	Very poor.
43E, 43F---------- Peaks	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
44*---------- Pits	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
45A---------- Purdy	Poor	Fair	Fair	Fair	---	Good	Good	Fair	Fair	Good.
46F*:										
Rock outcrop------	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Opequon----------	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
47C---------- Rushtown	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
48C---------- Sequoia	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
48D---------- Sequoia	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
49C---------- Shelocta	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
49D---------- Shelocta	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
50B---------- Shottower	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
50C, 51C---------- Shottower	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
51D---------- Shottower	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
52C, 52D---------- Thurmont	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
53B---------- Timberville	Poor	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
54A Toms	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
55B Tumbling	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
55C Tumbling	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
55D Tumbling	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
56C Tumbling	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
56D Tumbling	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
57C Tumbling	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Very poor.	Good	Very poor.
57D Tumbling	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Very poor.	Good	Very poor.
58C*:										
Tumbling	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Urban land.										
59B Tygart	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
60. Udorthents										
61*:										
Udorthents.										
Urban land.										
62F*:										
Weikert	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	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.
63A, 64A, 64B Wolfgap	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
65B Zoar	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--BUILDING SITE DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1B Alonzville	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
1C Alonzville	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
2C Bailegap	Moderate: depth to rock, large stones, slope.	Moderate: slope, large stones.	Moderate: depth to rock, slope, large stones.	Severe: slope.	Moderate: slope, frost action, large stones.	Moderate: slope.
3C Bailegap	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: slope, large stones.	Moderate: slope, frost action, large stones.	Severe: large stones.
3D, 3E Bailegap	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.	Severe: slope, large stones.
4C*:						
Berks	Moderate: slope, depth to rock.	Moderate: slope.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope.	Severe: small stones.
Weikert	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope, frost action.	Severe: droughty, depth to rock.
4D*, 4E*:						
Berks	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, small stones.
Weikert	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: droughty, depth to rock.
5B Botetourt	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: frost action.	Moderate: wetness, droughty.
6C Botetourt	Severe: wetness.	Moderate: wetness, slope.	Severe: wetness.	Severe: slope.	Severe: frost action.	Moderate: wetness, droughty, slope.
7C Carbo	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope, depth to rock.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
7D---------- Carbo	Severe: slope, depth to rock.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
8C*:						
Carbo----------	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope, depth to rock.
Opequon----------	Severe: depth to rock.	Severe: depth to rock, shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: slope, depth to rock, shrink-swell.	Severe: depth to rock, low strength, shrink-swell.	Severe: 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.
8E*:						
Carbo----------	Severe: slope, depth to rock.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
Opequon----------	Severe: slope, depth to rock.	Severe: slope, depth to rock, shrink-swell.	Severe: slope, depth to rock, shrink-swell.	Severe: slope, depth to rock, shrink-swell.	Severe: slope, depth to rock, low strength.	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: depth to rock.
9C---------- Chilhowie	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell.	Moderate: large stones, slope.
9D---------- Chilhowie	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: slope.
10E---------- Chilhowie	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: droughty, slope, too clayey.
11C*:						
Chiswell---------	Severe: depth to rock.	Moderate: depth to rock, slope.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope, frost action.	Severe: depth to rock.
Groseclose-------	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: slope, shrink-swell.	Severe: low strength, shrink-swell.	Moderate: small stones, slope.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
11D*, 11E*:						
Chiswell	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.
Groseclose	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: low strength, slope, shrink-swell.	Severe: slope.
12C Dekalb	Severe: depth to rock.	Moderate: slope, depth to rock, large stones.	Severe: depth to rock.	Severe: slope.	Moderate: slope, depth to rock, large stones.	Severe: small stones.
12D, 12E Dekalb	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.	Severe: slope, small stones.
13E*, 13F*:						
Dekalb	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.	Severe: slope, small stones.
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: depth to rock.
14A Derroc	Severe: cutbanks cave, large stones.	Severe: flooding, large stones.	Severe: flooding, large stones.	Severe: flooding, large stones.	Severe: flooding, large stones.	Severe: large stones.
15A Derroc	Severe: cutbanks cave, large stones.	Severe: flooding, large stones.	Severe: flooding, large stones.	Severe: flooding, large stones.	Severe: flooding, large stones.	Severe: large stones, flooding.
16C Edneytown	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: large stones.
16D, 16E Edneytown	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: large stones, slope.
17B Ernest	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength.	Moderate: large stones, small stones.
17C Ernest	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: wetness.	Severe: slope.	Severe: low strength.	Moderate: large stones, small stones, slope.
18C Ernest	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: wetness.	Severe: slope.	Severe: low strength.	Moderate: small stones, large stones, slope.
19B Flatwoods	Severe: wetness, depth to rock.	Moderate: wetness, shrink-swell.	Severe: wetness, depth to rock.	Moderate: wetness, shrink-swell, slope.	Severe: low strength.	Moderate: wetness, depth to rock.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
19C---------- Flatwoods	Severe: wetness, depth to rock.	Moderate: wetness, shrink-swell, slope.	Severe: wetness, depth to rock.	Severe: slope.	Severe: low strength.	Moderate: wetness, slope, depth to rock.
20B---------- Frederick	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
20C---------- Frederick	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: slope, shrink-swell.	Severe: shrink-swell, low strength.	Moderate: slope.
20D---------- Frederick	Severe: slope.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: shrink-swell, low strength, slope.	Severe: slope.
21C---------- Frederick	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: slope, shrink-swell.	Severe: shrink-swell, low strength.	Moderate: slope.
21D---------- Frederick	Severe: slope.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: shrink-swell, low strength, slope.	Severe: slope.
22C---------- Frederick	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: slope, shrink-swell.	Severe: shrink-swell, low strength.	Moderate: slope, small stones.
22D, 22E---------- Frederick	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: shrink-swell, low strength, slope.	Severe: slope.
23C---------- Frederick	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: slope, shrink-swell.	Severe: shrink-swell, low strength.	Severe: small stones.
23D---------- Frederick	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: shrink-swell, low strength, slope.	Severe: slope, small stones.
24C---------- Frederick	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: slope, shrink-swell.	Severe: shrink-swell, low strength.	Moderate: slope.
24D---------- Frederick	Severe: slope.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: shrink-swell, low strength, slope.	Severe: slope.
25C*:						
Frederick--------	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: slope, shrink-swell.	Severe: shrink-swell, low strength.	Moderate: slope.
Urban land-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
25D*:						
Frederick	Severe: slope.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: shrink-swell, low strength, slope.	Severe: slope.
Urban land	Variable	Variable	Variable	Variable	Variable	Variable.
26C Gilpin	Moderate: slope, depth to rock.	Moderate: slope.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope, thin layer.
27A Gladehill	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: droughty, flooding.
28B Groseclose	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
28C Groseclose	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: slope, shrink-swell.	Severe: low strength, shrink-swell.	Moderate: slope.
28D Groseclose	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: low strength, slope, shrink-swell.	Severe: slope.
29C Groseclose	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: slope, shrink-swell.	Severe: low strength, shrink-swell.	Moderate: slope.
29D Groseclose	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: low strength, slope, shrink-swell.	Severe: slope.
30C*:						
Groseclose	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: slope, shrink-swell.	Severe: low strength, shrink-swell.	Moderate: slope.
Litz	Moderate: depth to rock, large stones, slope.	Moderate: slope, large stones.	Moderate: depth to rock, slope, large stones.	Severe: slope.	Moderate: slope, frost action, large stones.	Severe: small stones.
30D*, 30E*:						
Groseclose	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: low strength, slope, shrink-swell.	Severe: slope.
Litz	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
31C---------- Hayesville	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.
31D---------- Hayesville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
32A---------- Irongate	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Moderate: wetness, flooding.
33B---------- Laidig	Moderate: wetness.	Slight---------	Moderate: wetness.	Moderate: slope.	Moderate: frost action.	Moderate: droughty.
33C---------- Laidig	Moderate: wetness, slope.	Moderate: slope.	Moderate: wetness, slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: droughty, slope.
34B---------- Laidig	Moderate: wetness.	Slight---------	Moderate: wetness.	Moderate: slope.	Moderate: frost action, low strength.	Moderate: small stones.
34C---------- Laidig	Moderate: wetness, slope.	Moderate: slope.	Moderate: slope, wetness.	Severe: slope.	Moderate: slope, frost action, low strength.	Moderate: small stones, slope.
34D---------- Laidig	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
35C---------- Laidig	Moderate: slope, wetness.	Moderate: slope.	Moderate: slope, wetness.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope, large stones, small stones.
35D, 35E---------- Laidig	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
36D*, 36E*:						
Lehew----------	Severe: slope, depth to rock.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: small stones, large stones, slope.
Dekalb----------	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.	Severe: slope, small stones.
37C---------- Lily	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope, frost action.	Moderate: large stones, slope, depth to rock.
37D, 37E---------- Lily	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
38A*---------- Lindside	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Moderate: flooding.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
39A Massanetta	Severe: wetness.	Severe: flooding.	Severe: wetness, flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
40B Moomaw	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Moderate: wetness, frost action.	Moderate: wetness.
40C Moomaw	Severe: wetness.	Moderate: wetness, slope.	Severe: wetness.	Severe: slope.	Moderate: wetness, slope, frost action.	Moderate: wetness, slope.
41C Oriskany	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: slope, large stones.	Severe: large stones.	Severe: large stones, droughty.
41D, 42E Oriskany	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.
43E, 43F Peaks	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
44* Pits	Variable	Variable	Variable	Variable	Variable	Variable.
45A Purdy	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, low strength, frost action.	Severe: wetness.
46F*:						
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: depth to rock.
Opequon	Severe: slope, depth to rock.	Severe: slope, depth to rock, shrink-swell.	Severe: slope, depth to rock, shrink-swell.	Severe: slope, depth to rock, shrink-swell.	Severe: slope, depth to rock, low strength.	Severe: slope, depth to rock.
47C Rushtown	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: small stones.
48C Sequoia	Moderate: depth to rock, too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: depth to rock, slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: droughty, slope.
48D Sequoia	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
49C Shelocta	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: small stones, slope.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
49D---------- Shelocta	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
50B---------- Shottower	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
50C---------- Shottower	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
51C---------- Shottower	Moderate: too clayey, large stones, slope.	Moderate: shrink-swell, large stones, slope.	Moderate: slope, shrink-swell, large stones.	Severe: slope.	Moderate: shrink-swell, low strength, slope.	Severe: large stones.
51D---------- Shottower	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, large stones.
52C---------- Thurmont	Moderate: wetness, slope.	Moderate: slope.	Moderate: wetness, slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, slope.
52D---------- Thurmont	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
53B---------- Timberville	Moderate: too clayey, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
54A---------- Toms	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, frost action.	Severe: wetness.
55B---------- Tumbling	Moderate: too clayey.	Slight---------	Slight---------	Moderate: slope.	Moderate: low strength, frost action.	Slight.
55C---------- Tumbling	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.
55D---------- Tumbling	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
56C---------- Tumbling	Moderate: too clayey, large stones, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope, large stones.
56D---------- Tumbling	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
57C---------- 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.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
57D---------- Tumbling	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
58C*:						
Tumbling---------	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.
Urban land-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable.
59B---------- Tygart	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness.	Severe: wetness.
60---------- Udorthents	Variable-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable.
61*:						
Udorthents-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable.
Urban land-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable.
62F*:						
Weikert----------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: droughty, 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: depth to rock.
63A---------- Wolfgap	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: droughty.
64A, 64B---------- Wolfgap	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.	Moderate: droughty.
65B---------- Zoar	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength.	Slight.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "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
1B Alonzville	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
1C Alonzville	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
2C Bailegap	Moderate: depth to rock, percs slowly, slope.	Severe: slope.	Severe: depth to rock, large stones.	Moderate: depth to rock, slope.	Poor: large stones.
3C Bailegap	Severe: large stones.	Severe: slope, large stones.	Severe: depth to rock, large stones.	Moderate: depth to rock, slope.	Poor: large stones.
3D, 3E Bailegap	Severe: slope, large stones.	Severe: slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope.	Poor: large stones, slope.
4C*:					
Berks	Severe: depth to rock.	Severe: slope, seepage, depth to rock.	Severe: depth to rock, seepage.	Severe: seepage, depth to rock.	Poor: small stones, area reclaim.
Weikert	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock.	Poor: depth to rock, seepage, small stones.
4D*, 4E*:					
Berks	Severe: depth to rock, slope.	Severe: slope, seepage, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: seepage, slope, depth to rock.	Poor: small stones, slope, area reclaim.
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.
5B Botetourt	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: small stones.
6C Botetourt	Severe: wetness.	Severe: slope, wetness.	Severe: wetness.	Severe: wetness.	Poor: small stones.
7C Carbo	Severe: depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
7D---------- Carbo	Severe: depth to rock, percs slowly, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.
8C*:					
Carbo----------	Severe: depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
Opequon----------	Severe: depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, 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.
8E*:					
Carbo----------	Severe: depth to rock, percs slowly, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.
Opequon----------	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: slope, depth to rock, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, slope.
Rock outcrop-------	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock, slope.
9C---------- Chilhowie	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.
9D, 10E---------- Chilhowie	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.
11C*:					
Chiswell----------	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock, small stones.
Groseclose---------	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
11D*, 11E*:					
Chiswell----------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
11D*, 11E*:					
Groseclose	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
12C Dekalb	Severe: depth to rock, poor filter.	Severe: slope, depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: seepage, depth to rock.	Poor: small stones, area reclaim.
12D, 12E Dekalb	Severe: slope, depth to rock, poor filter.	Severe: slope, depth to rock, seepage.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage, depth to rock.	Poor: slope, small stones, area reclaim.
13E*, 13F*:					
Dekalb	Severe: slope, depth to rock, poor filter.	Severe: slope, depth to rock, seepage.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage, depth to rock.	Poor: slope, small stones, area reclaim.
