United States
Department of
Agriculture

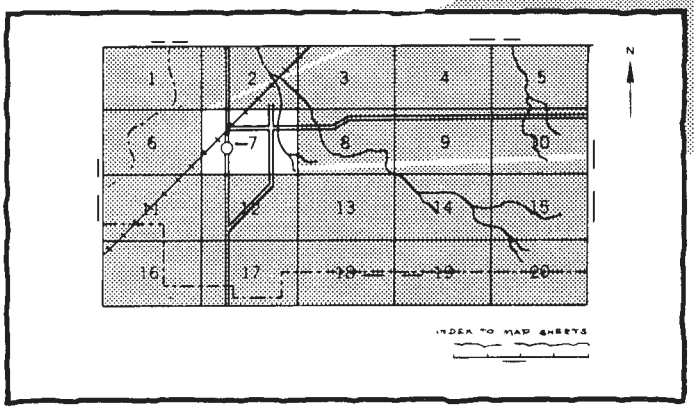
Soil
Conservation
Service

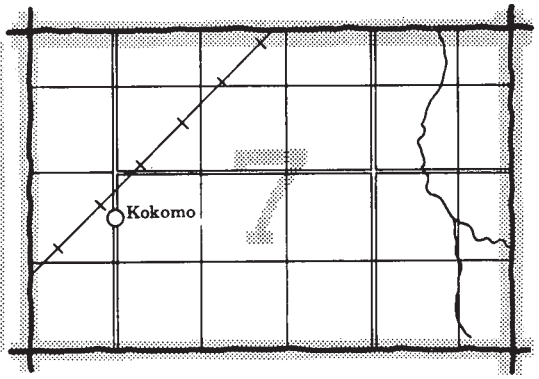
In cooperation with
Virginia Polytechnic Institute
and State University

Soil Survey of Montgomery County Virginia

HOW TO USE

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





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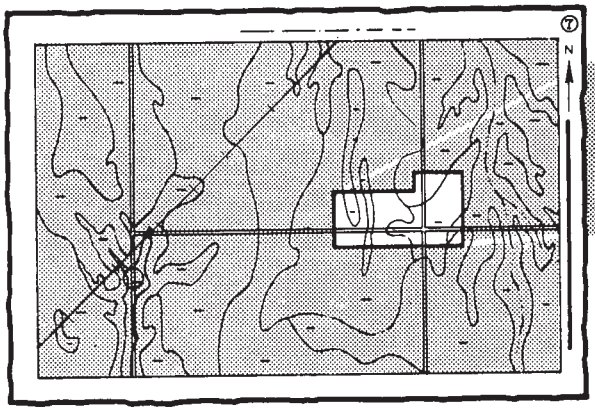
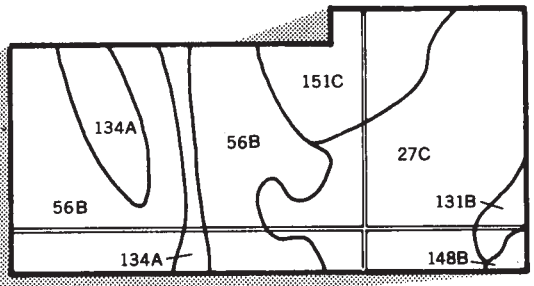
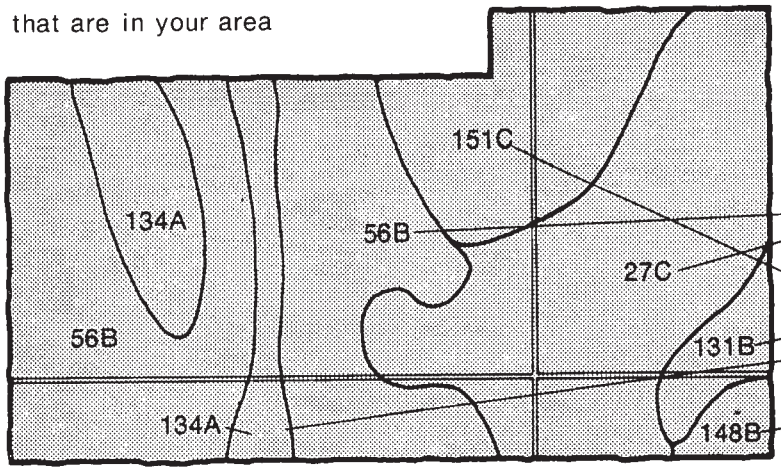