Rock outcrop	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock, slope.
14A, 15A Derroc	Severe: flooding, poor filter, large stones.	Severe: seepage, flooding, large stones.	Severe: flooding, seepage, large stones.	Severe: flooding, seepage.	Poor: small stones.
16C Edneytown	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: too sandy, slope.
16D, 16E Edneytown	Severe: slope.	Severe: seepage, slope.	Severe: slope, seepage.	Severe: seepage, slope.	Poor: slope.
17B Ernest	Severe: percs slowly, wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Poor: small stones.
17C Ernest	Severe: percs slowly, wetness.	Severe: slope, wetness.	Moderate: slope, wetness.	Moderate: slope, wetness.	Poor: small stones.
18C Ernest	Severe: wetness, percs slowly.	Severe: slope, wetness.	Moderate: slope, wetness.	Moderate: slope, wetness.	Poor: small stones.
19B Flatwoods	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock, wetness.	Severe: depth to rock, wetness, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
19C Flatwoods	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock, slope, wetness.	Severe: depth to rock, wetness, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
20B Frederick	Moderate: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
20C Frederick	Moderate: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
20D Frederick	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
21C Frederick	Moderate: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
21D Frederick	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
22C Frederick	Moderate: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
22D, 22E Frederick	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
23C Frederick	Moderate: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
23D Frederick	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
24C Frederick	Moderate: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
24D Frederick	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
25C*:					
Frederick	Moderate: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
Urban land	Variable	Variable	Variable	Variable	Variable.
25D*:					
Frederick	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
25D*:					
Urban land	Variable	Variable	Variable	Variable	Variable.
26C Gilpin	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, thin layer.
27A Gladehill	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Good.
28B Groseclose	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
28C Groseclose	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
28D Groseclose	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
29C Groseclose	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
29D Groseclose	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
30C*:					
Groseclose	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
Litz	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock, small stones.
30D*, 30E*:					
Groseclose	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Litz	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
31C Hayesville	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Fair: too clayey, hard to pack, slope.
31D Hayesville	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: slope.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
32A Irongate	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness.	Fair: small stones, wetness.
33B Laidig	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Moderate: wetness.	Severe: seepage.	Poor: small stones.
33C Laidig	Severe: wetness, percs slowly.	Severe: seepage, slope, wetness.	Moderate: wetness, slope.	Severe: seepage.	Poor: small stones.
34B Laidig	Severe: percs slowly, wetness.	Severe: seepage, wetness.	Moderate: wetness.	Severe: seepage.	Fair: small stones, wetness.
34C Laidig	Severe: percs slowly, wetness.	Severe: seepage, slope, wetness.	Moderate: slope, wetness.	Severe: seepage.	Fair: slope, small stones, wetness.
34D Laidig	Severe: slope, percs slowly, wetness.	Severe: seepage, slope, wetness.	Severe: slope.	Severe: slope, seepage.	Poor: slope.
35C Laidig	Severe: percs slowly, wetness.	Severe: seepage, slope, wetness.	Moderate: slope, wetness.	Severe: seepage.	Fair: slope, small stones, wetness.
35D, 35E Laidig	Severe: slope, percs slowly, wetness.	Severe: seepage, slope, wetness.	Severe: slope.	Severe: slope, seepage.	Poor: slope.
36D*, 36E*:					
Lehew	Severe: slope, depth to rock, poor filter.	Severe: slope, depth to rock, seepage.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage, depth to rock.	Poor: depth to rock, small stones, slope.
Dekalb	Severe: slope, depth to rock, poor filter.	Severe: slope, depth to rock, seepage.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage, depth to rock.	Poor: slope, small stones, area reclaim.
37C Lily	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: depth to rock, small stones.
37D, 37E Lily	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.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
38A*---------- Lindside	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
39A---------- Massanetta	Severe: wetness, flooding.	Severe: wetness, flooding.	Severe: flooding, wetness.	Severe: wetness, flooding.	Fair: too clayey, small stones, wetness.
40B---------- Moomaw	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Fair: small stones, wetness.
40C---------- Moomaw	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness.	Moderate: wetness, slope.	Fair: small stones, slope, wetness.
41C---------- Oriskany	Severe: large stones.	Severe: seepage, slope, large stones.	Severe: seepage, large stones.	Moderate: slope.	Poor: large stones.
41D, 42E---------- Oriskany	Severe: slope, large stones.	Severe: seepage, slope, large stones.	Severe: seepage, slope, large stones.	Severe: slope.	Poor: large stones, slope.
43E, 43F---------- Peaks	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.
44*---------- Pits	Variable---------	Variable---------	Variable---------	Variable---------	Variable.
45A---------- Purdy	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: wetness, too clayey, hard to pack.
46F*:					
Rock outcrop-------	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock, slope.
Opequon----------	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: slope, depth to rock, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, slope.
47C---------- Rushtown	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: seepage, small stones.
48C---------- Sequoia	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.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
48D Sequoia	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.
49C Shelocta	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Poor: small stones.
49D Shelocta	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: small stones, slope.
50B Shottower	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Poor: small stones.
50C Shottower	Moderate: percs slowly, slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Poor: small stones.
51C Shottower	Moderate: percs slowly, slope, large stones.	Severe: slope, large stones.	Severe: large stones.	Moderate: slope.	Poor: small stones.
51D Shottower	Severe: slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.	Poor: large stones, slope.
52C Thurmont	Moderate: wetness, percs slowly, slope.	Severe: slope.	Severe: wetness.	Moderate: wetness, slope.	Severe: large stones.
52D Thurmont	Severe: slope.	Severe: slope.	Severe: wetness, slope.	Severe: slope.	Severe: large stones, slope.
53B Timberville	Severe: flooding.	Severe: flooding.	Severe: flooding, too clayey.	Severe: flooding.	Poor: too clayey, hard to pack, small stones.
54A Toms	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey, large stones.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
55B Tumbling	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Poor: small stones.
55C Tumbling	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Poor: small stones.
55D Tumbling	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
56C---------- Tumbling	Moderate: percs slowly, slope, large stones.	Severe: slope.	Moderate: slope, too clayey, large stones.	Moderate: slope.	Poor: small stones.
56D---------- Tumbling	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
57C---------- Tumbling	Moderate: large stones, percs slowly, slope.	Severe: slope.	Severe: large stones.	Moderate: slope.	Poor: large stones.
57D---------- Tumbling	Severe: slope.	Severe: slope.	Severe: slope, large stones.	Severe: slope.	Poor: large stones, slope.
58C*:					
Tumbling----------	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Poor: small stones.
Urban land---------	Variable---------	Variable---------	Variable---------	Variable---------	Variable.
59B---------- Tygart	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
60---------- Udorthents	Variable---------	Variable---------	Variable---------	Variable---------	Variable.
61*:					
Udorthents---------	Variable---------	Variable---------	Variable---------	Variable---------	Variable.
Urban land---------	Variable---------	Variable---------	Variable---------	Variable---------	Variable.
62F*:					
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.
Rock outcrop-------	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock, slope.
63A---------- Wolfgap	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding.	Fair: too clayey, small stones, thin layer.
64A, 64B---------- Wolfgap	Moderate: flooding, percs slowly.	Severe: seepage.	Severe: seepage.	Moderate: flooding.	Fair: too clayey, small stones, thin layer.
65B---------- Zoar	Severe: percs slowly, wetness.	Severe: wetness.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "good," "fair," 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
1B Alonzville	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
1C Alonzville	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
2C Bailegap	Fair: depth to rock, thin layer, large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim.
3C Bailegap	Poor: large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim.
3D Bailegap	Poor: large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim, slope.
3E Bailegap	Poor: large stones, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim, slope.
4C*:				
Berks	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Weikert	Poor: depth to rock.	Improbable: small stones.	Improbable: thin layer.	Poor: depth to rock, small stones.
4D*:				
Berks	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Weikert	Poor: depth to rock.	Improbable: small stones.	Improbable: thin layer.	Poor: depth to rock, small stones, slope.
4E*:				
Berks	Poor: slope, area reclaim.	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.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
5B, 6C Botetourt	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
7C, 7D Carbo	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
8C*:				
Carbo	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Opequon	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, small stones.
Rock outcrop	Poor: depth to rock.	Improbable: depth to rock.	Improbable: depth to rock.	Poor: depth to rock.
8E*:				
Carbo	Poor: depth to rock, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Opequon	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, small stones.
Rock outcrop	Poor: depth to rock, slope.	Improbable: depth to rock.	Improbable: depth to rock.	Poor: depth to rock, slope.
9C Chilhowie	Poor: depth to rock, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.
9D Chilhowie	Poor: depth to rock, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
10E Chilhowie	Poor: depth to rock, shrink-swell, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
11C*:				
Chiswell	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones.
Groseclose	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
11D*:				
Chiswell	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Groseclose	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey, small stones.
11E*:				
Chiswell	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Groseclose	Poor: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey, small stones.
12C Dekalb	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
12D Dekalb	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
12E Dekalb	Poor: slope, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
13E*:				
Dekalb	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Rock outcrop	Poor: depth to rock.	Improbable: depth to rock.	Improbable: depth to rock.	Poor: depth to rock, slope.
13F*:				
Dekalb	Poor: slope, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Rock outcrop	Poor: depth to rock, slope.	Improbable: depth to rock.	Improbable: depth to rock.	Poor: depth to rock, slope.
14A, 15A Derroc	Poor: large stones.	Improbable: large stones.	Improbable: large stones.	Poor: area reclaim, small stones.
16C Edneytown	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: large stones, too clayey, slope.
16D Edneytown	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
16E Edneytown	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
17B, 17C, 18C Ernest	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
19B, 19C Flatwoods	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.
20B, 20C Frederick	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
20D Frederick	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
21C Frederick	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
21D Frederick	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
22C Frederick	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.
22D Frederick	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope, small stones.
22E Frederick	Poor: shrink-swell, slope, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope, small stones.
23C Frederick	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.
23D Frederick	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope, small stones.
24C Frederick	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
24D Frederick	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
25C*:				
Frederick	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Urban land	Variable	Variable	Variable	Variable.
25D*:				
Frederick	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
Urban land	Variable	Variable	Variable	Variable.
26C Gilpin	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
27A Gladehill	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
28B, 28C Groseclose	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
28D Groseclose	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
29C Groseclose	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
29D Groseclose	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
30C*:				
Groseclose	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Litz	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
30D*:				
Groseclose	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
Litz	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
30E*:				
Groseclose	Poor: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
30E*:				
Litz	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
31C Hayesville	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
31D Hayesville	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
32A Irongate	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
33B, 33C Laidig	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
34B, 34C Laidig	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
34D Laidig	Fair: slope, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
35C Laidig	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
35D Laidig	Fair: wetness, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
35E Laidig	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
36D*:				
Lehew	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Dekalb	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
36E*:				
Lehew	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Dekalb	Poor: slope, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
37C Lily	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
37D Lily	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
37E Lily	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
38A* Lindside	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
39A Massanetta	Fair: low strength, thin layer, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
40B, 40C Moomaw	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
41C Oriskany	Poor: large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim.
41D Oriskany	Poor: large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.
42E Oriskany	Poor: large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.
43E, 43F Peaks	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
44* Pits	Variable	Variable	Variable	Variable.
45A Purdy	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, too clayey.
46F*:				
Rock outcrop	Poor: depth to rock, slope.	Improbable: depth to rock.	Improbable: depth to rock.	Poor: depth to rock, slope.
Opequon	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, small stones.
47C Rushtown	Good	Improbable: small stones.	Probable	Poor: small stones.
48C Sequoia	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
48D---------- Sequoia	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
49C---------- Shelocta	Good----------	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
49D---------- Shelocta	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
50B, 50C---------- Shottower	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, area reclaim.
51C---------- Shottower	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, large stones, area reclaim.
51D---------- Shottower	Fair: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, large stones, area reclaim.
52C---------- Thurmont	Good----------	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
52D---------- Thurmont	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
53B---------- Timberville	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
54A---------- Toms	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines, large stones.	Poor: too clayey, large stones, area reclaim.
55B, 55C---------- Tumbling	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, area reclaim.
55D---------- Tumbling	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, area reclaim.
56C---------- Tumbling	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, area reclaim.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
56D Tumbling	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, area reclaim.
57C Tumbling	Fair: low strength, large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, large stones, area reclaim.
57D Tumbling	Fair: low strength, large stones, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, large stones, area reclaim.
58C*:				
Tumbling	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, area reclaim.
Urban land	Variable	Variable	Variable	Variable.
59B Tygart	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, too clayey.
60 Udorthents	Variable	Variable	Variable	Variable.
61*:				
Udorthents	Variable	Variable	Variable	Variable.
Urban land	Variable	Variable	Variable	Variable.
62F*:				
Weikert	Poor: depth to rock, slope.	Improbable: small stones.	Improbable: thin layer.	Poor: depth to rock, small stones, slope.
Rock outcrop	Poor: depth to rock, slope.	Improbable: depth to rock.	Improbable: depth to rock.	Poor: depth to rock, slope.
63A, 64A, 64B Wolfgap	Good	Probable	Probable	Poor: small stones.
65B Zoar	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, too clayey.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
1B Alonzville	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Favorable	Favorable.
1C Alonzville	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope	Slope.
2C, 3C, 3D, 3E Bailegap	Severe: slope.	Severe: piping, large stones.	Severe: no water.	Deep to water	Large stones, slope.	Slope, large stones.	Large stones, slope.
4C*, 4D*, 4E*:							
Berks	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, depth to rock.	Depth to rock, slope, large stones.	Droughty, depth to rock, slope.
Weikert	Severe: depth to rock, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
5B Botetourt	Moderate: seepage, slope.	Severe: wetness.	Moderate: slow refill.	Frost action, slope.	Slope, wetness, droughty.	Wetness	Droughty.
6C Botetourt	Severe: slope.	Severe: wetness.	Moderate: slow refill.	Frost action, slope.	Slope, wetness, droughty.	Slope, wetness.	Slope, droughty.
7C, 7D Carbo	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Percs slowly, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
8C*, 8E*:							
Carbo	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Percs slowly, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Opequon	Severe: depth to rock, slope.	Severe: hard to pack, thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
8C*, 8E*:							
Rock outcrop	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
9C, 9D Chilhowie	Severe: slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Slope, large stones, depth to rock.	Large stones, slope, erodes easily.
10E Chilhowie	Severe: slope.	Severe: seepage, hard to pack.	Severe: no water.	Deep to water	Slope, droughty, percs slowly.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
11C*, 11D*, 11E*:							
Chiswell	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, droughty, depth to rock.	Slope, depth to rock, large stones.	Slope, large stones.
Groseclose	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Percs slowly, slope, erodes easily.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
12C, 12D, 12E Dekalb	Severe: seepage, slope.	Severe: piping, large stones.	Severe: no water.	Deep to water	Slope, droughty, depth to rock.	Slope, depth to rock, large stones.	Slope, large stones, droughty.
13E*, 13F*:							
Dekalb	Severe: seepage, slope.	Severe: piping, large stones.	Severe: no water.	Deep to water	Slope, droughty, depth to rock.	Slope, depth to rock, large stones.	Slope, large stones, droughty.
Rock outcrop	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
14A, 15A Derroc	Severe: seepage.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Large stones, droughty.	Large stones	Large stones, droughty.
16C, 16D, 16E Edneytown	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope	Slope, too sandy.	Slope.
17B Ernest	Moderate: slope.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Slope, wetness, percs slowly.	Erodes easily, rooting depth, percs slowly.	Erodes easily, rooting depth.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
17C---------- Ernest	Severe: slope.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Slope, wetness, percs slowly.	Slope, erodes easily, rooting depth.	Rooting depth, slope, erodes easily.
18C---------- Ernest	Severe: slope.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Slope, wetness, percs slowly.	Slope, large stones, wetness.	Large stones, slope, rooting depth.
19B---------- Flatwoods	Moderate: depth to rock, slope.	Severe: hard to pack.	Severe: no water.	Depth to rock, slope.	Slope, depth to rock, wetness.	Depth to rock, wetness.	Depth to rock.
19C---------- Flatwoods	Severe: slope.	Severe: hard to pack.	Severe: no water.	Depth to rock, slope.	Slope, depth to rock, wetness.	Slope, depth to rock, wetness.	Slope, depth to rock.
20B---------- Frederick	Moderate: seepage, slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope----------	Favorable------	Favorable.
20C, 20D, 21C, 21D, 22C, 22D, 22E---------- Frederick	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope----------	Slope----------	Slope.
23C, 23D---------- Frederick	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope, droughty.	Slope, droughty.	Slope, droughty.
24C, 24D---------- Frederick	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope----------	Slope----------	Slope.
25C*, 25D*:							
Frederick--------	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope----------	Slope----------	Slope.
Urban land-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable.
26C---------- Gilpin	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock, large stones.	Slope, depth to rock, large stones.
27A---------- Gladehill	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Droughty, soil blowing.	Soil blowing---	Droughty.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
28B Groseclose	Moderate: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Percs slowly, slope, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
28C, 28D Groseclose	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Percs slowly, slope, erodes easily.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
29C, 29D Groseclose	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
30C*, 30D*, 30E*:							
Groseclose	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Percs slowly, slope, erodes easily.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
Litz	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
31C, 31D Hayesville	Severe: seepage, slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope	Slope	Slope.
32A Irongate	Severe: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Flooding	Wetness, flooding.	Erodes easily, wetness.	Erodes easily.
33B Laidig	Severe: seepage.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Slope, wetness, droughty.	Large stones, wetness.	Large stones, droughty.
33C Laidig	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Slope, wetness, droughty.	Slope, large stones, wetness.	Large stones, slope, droughty.
34B Laidig	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Rooting depth, slope.	Rooting depth	Rooting depth.
34C, 34D Laidig	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Rooting depth, slope.	Slope, rooting depth.	Slope, rooting depth.
35C, 35D, 35E Laidig	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Droughty, rooting depth, slope.	Slope, large stones, rooting depth.	Slope, large stones, droughty.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
36D*, 36E*:							
Lehew	Severe: seepage, slope.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Slope, large stones, depth to rock.	Slope, large stones, depth to rock.	Slope, large stones, droughty.
Dekalb	Severe: seepage, slope.	Severe: piping, large stones.	Severe: no water.	Deep to water	Slope, droughty, depth to rock.	Slope, depth to rock, large stones.	Slope, large stones, droughty.
37C, 37D, 37E Lily	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
38A* Lindside	Moderate: seepage.	Severe: piping.	Severe: slow refill.	Flooding, frost action.	Flooding, wetness, erodes easily.	Wetness, erodes easily.	Erodes easily.
39A Massanetta	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Flooding	Wetness, erodes easily.	Erodes easily, wetness.	Erodes easily.
40B Moomaw	Moderate: slope.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Slope, wetness.	Wetness, rooting depth.	Percs slowly, rooting depth.
40C Moomaw	Severe: slope.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Slope, wetness.	Slope, wetness, rooting depth.	Slope, percs slowly, rooting depth.
41C, 41D, 42E Oriskany	Severe: seepage, slope.	Severe: large stones.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones.	Large stones, slope, droughty.
43E, 43F Peaks	Severe: seepage, slope.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
44* Pits	Variable	Variable	Variable	Variable	Variable	Variable	Variable.
45A Purdy	Slight	Severe: piping, hard to pack, wetness.	Severe: slow refill.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
46F*:							
Rock outcrop	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
Opequon	Severe: depth to rock, slope.	Severe: hard to pack, thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
47C Rushtown	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Droughty, slope.	Slope	Slope, droughty.
48C, 48D Sequoia	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, droughty.
49C, 49D Shelocta	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope	Slope.
50B Shottower	Moderate: seepage, slope.	Moderate: hard to pack.	Severe: no water.	Deep to water	Slope	Favorable	Favorable.
50C Shottower	Severe: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water	Slope	Slope	Slope.
51C, 51D Shottower	Severe: slope.	Severe: large stones.	Severe: no water.	Deep to water	Large stones, slope, droughty.	Slope, large stones.	Large stones, slope, droughty.
52C, 52D Thurmont	Severe: slope.	Moderate: thin layer, piping, large stones.	Moderate: deep to water, slow refill.	Deep to water	Slope	Slope, large stones.	Slope, large stones.
53B Timberville	Moderate: seepage, slope.	Moderate: piping, hard to pack.	Severe: no water.	Deep to water	Slope, flooding.	Favorable	Favorable.
54A Toms	Slight	Severe: hard to pack, wetness.	Severe: no water.	Percs slowly, large stones, frost action.	Wetness, percs slowly, erodes easily.	Large stones, erodes easily, wetness.	Large stones, wetness, erodes easily.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
55B---------- Tumbling	Moderate: seepage, slope.	Moderate: large stones.	Severe: no water.	Deep to water	Slope----------	Large stones---	Large stones.
55C, 55D, 56C, 56D---------- Tumbling	Severe: slope.	Moderate: large stones.	Severe: no water.	Deep to water	Slope----------	Slope, large stones.	Large stones, slope.
57C, 57D---------- Tumbling	Severe: slope.	Severe: large stones.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones.	Large stones, slope, droughty.
58C*:							
Tumbling---------	Severe: slope.	Moderate: large stones.	Severe: no water.	Deep to water	Slope----------	Slope, large stones.	Large stones, slope.
Urban land-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable.
59B---------- Tygart	Moderate: slope.	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly, slope.	Wetness, percs slowly, slope.	Erodes easily, percs slowly, wetness.	Percs slowly, wetness, erodes easily.
60---------- Udorthents	Variable-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable.
61*:							
Udorthents-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable.
Urban land-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable.
62F*:							
Weikert----------	Severe: depth to rock, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Rock outcrop-----	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
63A---------- Wolfgap	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Droughty, flooding.	Favorable------	Droughty.
64A---------- Wolfgap	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Droughty-------	Favorable------	Droughty.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
64B---------- Wolfgap	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Slope, droughty.	Favorable------	Droughty.
65B---------- Zoar	Moderate: slope.	Severe: hard to pack, thin layer.	Severe: no water.	Slope, percs slowly.	Slope, wetness, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
1B, 1C---------- Alonzville	0-10	Loam----------	ML	A-4	0	90-100	80-100	65-95	50-75	<35	2-10
	10-65	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
2C---------- Bailegap	0-10	Fine sandy loam	SM, SC, SC-SM	A-4, A-2	0-5	80-100	75-95	50-75	25-50	10-25	NP-10
	10-42	Fine sandy loam, clay loam, sandy clay loam.	CL, CL-ML, SC, SC-SM	A-4, A-6, A-2	5-30	75-95	70-90	60-85	30-70	20-35	5-15
	42-51	Channery clay loam, silt loam, gravelly sandy loam.	CL, CL-ML, SC, GC	A-4, A-6, A-2	5-30	50-80	40-80	30-75	25-70	20-40	5-20
	51	Weathered bedrock	---	---	---	---	---	---	---	---	---