4. List the map unit symbols that are in your area



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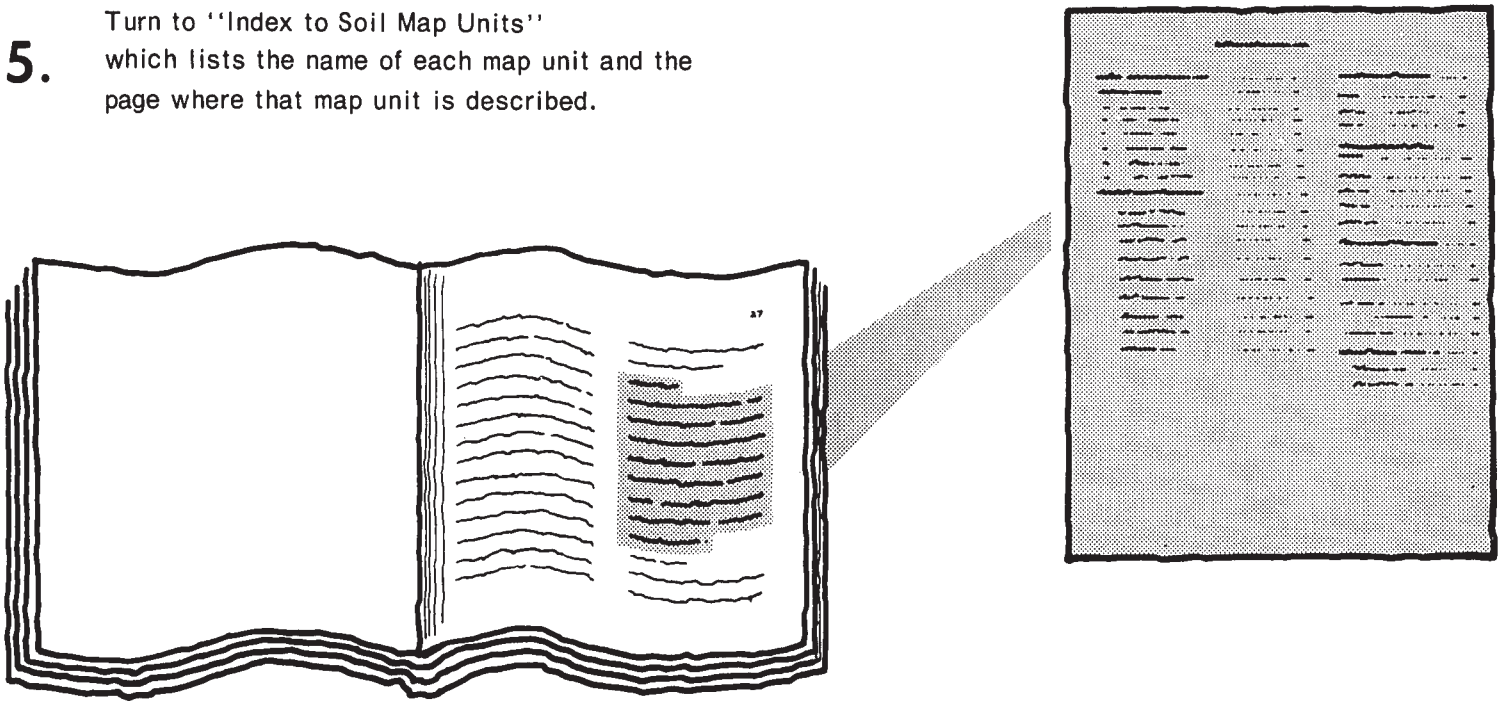
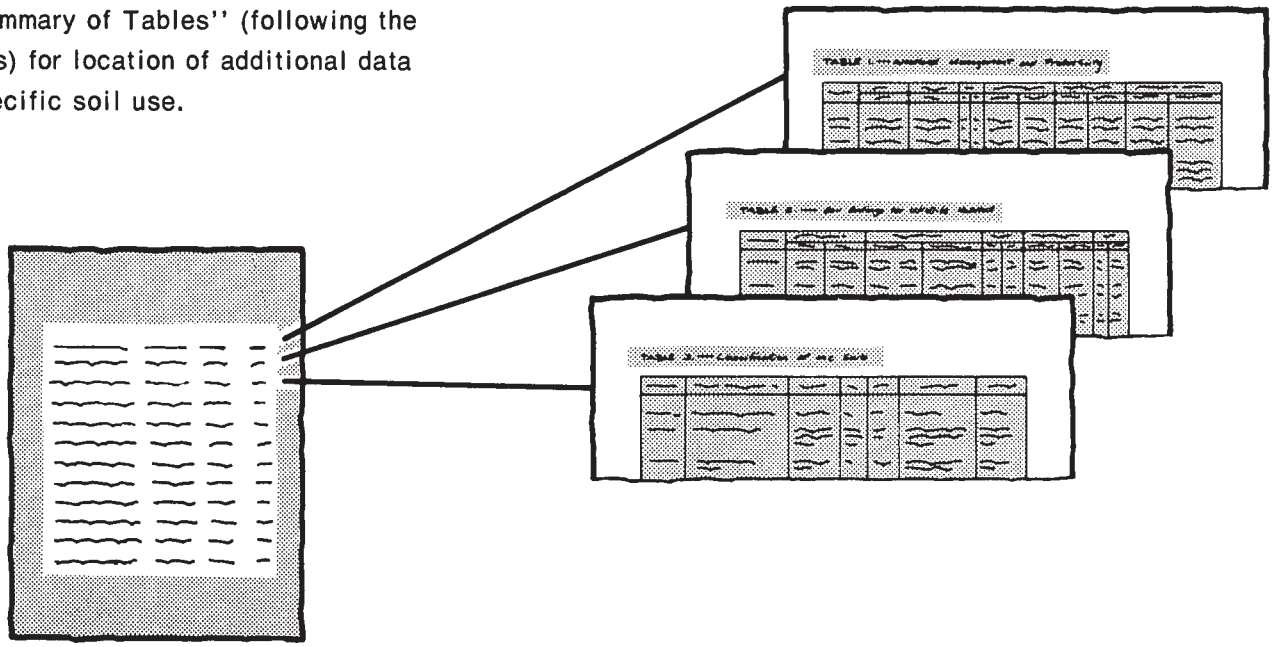
THIS SOIL SURVEY