3C, 3D, 3E------- Bailegap	0-10	Cobbly fine sandy loam.	SM, SC-SM, SC	A-2, A-4	10-30	80-100	75-95	50-75	25-75	10-30	NP-10
	10-42	Fine sandy loam, clay loam, sandy clay loam.	CL, CL-ML, SC-SM, SC	A-2, A-4, A-6	0-30	75-100	70-95	60-70	30-60	20-40	5-20
	42-51	Angular cobbly silt loam, channery clay loam.	GM-GC, SC-SM, SC, GC	A-2, A-4, A-6	10-40	50-90	35-80	30-75	25-70	20-35	5-15
	51	Weathered bedrock	---	---	---	---	---	---	---	---	---
4C*, 4D*, 4E*: Berks----------	0-6	Channery silt loam.	GM, ML, GC, SC	A-2, A-4	0-10	50-80	45-70	40-60	30-55	25-36	5-10
	6-24	Channery loam, very channery loam, channery silt loam, very channery silty clay loam.	GM, GC, SM, SC	A-1, A-2, A-4	0-30	40-80	35-70	25-60	20-45	25-36	5-10
	24-31	Channery loam, very channery loam, channery silt loam.	GM, SM	A-1, A-2	0-40	35-65	25-55	20-40	15-35	24-38	2-10
	31	Weathered bedrock	---	---	---	---	---	---	---	---	---
Weikert---------	0-4	Channery silt loam.	GM, ML, SM	A-1, A-2, A-4	0-10	35-70	35-70	25-65	20-55	30-40	4-10
	4-16	Shaly loam, very shaly silt loam, cherty loam, very channery silt loam, extremely channery silt loam.	GM, GP-GM	A-1, A-2	0-20	15-60	10-55	5-45	5-35	28-36	3-9
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
5B, 6C---------- Botetourt	0-7	Loam----------	ML, CL-ML, CL	A-4, A-6	0-5	80-100	75-95	60-85	50-80	15-35	NP-15
	7-44	Gravelly sandy clay loam, clay loam, loam.	GC, SC, CL	A-2, A-6, A-7-6	0-10	60-100	50-95	40-90	20-80	30-45	10-20
	44-65	Loam, gravelly sandy clay loam, clay loam.	GC, SC, CL, CL-ML	A-2, A-4, A-6, A-1-b	0-10	60-100	50-95	40-90	20-80	20-35	5-20
7C, 7D---------- Carbo	0-5	Silty clay loam	CL	A-6, A-7	0-2	95-100	90-100	85-95	75-85	30-50	10-25
	5-27	Clay----------	CH	A-7	0-5	95-100	85-100	80-95	70-90	60-80	35-55
	27	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
8C*, 8E*:											
Carbo----------	0-5	Silty clay loam	CL	A-6, A-7	0-2	95-100	90-100	85-95	75-85	30-50	10-25
	5-27	Clay----------	CH	A-7	0-5	95-100	85-100	80-95	70-90	60-80	35-55
	27	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Opequon---------	0-6	Silty clay loam	CL, MH, CH	A-6, A-7	0-5	85-100	80-100	80-100	75-95	30-55	10-30
	6-17	Silty clay loam, clay, silty clay.	CH, MH, CL	A-6, A-7	0-10	80-100	60-100	60-100	55-95	35-65	15-40
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
9C, 9D---------- Chilhowie	0-6	Silty clay loam	CL	A-6, A-7	0-5	90-100	85-100	80-100	75-95	30-50	10-25
	6-17	Clay, silty clay	CH	A-7	0-10	90-100	85-100	80-100	75-95	50-65	30-45
	17-27	Extremely channery clay, very channery silty clay, flaggy clay.	CH, GC, SM, GM	A-7, A-2	10-30	25-80	15-65	15-65	15-60	50-65	20-35
	27	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
10E---------- Chilhowie	0-3	Channery silty clay loam.	CL, GC, SC	A-6, A-7	5-10	70-90	55-75	48-73	45-70	30-50	10-25
	3-14	Channery clay, channery silty clay, gravelly clay.	CH, GC, SC	A-7	5-15	70-90	55-75	48-73	45-70	50-65	30-45
	14-24	Extremely channery clay, very channery silty clay, flaggy clay.	CH, GC, MH, GM	A-7, A-2	10-30	25-80	15-65	15-65	15-60	50-65	20-35
	24	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
11C*, 11D*, 11E*:											
Chiswell--------	0-4	Channery silt loam.	CL, GC, SC	A-2, A-4, A-6	3-15	55-90	50-75	40-70	30-65	25-40	8-20
	4-13	Very channery silt loam, channery silt loam.	GC, GP-GC, SC	A-2, A-6, A-7-6	0-20	15-75	10-50	10-45	8-40	25-50	10-30
	13	Weathered bedrock	---	---	---	---	---	---	---	---	---
Groseclose------	0-7	Gravelly silt loam.	GM, GC, ML, SC	A-4, A-6	0	60-80	55-75	40-75	35-70	15-35	NP-15
	7-65	Clay, silty clay loam, clay loam.	CH	A-7	0	80-100	75-100	70-100	50-95	35-65	20-45
12C, 12D, 12E---- Dekalb	0-6	Channery fine sandy loam.	SM, GM, ML, CL-ML	A-2, A-4, A-1	10-30	50-90	45-80	40-75	20-55	10-32	NP-10
	6-32	Channery sandy loam, channery loam, very channery fine sandy loam.	SM, GM, ML, GM-GC	A-2, A-4, A-1	5-30	50-85	40-75	40-75	20-55	15-32	NP-9
	32-34	Channery sandy loam, extremely flaggy fine sandy loam, flaggy loamy sand.	SM, GM, SC, GC	A-2, A-4, A-1	10-50	45-85	25-75	20-65	15-40	15-32	NP-9
	34	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
13E*, 13F*:											
Dekalb----------	0-6	Channery fine sandy loam.	SM, GM, ML, CL-ML	A-2, A-4, A-1	10-30	50-90	45-80	40-75	20-55	10-32	NP-10
	6-32	Very channery fine sandy loam, very channery sandy loam.	SM, GM, ML, GM-GC	A-2, A-4, A-1	5-40	50-85	40-75	40-75	20-55	15-32	NP-9
	32-34	Channery sandy loam, extremely flaggy fine sandy loam, very flaggy loamy sand.	SM, GM, SC, GC	A-2, A-4, A-1	10-50	45-85	25-75	20-65	15-40	15-32	NP-9
	34	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
14A---------- Derroc	0-7	Cobbly loam------	ML, SM, CL-ML, SC	A-2, A-4	15-35	80-95	65-95	50-80	25-60	<25	NP-10
	7-21	Gravelly sandy loam, very cobbly sandy loam, extremely cobbly sandy loam.	SM, GM, GC, SC	A-1, A-2, A-4	25-50	50-80	30-65	25-60	15-40	<25	NP-10
	21-65	Very cobbly loamy sand, very cobbly sandy loam, extremely cobbly sandy loam.	GC, GM, GP-GM, GM-GC	A-1, A-2	35-60	35-55	30-50	20-45	10-25	<25	NP-8
15A---------- Derroc	0-7	Very cobbly loam	SM, GM, GC, GM-GC	A-1, A-2, A-4	15-35	65-90	55-85	35-75	20-55	<25	NP-10
	7-21	Gravelly sandy loam, very cobbly sandy loam, extremely cobbly sandy loam.	SM, GM, GC, SC	A-1, A-2, A-4	25-50	50-80	30-65	25-60	15-40	<25	NP-10
	21-65	Very cobbly loamy sand, very cobbly sandy loam, extremely cobbly sandy loam.	GC, GM, GP-GM, GM-GC	A-1, A-2	35-60	35-55	30-50	20-45	10-25	<25	NP-8
16C, 16D, 16E---- Edneytown	0-7	Loam----------	SM, SC-SM	A-2, A-4	5-15	95-100	75-100	50-60	30-40	<25	NP-7
	7-29	Sandy clay loam, clay loam.	SC, CL, CL-ML, SC-SM	A-4, A-6	0-5	98-100	95-100	80-97	45-75	25-35	5-15
	29-37	Clay loam, sandy clay loam.	SM, SC, ML, CL	A-2, A-4	0-5	98-100	95-100	65-85	30-55	<25	NP-9
	37-65	Loamy sand, sandy loam.	SM, SC-SM	A-2, A-4	0-5	98-100	95-100	50-70	15-40	<25	NP-7
17B, 17C--------- Ernest	0-11	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0-5	85-100	80-100	70-95	60-95	20-40	4-15
	11-27	Silty clay loam, silt loam, channery silt loam.	ML, CL, CL-ML	A-4, A-6, A-7	0-15	75-95	70-100	65-90	55-90	25-50	6-22
	27-65	Very channery silty clay loam, channery loam, silty clay loam.	ML, CL, GM, SC	A-4, A-6, A-7	0-20	60-95	55-95	55-90	45-90	20-45	4-18
18C---------- Ernest	0-11	Cobbly loam------	ML, CL, CL-ML	A-4, A-6	3-15	65-80	60-80	55-75	55-70	20-40	4-15
	11-27	Silty clay loam, silt loam, channery silt loam.	ML, CL, CL-ML	A-4, A-6, A-7	0-15	75-95	70-100	65-90	55-90	25-50	6-22
	27-65	Very channery silty clay loam, channery loam, silty clay loam.	ML, CL, GM, SC	A-4, A-6, A-7	0-20	70-95	55-95	55-90	45-90	20-45	4-18

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
19B, 19C--------- Flatwoods	0-6	Silt loam--------	CL, CL-ML	A-4, A-6	0	90-100	85-100	75-100	60-90	25-35	5-15
	6-24	Silty clay loam, silty clay, clay.	CL, CH, MH, ML	A-6, A-7	0	75-100	70-100	65-100	55-95	35-65	10-35
	24-32	Silty clay, clay, channery clay.	CL, CH, MH, ML	A-7	0-5	60-100	50-100	45-100	40-95	40-75	20-40
	32	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
20B, 20C, 20D---- Frederick	0-11	Loam----------	ML, CL, CL-ML	A-4, A-6	0-5	80-100	75-100	75-95	75-90	<35	NP-15
	11-29	Silty clay loam, silty clay, clay.	CH, MH	A-7	0-5	80-100	75-100	70-95	60-90	50-70	20-40
	29-55	Clay, silty clay	CH	A-7	0-5	90-100	85-100	70-100	60-95	60-85	30-55
	55-65	Clay, silty clay	CH	A-7	0-5	90-100	85-100	75-100	65-95	50-75	24-45
21C, 21D--------- Frederick	0-5	Silty clay loam	CL, CL-ML	A-4, A-6, A-7	0-5	80-100	75-100	70-95	50-95	20-45	5-25
	5-21	Silty clay loam, silty clay, clay.	CH, MH	A-7	0-5	80-100	75-100	70-95	60-90	50-70	20-40
	21-43	Clay, silty clay	CH	A-7	0-5	90-100	85-100	70-100	60-95	60-85	30-55
	43-65	Clay, silty clay	CH	A-7	0-5	90-100	85-100	75-100	65-95	50-75	24-45
22C, 22D, 22E---- Frederick	0-11	Gravelly loam----	GM, GC, ML, CL	A-4, A-6	0-10	60-80	50-75	40-70	35-65	<35	NP-15
	11-29	Gravelly silty clay loam, silty clay, clay.	CH, MH, SM, SC	A-7	0-5	80-100	50-95	45-90	35-85	50-70	20-40
	29-55	Clay, silty clay	CH	A-7	0-5	90-100	85-100	70-100	60-85	60-85	30-50
	55-65	Clay, silty clay	CH	A-7	0-5	90-100	85-100	70-100	50-75	50-75	25-45
23C, 23D--------- Frederick	0-11	Very gravelly loam.	GC, GM-GC	A-2, A-1	0-10	40-60	35-50	25-35	15-30	20-45	5-25
	11-29	Gravelly silty clay loam, silty clay, clay.	CH, MH, SM, SC	A-7	0-5	80-100	50-95	45-90	35-85	50-70	20-40
	29-55	Clay, silty clay	CH	A-7	0-5	90-100	85-100	70-100	60-85	60-85	30-50
	55-65	Clay, silty clay	CH	A-7	0-5	90-100	85-100	70-100	50-75	50-75	25-45
24C, 24D--------- Frederick	0-11	Loam----------	ML, CL, CL-ML	A-4, A-6	0-5	80-100	75-100	75-95	75-90	<35	NP-15
	11-29	Silty clay loam, silty clay, clay.	CH, MH	A-7	0-5	80-100	75-100	70-95	60-90	50-70	20-40
	29-55	Clay, silty clay	CH	A-7	0-5	90-100	85-100	70-100	60-95	60-85	30-55
	55-65	Clay, silty clay	CH	A-7	0-5	90-100	85-100	75-100	65-95	50-75	24-45
25C*:											
Frederick-------	0-11	Loam----------	ML, CL, CL-ML	A-4, A-6	0-5	80-100	75-100	75-95	75-90	<35	NP-15
	11-29	Silty clay loam, silty clay, clay.	CH, MH	A-7	0-5	80-100	75-100	70-95	60-90	50-70	20-40
	29-55	Clay, silty clay	CH	A-7	0-5	90-100	85-100	70-100	60-95	60-85	30-55
	55-65	Clay, silty clay	CH	A-7	0-5	90-100	85-100	75-100	65-95	50-75	24-45
Urban land.											

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
25D*:											
Frederick-------	0-11	Loam----------	ML, CL, CL-ML	A-4, A-6	0-5	80-100	75-100	75-95	75-90	<35	NP-15
	11-29	Silty clay loam, silty clay, clay.	CH, MH	A-7	0-5	80-100	75-100	70-95	60-90	50-70	20-40
	29-55	Clay, silty clay	CH	A-7	0-5	90-100	85-100	70-100	60-95	60-85	30-55
	55-65	Clay, silty clay	CH	A-7	0-5	90-100	85-100	75-100	65-95	50-75	24-45
Urban land.											
26C---------- 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
	5-28	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
	28-34	Channery loam, very channery silt loam, very channery silty clay loam.	GC, GM-GC	A-1, A-2, A-4, A-6	0-35	25-55	20-50	15-45	15-40	20-40	4-15
	34	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
27A---------- Gladehill	0-5	Fine sandy loam	SM, SC-SM	A-2, A-4	0-5	80-100	80-100	50-85	25-50	<20	NP-5
	5-42	Loam, fine sandy loam, sandy loam.	ML, SM, SC, CL	A-2, A-4	0-5	80-100	80-100	50-95	30-70	<25	NP-10
	42-72	Fine sandy loam, loam, gravelly sandy loam.	SM, SC-SM, ML, GM-GC	A-1, A-2, A-4	0-30	60-100	50-100	25-100	20-70	<20	NP-5
28B, 28C, 28D---- Groseclose	0-7	Silt loam--------	SC-SM, SC, CL-ML, CL	A-2, A-4, A-6	0	80-100	75-100	50-100	30-90	20-35	5-15
	7-65	Clay, silty clay loam, clay loam.	CH	A-7	0	80-100	75-100	70-100	50-95	35-65	20-45
29C, 29D--------- Groseclose	0-7	Silty clay loam	CL	A-6, A-7	0	85-100	75-100	70-100	65-90	25-45	10-25
	7-65	Clay, silty clay loam, clay loam.	CH	A-7	0	80-100	75-100	70-100	50-95	35-65	20-45
30C*, 30D*, 30E*:											
Groseclose------	0-7	Silt loam--------	SC-SM, SC, CL-ML, CL	A-2, A-4, A-6	0	80-100	75-100	50-100	30-90	20-35	5-15
	7-65	Clay, silty clay loam, clay loam.	CH	A-7	0	80-100	75-100	70-100	50-95	35-65	20-45
Litz----------	0-9	Channery silt loam.	GM, GC, ML, CL	A-4, A-2	0-10	60-85	30-75	30-70	30-65	<25	NP-10
	9-27	Very channery silt loam, extremely channery silt loam.	GM, GC, GM-GC	A-2, A-4, A-6	10-20	40-60	15-60	14-50	13-45	<30	NP-15
	27	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
31C, 31D--------- Hayesville	0-10	Loam----------	SM, SC, ML, CL	A-4	0-5	90-100	85-95	70-95	35-60	25-35	NP-10
	10-36	Clay loam, clay	ML, MH, CL, CH	A-6, A-7	0-5	90-100	85-100	70-100	55-80	36-66	11-35
	36-54	Sandy clay loam, clay loam, loam.	SM, ML, MH, CL	A-6, A-7	0-5	90-100	90-100	85-95	45-65	36-55	11-25
	54-65	Fine sandy loam, loam, sandy loam.	SM, ML, CL, SC	A-4, A-6	5-15	90-100	90-95	65-90	40-55	25-40	NP-12
32A---------- Irongate	0-13	Loam----------	ML, CL, CL-ML	A-4	0-5	95-100	80-100	85-90	60-80	<25	1-10
	13-41	Silt loam, loam, fine sandy loam.	SM, SC, ML, CL	A-4	0-5	95-100	70-95	70-90	45-80	<25	1-10
	41-65	Fine sandy loam, loam, gravelly sandy loam.	SM, ML, GM, CL-ML	A-2, A-4	0-5	60-95	50-90	40-85	30-80	<25	1-10
33B, 33C--------- Laidig	0-7	Fine sandy loam	SM, SC-SM	A-1, A-2, A-4	0-5	80-95	75-90	45-70	25-45	15-25	NP-5
	7-32	Loam, clay loam, channery clay loam.	SM, SC, CL, ML	A-2, A-4, A-6	5-20	70-95	50-90	40-80	20-70	15-40	2-18
	32-65	Channery sandy clay loam, channery clay loam, clay loam.	GC, SC, GM-GC, CL-ML	A-2, A-4, A-6	5-20	50-90	40-85	30-80	15-70	15-35	2-16
34B, 34C, 34D---- Laidig	0-7	Cobbly fine sandy loam.	GM, SM, ML, CL	A-4	0-5	65-90	55-80	50-80	35-70	15-30	1-10
	7-32	Loam, clay loam, channery sandy clay loam.	SM, SC, CL, ML	A-2, A-4, A-6	5-20	70-95	55-90	40-80	20-70	15-40	2-18
	32-65	Clay loam, channery clay loam, channery loam.	GC, SC, CM-GC, CL-ML	A-2, A-4, A-6	5-20	65-90	40-85	30-80	15-70	15-35	2-16
35C, 35D, 35E---- Laidig	0-7	Cobbly fine sandy loam.	GM-GC, SM, CL-ML, SC-SM	A-4	3-15	65-90	50-80	45-80	35-70	15-30	NP-10
	7-32	Loam, clay loam, channery clay loam.	SM, SC, ML, CL	A-2, A-4, A-6	5-20	70-95	50-90	40-80	20-70	15-40	2-18
	32-65	Channery sandy clay loam, very channery loam, clay loam, channery clay loam.	SC, GM-GC, CL-ML, GC	A-2, A-4, A-6	5-20	50-90	40-85	30-80	15-70	15-35	2-16

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
36D*, 36E*:											
Lehew----------	0-6	Very channery fine sandy loam.	SM, GM, ML, CL-ML	A-2, A-4	20-50	50-90	45-80	40-75	20-55	15-30	NP-7
	6-26	Very channery sandy loam, very channery loam, very channery fine sandy loam.	SM, GM, GM-GC, SC-SM	A-2, A-4	5-40	45-75	30-65	20-55	10-40	15-30	NP-7
	26-31	Very channery sandy loam, extremely flaggy sandy loam.	SM, GM, GM-GC, SC-SM	A-2, A-4	10-50	45-75	30-65	20-55	10-40	15-30	NP-7
	31	Weathered bedrock	---	---	---	---	---	---	---	---	---
Dekalb----------	0-6	Channery fine sandy loam.	SM, GM, ML, CL-ML	A-2, A-4, A-1	15-30	50-90	45-80	40-75	20-55	10-32	NP-10
	6-32	Very channery fine sandy loam, very channery sandy loam.	SM, GM, ML, GM-GC	A-2, A-4, A-1	5-40	50-85	40-75	40-75	20-55	15-32	NP-9
	32-34	Extremely flaggy fine sandy loam, very flaggy loamy sand.	SM, GM, SC, GC	A-2, A-4, A-1	10-50	45-85	25-75	20-65	15-40	15-32	NP-9
	34	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
37C, 37D--------- Lily	0-8	Gravelly sandy loam.	SM, ML	A-2, A-4	5-20	90-95	85-90	55-90	25-75	<35	NP-7
	8-29	Sandy clay loam, gravelly loam.	SM, SC, ML, CL	A-4, A-6	5-20	90-95	85-90	60-85	40-80	<35	3-15
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
37E---------- Lily	0-8	Gravelly sandy loam.	SM, ML	A-2, A-4	5-20	90-95	85-90	55-90	25-75	<35	NP-7
	8-29	Sandy clay loam, loam, gravelly loam.	SM, GC, ML, CL	A-2, A-4, A-6	5-20	65-95	60-90	50-85	20-75	<35	NP-15
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
38A*---------- Lindside	0-5	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	95-100	80-100	55-90	20-35	2-15
	5-33	Silty clay loam, silt loam, very fine sandy loam.	CL, ML, CL-ML	A-4, A-6	0	100	95-100	90-100	70-95	25-40	4-18
	33-65	Stratified fine sandy loam, loam, and silt loam.	CL, ML, SM, SC	A-2, A-4, A-6	0	60-100	55-100	45-100	30-95	20-40	4-18

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
39A---------- Massanetta	0-11	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	12-30	2-12
	11-28	Clay loam, silty clay loam, silt loam.	CL	A-6	0-5	90-100	85-100	75-95	55-85	25-40	10-20
	28-65	Gravelly loam, silt loam, gravelly clay loam.	CL, CL-ML, SC-SM, SC	A-4, A-6	0-10	75-100	60-100	50-95	40-90	20-40	5-20
40B, 40C--------- Moomaw	0-9	Loam----------	ML	A-4	0-5	90-100	80-100	65-100	50-90	20-35	NP-10
	9-21	Silt loam, clay loam, gravelly loam.	CL, CL-ML	A-4, A-6	0-15	90-100	80-100	75-100	70-90	20-40	5-15
	21-65	Loam, clay loam, very cobbly clay loam.	ML, CL, SM, SC	A-4, A-6	0-10	80-100	60-100	55-95	45-90	20-40	3-15
41C, 41D--------- Oriskany	0-9	Very cobbly sandy loam.	SM, GM, GC, GM-GC	A-2, A-4	35-60	65-80	50-75	30-65	20-50	<30	NP-10
	9-56	Very cobbly loam, very cobbly sandy clay loam, extremely cobbly clay loam.	SC, CL, GC, SC-SM	A-2, A-4, A-6	35-75	50-75	45-75	25-65	20-55	20-40	5-20
	56-74	Extremely cobbly sandy loam, very cobbly loam, very cobbly sandy clay loam.	GM, SM, GM-GC, GC	A-2, A-4, A-6	35-75	50-75	45-75	25-65	15-50	20-40	2-15
42E---------- Oriskany	0-7	Extremely cobbly sandy loam.	SM, GM, GC, GM-GC	A-2, A-4	50-80	65-80	50-75	30-65	20-50	<30	NP-10
	7-54	Very cobbly loam, very cobbly sandy clay loam, extremely cobbly clay loam.	SC, CL, GC, SC-SM	A-2, A-4, A-6	35-75	50-75	45-75	25-65	20-55	20-40	5-20
	54-74	Extremely cobbly sandy loam, very cobbly loam, very cobbly sandy clay loam.	GM, SM, GM-GC, GC	A-2, A-4, A-6	35-75	50-75	45-75	25-65	15-50	20-40	2-15
43E, 43F--------- Peaks	0-4	Gravelly sandy loam.	SM, GM, ML, CL-ML	A-2, A-4	5-25	50-90	45-80	40-75	20-55	<30	NP-7
	4-16	Very gravelly sandy loam, channery fine sandy loam, channery loam.	SM, GM, GM-GC, SC-SM	A-2, A-4	5-30	45-75	30-65	20-55	10-40	<30	NP-7
	16-24	Extremely channery sandy loam, very channery fine sandy loam, extremely channery loam.	SM, GM, GM-GC, SC-SM	A-2, A-4	10-50	45-75	30-65	20-55	10-40	<30	NP-7
	24	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
44*. Pits											
45A---------- Purdy	0-7	Silty clay loam	ML, CL	A-4, A-6, A-7	0	95-100	90-100	90-100	90-100	25-50	4-20
	7-32	Silty clay, clay, silty clay loam.	CL, CH, MH	A-6, A-7	0	95-100	90-100	85-100	75-85	30-65	11-30
	32-65	Silty clay, clay loam, clay.	CL, CH, MH	A-6, A-7	0	95-100	90-100	85-100	70-95	30-65	11-30
46F*: Rock outcrop.											
Opequon---------	0-6	Silty clay loam	CL, MH, CH	A-6, A-7	0-5	85-100	80-100	80-100	75-95	30-55	10-30
	6-17	Silty clay loam, clay, silty clay.	CH, MH, CL	A-6, A-7	0-10	80-100	60-100	60-100	55-95	35-65	15-40
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
47C---------- Rushtown	0-13	Very channery silt loam.	GM, GP	A-1, A-2	0	25-50	20-35	15-30	3-25	25-35	NP-10
	13-27	Extremely channery silt loam, very channery silt loam.	GM	A-1, A-2, A-4	0-5	30-60	25-55	25-55	20-50	25-40	1-10
	27-65	Extremely channery silt loam, very channery silt loam.	GM, GP	A-1, A-2	0-5	10-35	5-30	5-30	3-25	25-40	1-10
48C, 48D--------- Sequoia	0-6	Silt loam--------	CL, CL-ML	A-4, A-6	0	95-100	95-100	85-100	80-95	23-35	5-15
	6-30	Silty clay, clay, shaly silty clay.	CL, MH, CH	A-7	0	70-100	65-100	60-100	55-95	43-74	20-40
	30-65	Weathered bedrock	---	---	---	---	---	---	---	---	---
49C, 49D--------- Shelocta	0-8	Gravelly silt loam.	ML, GM, SM	A-4	0-10	55-95	50-80	40-70	36-65	<35	NP-10
	8-41	Silty clay loam, very channery silty clay, channery silty clay loam.	CL, CL-ML, GC, SC	A-6, A-4	0-10	55-95	50-95	45-95	40-90	25-40	4-15
	41-65	Channery silt loam, channery silty clay loam, very channery silt loam.	GM, GC, ML, CL	A-4, A-6, A-2, A-1-b	0-15	40-95	35-70	25-70	20-60	20-40	3-20
50B, 50C--------- Shottower	0-10	Loam----------	CL	A-4, A-6	0-2	90-100	75-100	60-95	50-85	20-35	5-15
	10-17	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
	17-65	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

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
51C, 51D--------- Shottower	0-10	Cobbly loam------	CL, SC	A-4, A-6	10-20	80-95	65-90	50-85	35-80	20-35	5-15
	10-17	Silty clay loam, cobbly clay loam, cobbly silty clay.	CL, CH, SC	A-2, A-6, A-7	5-45	75-90	50-80	45-70	30-65	35-55	10-35
	17-65	Cobbly silty clay loam, cobbly clay, cobbly silty clay.	CL, CH, SC	A-2, A-7	15-35	75-90	50-75	45-70	30-65	35-65	15-40
52C, 52D--------- Thurmont	0-7	Loam----------	SM, ML, CL, SC-SM	A-1, A-2, A-4	5-20	75-95	75-80	40-70	20-55	<30	NP-10
	7-34	Clay loam, loam, gravelly sandy clay loam.	SC, CL	A-2, A-6, A-7, A-4	2-20	75-90	55-75	45-70	20-55	25-45	7-25
	34-52	Sandy loam, clay loam, gravelly sandy clay loam.	SC	A-2, A-6, A-4	2-20	75-90	55-75	35-60	20-40	25-40	7-20
	52-65	Sandy clay loam, gravelly sandy clay loam.	SM, SC-SM	A-1, A-2	10-40	70-85	45-75	30-50	15-35	<20	NP-7
53B---------- Timberville	0-11	Silt loam--------	ML, CL-ML, SC-SM, SM	A-4	0-3	85-100	75-100	55-95	35-85	<25	NP-7
	11-43	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
	43-65	Clay, silty clay loam, gravelly clay loam.	CL, CH, SC, GC	A-6, A-7	0-10	55-95	50-95	45-90	40-85	35-60	14-32
54A---------- Toms	0-7	Silt loam--------	ML, CL-ML	A-4	0-1	90-100	85-100	80-90	55-80	<25	NP-7
	7-53	Clay, very cobbly clay, silty clay.	CL, CH	A-7	0-55	85-100	85-100	80-90	75-90	40-75	15-45
	53-65	Silty clay, silty clay loam, very channery clay.	CL, CH	A-7	0-55	90-100	90-100	85-100	75-95	40-75	15-45
55B, 55C, 55D---- Tumbling	0-9	Loam----------	CL-ML, CL	A-4, A-6	0-2	80-100	75-100	65-95	50-80	15-30	4-15
	9-14	Clay loam, sandy clay loam, cobbly clay loam.	CL, SC	A-2, A-4, A-6	0-20	75-100	60-95	50-90	30-70	30-45	8-20
	14-44	Clay loam, clay, very cobbly clay.	CL	A-7	0-20	75-95	60-95	55-90	50-90	40-50	15-25
	44-65	Cobbly clay loam, clay loam, clay.	CL, CH, SC, GC	A-2, A-7	0-20	60-95	50-95	45-85	30-75	40-55	15-30
56C, 56D--------- Tumbling	0-9	Cobbly loam------	CL	A-4, A-6	15-25	80-95	65-90	55-85	40-70	15-30	4-15
	9-14	Clay loam, sandy clay loam, cobbly clay loam.	CL, SC	A-2, A-4, A-6	0-20	75-100	60-95	50-90	30-70	30-45	8-20
	14-44	Clay loam, clay, very cobbly clay.	CL	A-7	0-20	75-95	60-95	55-90	50-90	40-50	15-25
	44-65	Cobbly clay loam, clay loam, 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 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
57C, 57D--------- Tumbling	0-9	Cobbly loam------	CL-ML, SC-SM, SC	A-4, A-6	2-10	80-100	60-95	60-90	40-80	15-30	4-15
	9-14	Clay loam, cobbly sandy clay loam, cobbly clay loam.	CL, SC	A-2, A-4, A-6	5-30	75-100	60-95	50-90	30-70	30-45	8-20
	14-30	Clay loam, clay cobbly clay loam.	CL	A-7	5-30	75-95	60-95	55-90	50-90	40-50	15-25
	30-65	Clay loam, cobbly clay, clay.	CL, CH, SC, GC	A-7, A-2	10-45	60-95	50-95	45-85	30-75	40-55	15-30
58C*:											
Tumbling--------	0-9	Loam----------	CL-ML, CL	A-4, A-6	0-2	80-100	75-100	65-95	50-80	15-30	4-15
	9-14	Clay loam, sandy clay loam, cobbly clay loam.	CL, SC	A-2, A-4, A-6	0-20	75-100	60-95	50-90	30-70	30-45	8-20
	14-44	Clay loam, clay, very cobbly clay.	CL	A-7	0-20	75-95	60-95	55-90	50-90	40-50	15-25
	44-65	Cobbly clay loam, clay loam, cobbly clay.	CL, CH, SC, GC	A-2, A-7	0-20	60-95	50-95	45-85	30-75	40-55	15-30
Urban land.											
59B---------- Tygart	0-7	Silt loam--------	ML, CL	A-4, A-6	0	95-100	95-100	85-100	60-90	25-40	2-15
	7-49	Silty clay loam, silty clay, clay.	CL, CH, MH	A-6, A-7	0	95-100	95-100	85-100	65-95	30-65	11-30
	49-65	Silty clay loam, silty clay, clay.	CL, CH, MH	A-6, A-7	0	95-100	95-100	85-100	70-95	30-65	11-30
60. Udorthents											
61*:											
Udorthents.											