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



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



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

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

Major fieldwork for this soil survey was performed in the period Feb. 1, 1956 through Jan. 30, 1961. Soil names and descriptions were approved in 1980. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1980. This survey was made cooperatively by the Soil Conservation Service and the Virginia Polytechnic Institute and State University. It is part of the technical assistance furnished to the Skyline 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.

Cover: Groseclose and Poplimento soils, 2 to 7 percent slopes, are on uplands, and Duffield-Ernest complex, 2 to 7 percent slopes, is on colluvial and alluvial landscapes. This area in Draper's Meadow is in the New River drainage basin.

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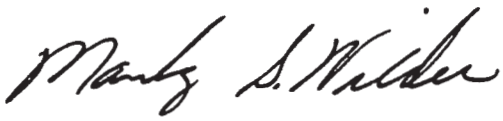
foreword

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

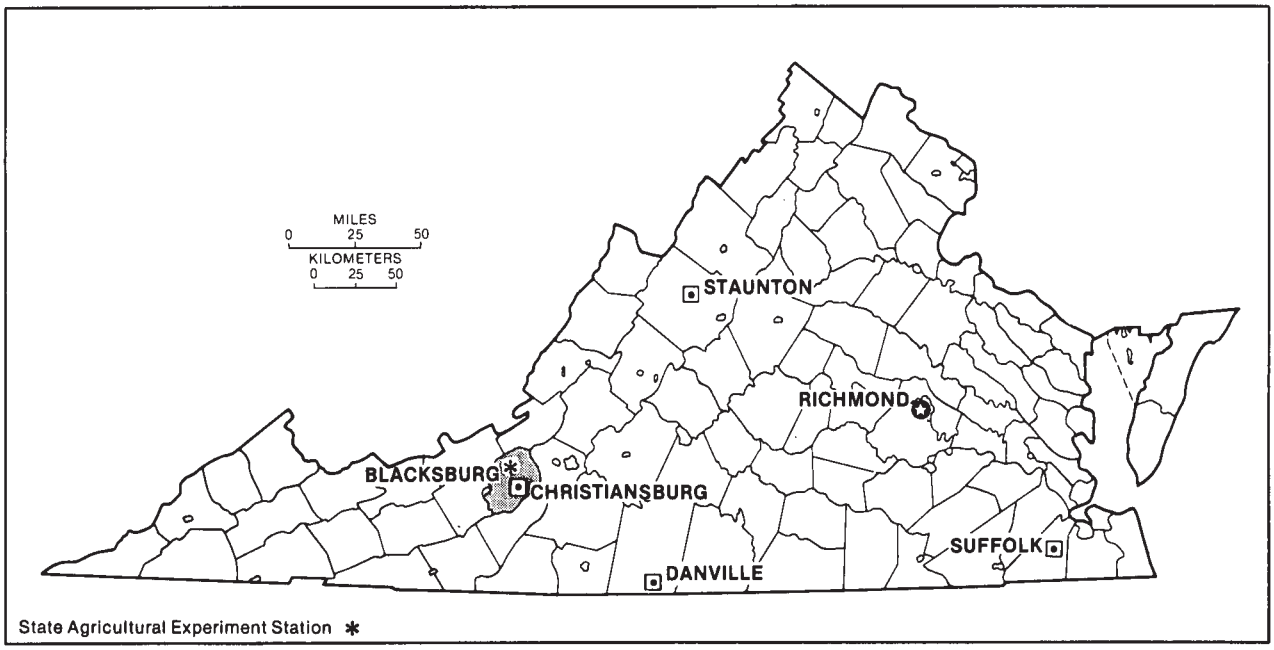
This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers developers, builders, and home buyers can use the survey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