Urban land.											
62F*:											
Weikert---------	0-4	Channery silt loam.	GM, ML, SM	A-1, A-2, A-4	0-10	35-70	35-70	25-65	20-55	30-40	4-10
	4-16	Very channery silt loam, extremely channery silt loam.	GM, GP-GM	A-1, A-2	0-20	15-60	10-55	5-45	5-35	28-36	3-9
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
63A, 64A--------- Wolfgap	0-10	Loam----------	ML, CL, CL-ML	A-4	0	95-100	90-100	75-100	55-90	20-35	2-10
	10-51	Clay loam, sandy clay loam, loam, gravelly sandy clay loam.	ML, CL, SM, SC	A-4, A-6	0-5	90-100	70-100	65-100	45-80	20-40	2-20
	51-65	Very gravelly loamy sand, gravelly fine sandy loam, gravelly sandy loam.	GC, GM-GC, SP-SM	A-1, A-2, A-3, A-4	10-20	35-90	20-75	10-65	4-45	<20	NP-10
64B---------- Wolfgap	0-10	Loam----------	ML, CL, CL-ML	A-4	0	95-100	90-100	75-100	55-90	20-35	2-10
	10-51	Clay loam, sandy clay loam, loam, gravelly sandy clay loam.	ML, CL, SM, SC	A-4, A-6	0-5	90-100	70-100	65-100	45-80	20-40	2-20
	51-65	Very gravelly loamy sand, gravelly sandy clay loam, gravelly fine sandy loam.	GC, GM-GC, SP-SM	A-1, A-2, A-3, A-4	10-20	35-90	20-75	10-65	4-45	<20	NP-10
65B---------- Zoar	0-8	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	95-100	95-100	90-100	75-95	20-40	3-15
	8-48	Silty clay, silty clay loam.	CL, CH, ML, MH	A-6, A-7	0	95-100	95-100	90-100	85-100	30-55	11-32
	48-65	Clay loam, silty clay loam, silty clay.	CL, CH, ML, MH	A-6, A-7	0	95-100	95-100	90-100	75-95	30-60	11-35

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH				Pct
1B, 1C---------- Alonzville	0-10	15-27	1.45-1.65	0.6-2.0	0.15-0.19	3.6-6.5	Low----------	0.32	5	1-4
	10-65	18-34	1.45-1.70	0.6-2.0	0.13-0.18	3.6-6.5	Low----------	0.28		
2C---------- Bailegap	0-10	5-18	1.45-1.65	0.6-2.0	0.13-0.16	4.5-5.5	Low----------	0.24	3	.5-2
	10-42	18-35	1.35-1.60	0.6-2.0	0.10-0.14	4.5-5.5	Low----------	0.24		
	42-51	15-30	1.35-1.65	0.6-2.0	0.06-0.14	4.5-5.5	Low----------	0.24		
	51	---	---	---	---	---	----------	----		
3C, 3D, 3E------- Bailegap	0-10	10-25	1.35-1.60	0.6-2.0	0.10-0.14	4.5-5.5	Low----------	0.17	3	.5-2
	10-42	18-35	1.35-1.65	0.6-2.0	0.10-0.14	4.5-5.5	Low----------	0.15		
	42-51	15-30	1.35-1.65	0.6-2.0	0.06-0.10	4.5-5.5	Low----------	0.15		
	51	---	---	---	---	---	----------	----		
4C*, 4D*, 4E*:										
Berks----------	0-6	5-23	1.20-1.50	0.6-6.0	0.08-0.12	3.6-6.5	Low----------	0.17	3	.5-3
	6-24	5-32	1.20-1.60	0.6-6.0	0.04-0.10	3.6-6.5	Low----------	0.17		
	24-31	5-20	1.20-1.60	2.0-6.0	0.04-0.10	3.6-6.5	Low----------	0.17		
	31	---	---	---	---	---	----------	----		
Weikert---------	0-4	15-27	1.20-1.40	2.0-6.0	0.08-0.14	4.5-6.0	Low----------	0.28	2	1-3
	4-16	15-27	1.20-1.40	2.0-6.0	0.04-0.08	4.5-6.0	Low----------	0.28		
	16	---	---	---	---	---	----------	----		
5B, 6C---------- Botetourt	0-7	7-27	1.35-1.60	0.6-2.0	0.15-0.20	5.1-7.3	Low----------	0.32	5	.5-4
	7-44	18-35	1.45-1.70	0.6-2.0	0.07-0.15	5.1-6.5	Low----------	0.28		
	44-65	18-35	1.45-1.70	0.6-2.0	0.07-0.15	5.1-6.5	Low----------	0.28		
7C, 7D---------- Carbo	0-5	20-40	1.20-1.40	0.6-2.0	0.16-0.19	4.5-7.3	Moderate-----	0.37	2	.5-3
	5-27	60-80	1.30-1.45	0.06-0.2	0.10-0.14	5.6-7.8	High---------	0.24		
	27	---	---	---	---	---	----------	----		
8C*, 8E*:										
Carbo----------	0-5	20-40	1.20-1.40	0.6-2.0	0.16-0.19	4.5-7.3	Moderate-----	0.37	2	.5-3
	5-27	60-80	1.30-1.45	0.06-0.2	0.10-0.14	5.6-7.8	High---------	0.24		
	27	---	---	---	---	---	----------	----		
Opequon---------	0-6	27-45	1.20-1.50	0.2-2.0	0.16-0.21	5.1-7.8	High---------	0.37	1	1-4
	6-17	35-75	1.40-1.70	0.2-2.0	0.12-0.16	5.1-7.8	High---------	0.32		
	17	---	---	---	---	---	----------	----		
Rock outcrop.										
9C, 9D---------- Chilhowie	0-6	30-40	1.20-1.40	0.6-2.0	0.15-0.20	6.1-8.4	Moderate-----	0.37	2	.5-3
	6-17	60-80	1.30-1.45	0.06-0.2	0.10-0.15	6.1-8.4	High---------	0.24		
	17-27	55-80	1.20-1.50	0.06-0.2	0.02-0.05	6.6-8.4	High---------	0.24		
	27	---	---	---	---	---	----------	----		
10E---------- Chilhowie	0-3	30-40	1.50-1.65	0.6-2.0	0.08-0.12	6.1-8.4	Moderate-----	0.20	2	.5-3
	3-14	60-80	1.30-1.45	0.06-0.2	0.06-0.10	6.1-8.4	High---------	0.20		
	14-24	55-80	1.30-1.45	0.06-0.2	0.02-0.05	6.6-8.4	High---------	0.20		
	24	---	---	---	---	---	----------	----		
11C*, 11D*, 11E*:										
Chiswell--------	0-4	10-27	1.20-1.40	0.6-2.0	0.10-0.14	3.6-6.0	Low----------	0.24	2	.5-2
	4-13	10-35	1.20-1.60	0.6-2.0	0.04-0.10	3.6-6.0	Low----------	0.10		
	13	---	---	---	---	---	----------	----		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH				Pct
11C*, 11D*, 11E*:										
Groseclose------	0-7	7-27	1.25-1.55	2.0-6.0	0.12-0.20	3.6-5.5	Low----------	0.28	4	1-2
	7-65	35-60	1.35-1.60	0.06-0.2	0.10-0.17	3.6-5.5	High---------	0.24		
12C, 12D, 12E---- Dekalb	0-6	10-20	1.20-1.50	6.0-20	0.08-0.12	3.6-6.5	Low----------	0.17	2	2-4
	6-32	7-18	1.20-1.50	6.0-20	0.06-0.12	3.6-5.5	Low----------	0.17		
	32-34	5-15	1.20-1.50	>6.0	0.05-0.10	3.6-5.5	Low----------	0.17		
	34	---	---	---	---	---	----------	----		
13E*, 13F*:										
Dekalb----------	0-6	10-20	1.20-1.50	6.0-20	0.08-0.12	3.6-6.5	Low----------	0.17	2	2-4
	6-32	7-18	1.20-1.50	6.0-20	0.06-0.12	3.6-5.5	Low----------	0.17		
	32-34	5-15	1.20-1.50	>6.0	0.05-0.10	3.6-5.5	Low----------	0.17		
	34	---	---	---	---	---	----------	----		
Rock outcrop.										
14A---------- Derroc	0-7	5-15	1.40-1.65	2.0-20	0.10-0.15	5.6-7.3	Low----------	0.17	3	1-3
	7-21	5-15	1.55-1.70	2.0-20	0.06-0.09	5.6-7.3	Low----------	0.17		
	21-65	5-10	1.55-1.70	>6.0	0.04-0.07	5.6-7.3	Low----------	0.17		
15A---------- Derroc	0-7	5-15	1.40-1.65	2.0-20	0.06-0.10	5.6-7.3	Low----------	0.17	3	1-3
	7-21	5-15	1.55-1.70	2.0-20	0.06-0.09	5.6-7.3	Low----------	0.17		
	21-65	5-10	1.55-1.70	>6.0	0.04-0.07	5.6-7.3	Low----------	0.17		
16C, 16D, 16E---- Edneytown	0-7	5-15	1.40-1.60	2.0-6.0	0.10-0.14	4.5-6.0	Low----------	0.15	3	1-3
	7-29	20-35	1.30-1.40	0.6-2.0	0.12-0.18	4.5-5.5	Low----------	0.24		
	29-37	10-20	1.30-1.50	0.6-2.0	0.11-0.14	4.5-5.5	Low----------	0.24		
	37-65	4-15	1.30-1.50	2.0-6.0	0.06-0.12	4.5-5.5	Low----------	0.17		
17B, 17C--------- Ernest	0-11	15-20	1.20-1.40	0.6-2.0	0.14-0.20	4.5-6.0	Low----------	0.43	3	2-4
	11-27	20-35	1.30-1.50	0.6-2.0	0.12-0.16	4.5-5.5	Moderate-----	0.32		
	27-65	18-30	1.40-1.70	0.06-0.6	0.08-0.12	4.5-5.5	Low----------	0.32		
18C---------- Ernest	0-11	15-20	1.20-1.40	0.6-2.0	0.12-0.18	4.5-6.0	Low----------	0.32	3	2-4
	11-27	20-35	1.30-1.50	0.6-2.0	0.12-0.16	4.5-5.5	Moderate-----	0.32		
	27-65	18-30	1.40-1.70	0.06-0.6	0.08-0.12	4.5-5.5	Low----------	0.32		
19B, 19C--------- Flatwoods	0-6	10-27	1.30-1.50	0.6-2.0	0.17-0.20	4.5-5.5	Low----------	0.28	2	2-4
	6-24	35-70	1.35-1.50	0.2-0.6	0.10-0.18	4.5-5.5	Moderate-----	0.24		
	24-32	35-70	1.35-1.55	0.2-0.6	0.07-0.14	4.5-5.5	Moderate-----	0.20		
	32	---	---	---	---	---	----------	----		
20B, 20C, 20D---- Frederick	0-11	13-27	1.25-1.50	2.0-6.0	0.16-0.24	4.5-6.0	Low----------	0.32	4	1-2
	11-29	35-75	1.20-1.50	0.6-2.0	0.12-0.18	4.5-6.0	Moderate-----	0.24		
	29-55	40-80	1.20-1.50	0.6-2.0	0.10-0.18	4.5-6.0	High---------	0.24		
	55-65	40-80	1.20-1.40	0.6-2.0	0.10-0.20	4.5-6.0	High---------	0.24		
21C, 21D--------- Frederick	0-5	27-40	1.30-1.60	0.6-2.0	0.12-0.20	4.5-6.0	Moderate-----	0.32	4	.5-2
	5-21	35-75	1.20-1.50	0.6-2.0	0.12-0.18	4.5-6.0	Moderate-----	0.24		
	21-43	40-80	1.20-1.50	0.6-2.0	0.10-0.18	4.5-6.0	High---------	0.24		
	43-65	40-80	1.20-1.40	0.6-2.0	0.10-0.20	4.5-6.0	High---------	0.24		
22C, 22D, 22E---- Frederick	0-11	13-27	1.25-1.50	2.0-6.0	0.12-0.20	4.5-6.0	Low----------	0.28	4	1-2
	11-29	35-75	1.20-1.50	0.6-2.0	0.10-0.18	4.5-6.0	Moderate-----	0.24		
	29-55	40-80	1.20-1.50	0.6-2.0	0.10-0.18	4.5-6.0	High---------	0.24		
	55-65	40-70	1.20-1.50	0.6-2.0	0.09-0.20	4.5-6.0	High---------	0.24		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH				Pct
23C, 23D---------Frederick	0-11	13-27	1.35-1.50	2.0-6.0	0.08-0.12	4.5-6.0	Low----------	0.28	4	1-2
	11-29	35-75	1.20-1.50	0.6-2.0	0.10-0.18	4.5-6.0	Moderate-----	0.24		
	29-55	40-80	1.20-1.50	0.6-2.0	0.10-0.18	4.5-6.0	High---------	0.24		
	55-65	40-70	1.20-1.50	0.6-2.0	0.09-0.20	4.5-6.0	High---------	0.24		
24C, 24D---------Frederick	0-11	13-27	1.25-1.50	2.0-6.0	0.16-0.24	4.5-6.0	Low----------	0.32	4	1-2
	11-29	35-75	1.20-1.50	0.6-2.0	0.12-0.18	4.5-6.0	Moderate-----	0.24		
	29-55	40-80	1.20-1.50	0.6-2.0	0.10-0.18	4.5-6.0	High---------	0.24		
	55-65	40-80	1.20-1.40	0.6-2.0	0.10-0.20	4.5-6.0	High---------	0.24		
25C*, 25D*:										
Frederick-------	0-11	13-27	1.25-1.50	2.0-6.0	0.16-0.24	4.5-6.0	Low----------	0.32	4	1-2
	11-29	35-75	1.20-1.50	0.6-2.0	0.12-0.18	4.5-6.0	Moderate-----	0.24		
	29-55	40-80	1.20-1.50	0.6-2.0	0.10-0.18	4.5-6.0	High---------	0.24		
	55-65	40-80	1.20-1.40	0.6-2.0	0.10-0.20	4.5-6.0	High---------	0.24		
Urban land.										