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

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



Manly S. Wilder
State Conservationist
Soil Conservation Service



Location of Montgomery County in Virginia.

soil survey of
Montgomery County, Virginia

By W. H. Creggar and H. C. Hudson, Soil Conservation Service,
and H. C. Porter, Virginia Polytechnic Institute and State University

Field observations by H. L. Mathews, W. J. Edmonds, W. G. Harris,
and K. W. Molten, Virginia Polytechnic Institute and State University

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

This soil survey includes Montgomery County and the city of Radford, which are in southwestern Virginia. Montgomery County has a total of 252,730 acres, or 395 square miles, and the city of Radford covers 3,270 acres, or 5 square miles. Montgomery County is in the Blue Ridge and Ridge and Valley physiographic provinces. The city of Radford is in the Ridge and Valley physiographic province.

Montgomery County was formed from Fincastle County in 1776. It was named for General Richard Montgomery, a war hero killed in the American Revolution. The city of Radford originated from the town of Central City, which was incorporated in 1887. The town was renamed Radford in 1890 and became a city in 1892 (*8*).

This region of southwestern Virginia was first explored in 1671 when an expedition discovered what is now called the New River (*5*). Pioneers from Pennsylvania and eastern Virginia began settling the region in the early 1700's. These early settlers were predominantly of German, French, Scotch-Irish, and English descent.

Christiansburg, the county seat of Montgomery County, was incorporated in 1792 and named in honor of Colonel William Christian. This community was an important stop on the "Wilderness Road," which roughly corresponds to the present day U.S. Route 11.

Blacksburg was incorporated in 1871. The town originated on tracts of land donated by William Black, for whom it was named. A previous settlement, Draper's Meadow, had been established at the same site in the 1740's but was destroyed by Shawnee Indians during the French and Indian War.

In 1970 the population of Montgomery County was 47,157, and that of Radford City was 11,596 (*3*). Montgomery County has become increasingly urbanized since 1950, and over one-third of the county population is now in urban centers.

The two universities in the survey area, Virginia Polytechnic Institute and Radford, are major employers and have had a significant impact on retail sales. Virginia Tech employed nearly 4,500 on-campus personnel and had a student enrollment of over 20,000 in the fall of 1979. Radford University, in the same period, employed over 700 and had an enrollment of over 5,600.

Manufacturing establishments have become increasingly important sources of employment in the area. The Radford Army Ammunition Plant is one of the largest industrial employers. Other industries include electronics, textiles, clothes, machine parts, furniture, and glass.

Farm employment in Montgomery County has been steadily declining since the 1950's. This decline is related to agricultural mechanization and the consolidation of smaller farms. Farmers and farm laborers made up less than 3 percent of the county work force in 1970. Agriculture has decreased in terms of farm products sold, the percent of land area in farms, and the number of farms. Dairy and livestock farming are predominant in the county because the valley soils are generally well suited to pasture, hay, and grain crops.

Nearly 60 percent of Montgomery County is forested. Roughly 7 percent of this forest land is in the Jefferson National Forest; most of the remaining land is privately owned. The predominant forest types are oak-hickory and oak-pine. 1977 estimates of stand-size classes are as follows: sawtimber, 66,835 acres; poletimber, 72,202 acres; and sapling and seedling, 10,547 acres (*9*).