26C----------Gilpin	0-5	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	Low----------	0.32	3	.5-4
	5-28	18-35	1.20-1.50	0.6-2.0	0.12-0.16	3.6-5.5	Low----------	0.24		
	28-34	15-35	1.20-1.50	0.6-2.0	0.08-0.12	3.6-5.5	Low----------	0.24		
	34	---	---	---	---	---	----------	----		
27A----------Gladehill	0-5	5-10	1.45-1.65	2.0-6.0	0.08-0.14	6.1-8.4	Low----------	0.20	5	1-3
	5-42	5-18	1.45-1.70	2.0-6.0	0.10-0.20	6.1-8.4	Low----------	0.28		
	42-72	5-10	1.50-1.70	2.0-6.0	0.08-0.16	6.1-8.4	Low----------	0.28		
28B, 28C, 28D----Groseclose	0-7	7-27	1.25-1.55	2.0-6.0	0.11-0.20	3.6-5.5	Low----------	0.43	4	1-2
	7-65	35-60	1.35-1.60	0.06-0.2	0.10-0.17	3.6-5.5	High---------	0.24		
29C, 29D---------Groseclose	0-7	27-40	1.35-1.55	0.6-2.0	0.10-0.16	3.6-5.5	Moderate-----	0.32	4	1-2
	7-65	35-60	1.35-1.60	0.06-0.2	0.10-0.17	3.6-5.5	High---------	0.24		
30C*, 30D*, 30E*:										
Groseclose------	0-7	7-27	1.25-1.55	2.0-6.0	0.11-0.20	3.6-5.5	Low----------	0.43	4	1-2
	7-65	35-60	1.35-1.60	0.06-0.2	0.10-0.17	3.6-5.5	High---------	0.24		
Litz----------	0-9	10-27	1.20-1.50	0.6-2.0	0.13-0.16	4.5-5.5	Low----------	0.32	3	.5-2
	9-27	10-35	1.20-1.50	0.6-2.0	0.10-0.16	4.5-5.5	Low----------	0.32		
	27	---	---	---	---	---	----------	----		
31C, 31D---------Hayesville	0-10	10-25	1.35-1.60	2.0-6.0	0.12-0.20	3.6-6.5	Low----------	0.20	5	1-3
	10-36	35-50	1.20-1.35	0.6-2.0	0.15-0.20	3.6-6.0	Low----------	0.24		
	36-54	20-40	1.30-1.40	0.6-2.0	0.12-0.20	3.6-6.0	Low----------	0.20		
	54-65	5-25	1.45-1.65	2.0-6.0	0.11-0.15	3.6-6.0	Low----------	0.17		
32A----------Irongate	0-13	10-18	1.20-1.40	0.6-2.0	0.14-0.20	5.6-7.8	Low----------	0.37	5	2-4
	13-41	10-18	1.20-1.40	0.6-2.0	0.10-0.20	5.6-7.8	Low----------	0.28		
	41-65	5-18	1.20-1.40	2.0-6.0	0.06-0.10	5.6-7.8	Low----------	0.24		
33B, 33C---------Laidig	0-7	7-20	1.20-1.40	2.0-6.0	0.10-0.12	3.6-5.5	Low----------	0.24	4	1-4
	7-32	18-35	1.30-1.50	0.6-6.0	0.08-0.12	3.6-5.5	Low----------	0.24		
	32-65	18-35	1.30-1.60	0.06-0.6	0.06-0.10	3.6-5.5	Low----------	0.17		
34B, 34C, 34D----Laidig	0-7	10-27	1.20-1.40	0.6-6.0	0.10-0.14	3.6-5.5	Low----------	0.28	4	1-4
	7-32	18-35	1.30-1.50	0.6-6.0	0.08-0.12	3.6-5.5	Low----------	0.24		
	32-65	18-35	1.30-1.60	0.2-0.6	0.06-0.10	3.6-5.5	Low----------	0.17		
35C, 35D, 35E----Laidig	0-7	7-27	1.20-1.40	0.6-6.0	0.08-0.12	3.6-5.5	Low----------	0.28	4	1-4
	7-32	18-35	1.30-1.50	0.6-6.0	0.08-0.10	3.6-5.5	Low----------	0.28		
	32-65	18-35	1.30-1.60	0.06-0.6	0.06-0.10	3.6-5.5	Low----------	0.17		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH				Pct
36D*, 36E*:										
Lehew----------	0-6	4-16	1.20-1.40	2.0-20	0.08-0.12	4.5-5.5	Low----------	0.17	3	2-4
	6-26	5-18	1.20-1.40	2.0-20	0.06-0.10	4.5-5.5	Low----------	0.17		
	26-31	5-18	1.20-1.40	2.0-20	0.06-0.10	4.5-5.5	Low----------	0.17		
	31	---	---	---	---	---	----------	----		
Dekalb----------	0-6	10-20	1.20-1.50	6.0-20	0.08-0.12	3.6-6.5	Low----------	0.17	2	2-4
	6-32	7-18	1.20-1.50	6.0-20	0.06-0.12	3.6-5.5	Low----------	0.17		
	32-34	5-15	1.20-1.50	>6.0	0.05-0.10	3.6-5.5	Low----------	0.17		
	34	---	---	---	---	---	----------	----		
37C, 37D--------- Lily	0-8	5-25	1.20-1.40	0.6-6.0	0.09-0.16	3.6-5.5	Low----------	0.24	2	.5-4
	8-29	18-35	1.25-1.55	2.0-6.0	0.12-0.18	3.6-5.5	Low----------	0.24		
	29	---	---	---	---	---	----------	----		
37E---------- Lily	0-8	5-25	1.20-1.40	0.6-6.0	0.09-0.16	3.6-5.5	Low----------	0.24	2	.5-4
	8-29	18-35	1.25-1.55	2.0-6.0	0.08-0.17	3.6-5.5	Low----------	0.17		
	29	---	---	---	---	---	----------	----		
38A*---------- Lindside	0-5	15-27	1.20-1.40	0.6-2.0	0.20-0.26	5.1-7.8	Low----------	0.32	5	2-4
	5-33	18-35	1.20-1.40	0.2-2.0	0.17-0.22	5.1-7.8	Low----------	0.37		
	33-65	18-35	1.20-1.40	0.2-6.0	0.12-0.18	5.6-7.8	Low----------	0.32		
39A---------- Massanetta	0-11	20-26	1.20-1.55	0.6-2.0	0.14-0.20	7.4-8.4	Low----------	0.37	5	4-8
	11-28	20-32	1.35-1.65	0.6-2.0	0.14-0.20	7.4-8.4	Low----------	0.37		
	28-65	22-32	1.30-1.60	0.6-2.0	0.12-0.20	7.4-8.4	Low----------	0.28		
40B, 40C--------- Moomaw	0-9	10-27	1.35-1.60	0.6-2.0	0.14-0.24	4.5-5.5	Low----------	0.28	3	.5-3
	9-21	18-35	1.45-1.65	0.6-2.0	0.10-0.21	4.5-5.5	Low----------	0.32		
	21-65	18-35	1.45-1.70	0.06-0.6	0.08-0.20	4.5-5.5	Low----------	0.32		
41C, 41D--------- Oriskany	0-9	5-15	1.20-1.40	2.0-6.0	0.04-0.14	4.5-5.5	Low----------	0.10	5	.5-2
	9-56	20-35	1.30-1.65	0.6-2.0	0.04-0.12	4.5-5.5	Low----------	0.10		
	56-74	10-30	1.25-1.60	0.6-6.0	0.03-0.10	4.5-5.5	Low----------	0.10		
42E---------- Oriskany	0-7	5-15	1.20-1.40	2.0-6.0	0.03-0.10	4.5-5.5	Low----------	0.05	5	.5-2
	7-54	20-35	1.30-1.65	0.6-2.0	0.04-0.12	4.5-5.5	Low----------	0.10		
	54-74	10-30	1.25-1.60	0.6-6.0	0.03-0.10	4.5-5.5	Low----------	0.10		
43E, 43F--------- Peaks	0-4	4-16	1.20-1.40	6.0-20	0.08-0.12	4.5-6.0	Low----------	0.15	2	.5-2
	4-16	5-18	1.20-1.40	6.0-20	0.06-0.10	4.5-6.0	Low----------	0.10		
	16-24	5-18	1.20-1.40	6.0-20	0.06-0.10	4.5-6.0	Low----------	0.05		
	24	---	---	---	---	---	----------	----		
44*. Pits										
45A---------- Purdy	0-7	18-35	1.30-1.50	0.2-0.6	0.18-0.24	3.6-5.5	Moderate-----	0.43	3	2-4
	7-32	35-50	1.30-1.60	<0.2	0.12-0.18	3.6-5.5	Moderate-----	0.32		
	32-65	35-50	1.30-1.60	<0.2	0.10-0.16	3.6-5.5	Moderate-----	0.32		
46F*: Rock outcrop.										
Opequon----------	0-6	27-45	1.20-1.50	0.2-2.0	0.16-0.21	5.1-7.8	High----------	0.37	1	1-4
	6-17	35-75	1.40-1.70	0.2-2.0	0.12-0.16	5.1-7.8	High----------	0.32		
	17	---	---	---	---	---	----------	----		
47C---------- Rushtown	0-13	18-25	1.20-1.40	>6.0	0.06-0.14	4.5-6.0	Low----------	0.17	3	1-3
	13-27	18-27	1.20-1.40	>6.0	0.06-0.14	4.5-6.0	Low----------	0.24		
	27-65	18-27	1.20-1.40	>6.0	0.03-0.12	4.5-6.0	Low----------	0.17		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH				Pct
48C, 48D--------- Sequoia	0-6	15-27	1.30-1.50	0.6-2.0	0.17-0.20	4.5-5.5	Low----------	0.37	3	.5-2
	6-30	35-60	1.35-1.55	0.2-0.6	0.08-0.16	4.5-5.5	Moderate-----	0.24		
	30-65	---	---	---	---	---	----------	----		
49C, 49D--------- Shelocta	0-8	10-25	1.15-1.30	0.6-2.0	0.10-0.18	4.5-5.5	Low----------	0.28	4	.5-5
	8-41	18-34	1.30-1.55	0.6-2.0	0.10-0.20	4.5-5.5	Low----------	0.28		
	41-65	15-34	1.30-1.55	0.6-6.0	0.08-0.16	4.5-5.5	Low----------	0.17		
50B, 50C--------- Shottower	0-10	15-27	1.30-1.45	0.6-6.0	0.14-0.22	3.6-6.0	Low----------	0.32	5	.5-2
	10-17	30-50	1.45-1.60	0.6-2.0	0.10-0.15	3.6-6.0	Moderate-----	0.24		
	17-65	40-70	1.45-1.60	0.6-2.0	0.10-0.14	3.6-6.0	Moderate-----	0.20		
51C, 51D--------- Shottower	0-10	15-27	1.30-1.45	0.6-6.0	0.12-0.18	3.6-6.0	Low----------	0.24	5	.5-2
	10-17	30-50	1.40-1.60	0.6-2.0	0.08-0.12	3.6-6.0	Moderate-----	0.20		
	17-65	40-70	1.40-1.60	0.6-2.0	0.06-0.10	3.6-6.0	Moderate-----	0.17		
52C, 52D--------- Thurmont	0-7	10-25	1.20-1.40	2.0-6.0	0.10-0.15	4.5-6.0	Low----------	0.24	4	.5-2
	7-34	18-35	1.30-1.50	0.6-2.0	0.13-0.18	4.5-5.5	Low----------	0.20		
	34-52	18-30	1.30-1.50	0.6-2.0	0.07-0.12	4.5-5.5	Low----------	0.20		
	52-65	10-20	1.20-1.40	0.6-2.0	0.04-0.08	4.5-5.5	Low----------	0.20		
53B---------- Timberville	0-11	6-25	1.30-1.50	2.0-6.0	0.11-0.20	3.6-6.5	Low----------	0.32	5	1-3
	11-43	35-50	1.30-1.50	0.6-2.0	0.11-0.19	3.6-6.5	Low----------	0.24		
	43-65	35-60	1.40-1.55	0.6-2.0	0.10-0.18	3.6-6.5	Moderate-----	0.24		
54A---------- Toms	0-7	12-20	1.20-1.35	0.6-2.0	0.18-0.22	5.6-7.8	Low----------	0.43	3	2-4
	7-53	35-60	1.25-1.40	0.06-0.2	0.12-0.16	5.6-7.8	Moderate-----	0.32		
	53-65	35-60	1.25-1.40	0.06-0.2	0.12-0.16	5.6-7.8	Moderate-----	0.32		
55B, 55C, 55D---- Tumbling	0-9	10-27	1.20-1.40	0.6-2.0	0.16-0.22	4.5-5.5	Low----------	0.32	5	.5-2
	9-14	25-40	1.20-1.45	0.6-2.0	0.10-0.12	4.5-5.5	Low----------	0.20		
	14-44	35-50	1.20-1.40	0.6-2.0	0.10-0.12	4.5-5.5	Low----------	0.20		
	44-65	35-55	1.20-1.45	0.6-2.0	0.08-0.12	4.5-5.5	Low----------	0.20		
56C, 56D--------- Tumbling	0-9	10-27	1.20-1.40	0.6-2.0	0.18-0.26	4.5-5.5	Low----------	0.22	5	.5-2
	9-14	25-40	1.20-1.45	0.6-2.0	0.10-0.12	4.5-5.5	Low----------	0.20		
	14-44	35-50	1.20-1.40	0.6-2.0	0.10-0.12	4.5-5.5	Low----------	0.20		
	44-65	35-55	1.20-1.45	0.6-2.0	0.08-0.12	4.5-5.5	Low----------	0.20		
57C, 57D--------- Tumbling	0-9	10-27	1.20-1.45	0.6-6.0	0.14-0.18	4.5-5.5	Low----------	0.24	5	.5-2
	9-14	25-40	1.20-1.45	0.6-2.0	0.10-0.12	4.5-5.5	Low----------	0.17		
	14-30	35-50	1.20-1.40	0.6-2.0	0.08-0.12	4.5-5.5	Low----------	0.17		
	30-65	35-55	1.20-1.45	0.6-2.0	0.06-0.10	4.5-5.5	Low----------	0.17		
58C*:										
Tumbling--------	0-9	10-27	1.20-1.40	0.6-2.0	0.16-0.22	4.5-5.5	Low----------	0.32	5	.5-2
	9-14	25-40	1.20-1.45	0.6-2.0	0.10-0.12	4.5-5.5	Low----------	0.20		
	14-44	35-50	1.20-1.40	0.6-2.0	0.10-0.12	4.5-5.5	Low----------	0.20		
	44-65	35-55	1.20-1.45	0.6-2.0	0.08-0.12	4.5-5.5	Low----------	0.20		
Urban land.										
59B---------- Tygart	0-7	15-27	1.20-1.40	0.6-2.0	0.18-0.22	4.5-6.0	Low----------	0.43	3	2-4
	7-49	35-50	1.20-1.50	0.06-0.2	0.10-0.14	3.6-5.5	Moderate-----	0.32		
	49-65	35-50	1.30-1.60	0.06-0.2	0.10-0.14	3.6-5.5	Moderate-----	0.32		
60. Udorthents										
61*: Udorthents.										

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH				Pct
61*:										
Urban land.										
62F*:										
Weikert---------	0-4	15-27	1.20-1.40	2.0-6.0	0.08-0.14	4.5-6.0	Low----------	0.28	2	1-3
	4-16	15-27	1.20-1.40	2.0-6.0	0.04-0.08	4.5-6.0	Low----------	0.28		
	16	---	---	---	---	---	----------	----		
Rock outcrop.										
63A, 64A--------- Wolfgap	0-10	12-30	1.35-1.60	0.6-2.0	0.12-0.18	6.1-8.4	Low----------	0.32	5	1-3
	10-51	18-30	1.45-1.70	0.6-2.0	0.08-0.16	6.1-8.4	Low----------	0.32		
	51-65	8-15	1.50-1.70	6.0-20	0.04-0.08	6.1-8.4	Low----------	0.20		
64B---------- Wolfgap	0-10	12-30	1.35-1.60	0.6-2.0	0.12-0.18	6.1-8.4	Low----------	0.32	5	1-3
	10-51	18-30	1.45-1.70	0.6-2.0	0.08-0.16	6.1-8.4	Low----------	0.32		
	51-65	8-15	1.50-1.70	6.0-20	0.04-0.08	6.1-8.4	Low----------	0.20		
65B---------- Zoar	0-8	15-30	1.20-1.40	0.6-2.0	0.15-0.18	4.5-5.5	Low----------	0.43	3	1-4
	8-48	35-50	1.30-1.60	0.06-0.6	0.12-0.15	4.5-5.5	Moderate-----	0.32		
	48-65	35-50	1.40-1.70	0.06-0.2	0.08-0.12	4.5-5.5	Moderate-----	0.32		

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--SOIL AND WATER FEATURES

("Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means 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	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
1B, 1C: Alonzville	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low	High.
2C, 3C, 3D, 3E: Bailegap	B	None	---	---	>6.0	---	---	40-60	Hard	Moderate	Low	High.
4C*, 4D*, 4E*:												
Berks	C	None	---	---	>6.0	---	---	20-40	Soft	Low	Low	High.
Weikert	C/D	None	---	---	>6.0	---	---	10-20	Soft	Moderate	Moderate	Moderate.
5B: Botetourt	C	Rare	---	---	1.5-2.5	Apparent	Nov-May	>60	---	High	Moderate	High.
6C: Botetourt	C	None	---	---	1.5-2.5	Apparent	Nov-May	>60	---	High	Moderate	High.
7C, 7D: Carbo	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	High	Low.
8C*, 8E*:												
Carbo	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	High	Low.
Opequon	C	None	---	---	>6.0	---	---	12-20	Hard	Moderate	Moderate	Low.
Rock outcrop	D	None	---	---	>6.0	---	---	0	Hard	---	---	---
9C, 9D, 10E: Chilhowie	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	High	Low.
11C*, 11D*, 11E*:												
Chiswell	D	None	---	---	>6.0	---	---	10-20	Soft	Moderate	Moderate	Moderate.
Groseclose	C	None	---	---	>6.0	---	---	>60	---	Moderate	High	High.
12C, 12D, 12E: Dekalb	C	None	---	---	>6.0	---	---	20-40	Hard	Low	Low	High.
13E*, 13F*:												
Dekalb	C	None	---	---	>6.0	---	---	20-40	Hard	Low	Low	High.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
13E*, 13F*:												
Rock outcrop	D	None	---	---	>6.0	---	---	0	Hard	---	---	---
14A Derroc	B	Occasional	Very brief to brief.	Dec-Mar	>6.0	---	---	>60	---	Moderate	Low	Moderate.
15A Derroc	B	Frequent	Very brief to brief.	Dec-Mar	>6.0	---	---	>60	---	Moderate	Low	Moderate.
16C, 16D, 16E Edneytown	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
17B, 17C, 18C Ernest	C	None	---	---	1.5-3.0	Perched	Dec-Apr	>60	---	Moderate	Moderate	Moderate.
19B, 19C Flatwoods	C	None	---	---	1.5-3.0	Perched	Nov-Apr	20-40	Hard	Moderate	High	High.
20B, 20C, 20D, 21C, 21D, 22C, 22D, 22E, 23C, 23D, 24C, 24D Frederick	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	High.
25C*, 25D*:												
Frederick	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	High.
Urban land	---	None	---	---	>2.0	---	---	>10	---	---	---	---
26C Gilpin	C	None	---	---	>6.0	---	---	20-40	Soft	Moderate	Low	High.
27A Gladehill	B	Occasional	Very brief to brief.	Dec-Mar	>6.0	---	---	>60	---	Moderate	Low	Low.
28B, 28C, 28D, 29C, 29D Groseclose	C	None	---	---	>6.0	---	---	>60	---	Moderate	High	High.
30C*, 30D*, 30E*:												
Groseclose	C	None	---	---	>6.0	---	---	>60	---	Moderate	High	High.
Litz	C	None	---	---	>6.0	---	---	20-40	Soft	Moderate	Moderate	High.
31C, 31D Hayesville	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hardness	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In				
32A---------- Irongate	B	Occasional	Very brief	Dec-May	1.5-3.0	Apparent	Dec-Apr	>60	---	Moderate	Low------	High.
33B, 33C---------- Laidig	C	None--------	---	---	2.5-4.0	Perched	Jan-Mar	>60	---	Moderate	Moderate	High.
34B, 34C, 34D----- Laidig	C	None--------	---	---	2.5-4.0	Perched	Jan-Mar	60	---	Moderate	Moderate	High.
35C, 35D, 35E----- Laidig	C	None--------	---	---	2.5-4.0	Perched	Jan-Mar	>60	---	Moderate	Moderate	High.
36D*, 36E*:												
Lehew----------	C	None--------	---	---	>6.0	---	---	20-40	Hard	Low------	Low------	High.
Dekalb----------	C	None--------	---	---	>6.0	---	---	20-40	Hard	Low------	Low------	High.
37C, 37D, 37E----- Lily	B	None--------	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate	High.
38A*---------- Lindside	C	Occasional	Very brief to brief.	Dec-Apr	1.5-3.0	Apparent	Dec-Apr	>60	---	High-----	Moderate	Low.
39A---------- Massanetta	B	Occasional	Very brief	May-Sep	2.0-3.5	Apparent	Jan-Apr	>60	---	Moderate	Low------	Low.
40B, 40C---------- Moomaw	C	None--------	---	---	1.5-3.0	Perched	Dec-Apr	>60	---	Moderate	High-----	High.
41C, 41D, 42E----- Oriskany	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	High.
43E, 43F---------- Peaks	C	None--------	---	---	>6.0	---	---	20-40	Hard	Low------	Low------	High.
44*---------- Pits	---	None--------	---	---	>6.0	---	---	>60	---	---	---	---
45A---------- Purdy	D	None--------	---	---	+1-1.0	Apparent	Nov-Jun	>60	---	High-----	High-----	High.
46F*:												
Rock outcrop-----	D	None--------	---	---	>6.0	---	---	0	Hard	---	---	---
Opequon----------	C	None--------	---	---	>6.0	---	---	12-20	Hard	Moderate	Moderate	Low.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hardness	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In				
47C---------- Rushtown	A	None---------	---	---	>6.0	---	---	>60	---	Low------	Low------	Moderate.
48C, 48D---------- Sequoia	C	None---------	---	---	>6.0	---	---	20-40	Soft	---	High-----	Moderate.
49C, 49D---------- Shelocta	B	None---------	---	---	>6.0	---	---	>60	Hard	---	Low------	High.
50B, 50C, 51C, 51D---------- Shottower	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
52C, 52D---------- Thurmont	B	None---------	---	---	4.0-6.0	Apparent	Jan-Apr	>60	---	Moderate	Moderate	High.
53B---------- Timberville	B	Occasional	Very brief	Apr-Oct	>6.0	---	---	>60	---	Moderate	Low------	High.
54A---------- Toms	C	Rare---------	---	---	0.5-1.5	Perched	Nov-Apr	>60	---	High-----	High-----	High.
55B, 55C, 55D, 56C, 56D, 57C, 57D---------- Tumbling	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
58C*:												
Tumbling----------	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Urban land-------	---	None---------	---	---	>2.0	---	---	>10	---	---	---	---
59B---------- Tygart	D	None---------	---	---	0.5-1.5	Apparent	Dec-May	>60	---	Moderate	High-----	High.
60. Udorthents												
61*: Udorthents.												
Urban land-------	---	None---------	---	---	>2.0	---	---	>10	---	---	---	---
62F*:												
Weikert----------	C/D	None---------	---	---	>6.0	---	---	10-20	Soft	Moderate	Moderate	Moderate.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
62F*:												
Rock outcrop	D	None	---	---	>6.0	---	---	0	Hard	---	---	---
63A Wolfgap	B	Occasional	Very brief to brief.	Dec-Mar	>6.0	---	---	>60	---	Moderate	Low	Moderate.
64A, 64B Wolfgap	B	Rare	---	---	>6.0	---	---	>60	---	Moderate	Low	Moderate.
65B Zoar	C	None	---	---	1.5-2.5	Perched	Dec-Apr	>60	---	Moderate	High	High.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Alonzville	Fine-loamy, siliceous, mesic Typic Hapludults
Bailegap	Fine-loamy, siliceous, mesic Typic Hapludults
Berks	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
Botetourt	Fine-loamy, siliceous, mesic Ultic Hapludalfs
Carbo	Very fine, mixed, mesic Typic Hapludalfs
Chilhowie	Very fine, mixed, mesic Typic Hapludalfs
Chiswell	Loamy-skeletal, mixed, mesic, shallow Typic Dystrochrepts
Dekalb	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
Derroc	Loamy-skeletal, siliceous, mesic Dystric Fluventic Eutrochrepts
Edneytown	Fine-loamy, mixed, mesic Typic Hapludults
Ernest	Fine-loamy, mixed, mesic Aquic Fragiudults
Flatwoods	Clayey, mixed, mesic Aquic Hapludults
Frederick	Clayey, mixed, mesic Typic Paleudults
Gilpin	Fine-loamy, mixed, mesic Typic Hapludults
Gladehill	Coarse-loamy, siliceous, mesic Fluventic Hapludolls
Groseclose	Clayey, mixed, mesic Typic Hapludults
Hayesville	Clayey, kaolinitic, mesic Typic Kanhapludults
Irongate	Coarse-loamy, siliceous, mesic Fluventic Hapludolls
Laidig	Fine-loamy, siliceous, mesic Typic Fragiudults
Lehew	Loamy-skeletal, siliceous, mesic Typic Dystrochrepts
Lily	Fine-loamy, siliceous, mesic Typic Hapludults
Lindside	Fine-silty, mixed, mesic Fluvaquentic Eutrochrepts
Litz	Loamy-skeletal, mixed, mesic Ruptic-Ultic Dystrochrepts
Massanetta	Fine-loamy, carbonatic, mesic Fluvaquentic Hapludolls
Moomaw	Fine-loamy, siliceous, mesic Typic Fragiudults
Opequon	Clayey, mixed, mesic Lithic Hapludalfs
Oriskany	Loamy-skeletal, siliceous, mesic Typic Hapludults
Peaks	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
Purdy	Clayey, mixed, mesic Typic Ochraquults
Rushtown	Loamy-skeletal over fragmental, mixed, mesic Typic Dystrochrepts
Sequoia	Clayey, mixed, mesic Typic Hapludults
Shelocta	Fine-loamy, mixed, mesic Typic Hapludults
Shottower	Clayey, kaolinitic, mesic Typic Paleudults
Thurmont	Fine-loamy, mixed, mesic Typic Hapludults
Timberville	Clayey, mixed, mesic Typic Hapludults
Toms	Fine, mixed, mesic Aeric Ochraqualfs
Tumbling	Clayey, kaolinitic, mesic Typic Paleudults
Tygart	Clayey, mixed, mesic Aeric Ochraquults
Udorthents	Udorthents
Weikert	Loamy-skeletal, mixed, mesic Lithic Dystrochrepts
Wolfgap	Fine-loamy, siliceous, mesic Fluventic Hapludolls
Zoar	Clayey, mixed, mesic Aquic Hapludults

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