Mineral resources in the survey area are varied. Limestone is an abundant resource and is mined extensively. Quartz sand is mined from sandstone along the southeastern slope of Paris Mountain near Ironto. Semi-anthracite coal mines on Brush and Price Mountains, once of major economic importance, are now abandoned. Small amounts of valuable metals such as iron, copper, tin, and gold have been detected but are not presently mined.

general nature of the county

This section provides information on the climate of the county and describes the physiography, relief, and drainage of the area.

climate

Prepared by Virginia Polytechnic Institute and State University, Blacksburg, Virginia (*7*).

Table 1 gives data on temperature and precipitation for the survey area as recorded at Blacksburg, Virginia, in the period 1953 to 1978. 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 32 degrees F, and the average daily minimum temperature is 22 degrees. The lowest temperature on record, which occurred at Blacksburg on January 10, 1970, is -12 degrees. In summer the average temperature is 69 degrees, and the average daily maximum temperature is 81 degrees. The highest recorded temperature, which occurred at Blacksburg on July 14, 1954, is 99 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 40 inches. Of this, 21 inches, or 53 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 19 inches. The heaviest 1-day rainfall during the period of record was 3.8 inches at Blacksburg on June 17, 1976. Thunderstorms occur on about 12 days each year, and most occur in summer.

Average seasonal snowfall is 28 inches. The greatest snow depth at any one time during the period of record was 33 inches. On an average of 7 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 66 percent. Humidity is higher at night, and the average at dawn is about 81 percent. The sun shines 60 percent of the time in summer and about 50 percent in winter. The prevailing wind is from the west. Average windspeed is highest, 8 miles per hour, in March.

physiography, relief, and drainage

Montgomery County is composed of mountains and valleys formed by erosion. They formed during a long interval of geologic time in which the landscape had reached a condition of dynamic equilibrium between the landforms and bedrock (*6*). A divide, separating the New River drainage to the Gulf of Mexico and the Roanoke River drainage to the Atlantic Ocean (*4*), crosses the county roughly through the center from north to south. Two distinctly different geomorphic surfaces have developed in response to these drainage systems.

The New River drainage basin is a gently rolling land surface moderately dissected by relatively shallow to moderately deep drainageways. The area is composed primarily of broad, gently sloping ridges bordered by long, sloping side slopes. Maximum relief is about 1,300 feet, and local relief generally ranges from 10 to 50 feet.

The Roanoke River drainage basin is a hilly land surface highly dissected by deep to very deep drainageways. The area is composed primarily of long, steep side slopes bordering narrow, moderately steep ridges. Maximum relief is about 2,500 feet, and local relief generally ranges from 500 to more than 1,000 feet.

The southeastern part of the county consists primarily of long, very steep side slopes bordering narrow, moderately steep, northeast-southwest hogback ridges. These areas are underlain by clastic sedimentary rocks. Relief generally ranges from about 1,000 to 2,500 feet and represents the maximum relief in the survey area. The crest of the ridge, underlain by crystalline rocks, is a broad upland drained by the Little River. This plateau is composed of broad, rounded, sloping ridges bordered by long, moderately steep and steep side slopes. Relief and steepness of slope increase with proximity to the Little River.

how this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles.

A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

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

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

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, rangeland and woodland managers, engineers, planners, developers and builders, home buyers, and others.

general soil map units

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

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

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

Use of the general soil map for certain broad interpretations can be facilitated by information such as the slope and aspect of soils. Slope is important because it affects soil properties and interpretations, including the rate of erosion and the use of equipment. Aspect, which determines the exposure of soils to the sun's rays, is the azimuth, or compass direction, that the slope faces. Differences in aspect can account for differences in soil temperature, soil moisture, and vegetative cover.

Information about slopes and their aspect has been developed for most of the general soil map units in Montgomery County based on topographic maps. Table 4 gives information about the distribution of slope classes and aspect for areas that are 1 or 9 square miles. Six slope classes are tabulated against eight azimuths, and the marginal total and cumulative percentages are given. This information can be used for many interpretations where preliminary land planning is needed, and particularly for the initial planning for woodland management of large areas.

soil descriptions

1. Groseclose-Poplimento-Duffield

Deep, well drained, gently sloping to steep soils that have a clayey subsoil and formed in limestone, shale, and sandstone residuum and colluvium; or moderately dissected uplands

These soils are on broad, moderately dissected uplands. Sinkholes are common in some areas. Slopes are dominantly 0 to 25 percent, but steeper slopes are near the New River and other streams.

This map unit covers about 22 percent of the survey area. It is about 21 percent Groseclose soils, 15 percent Poplimento soils, and 9 percent Duffield soils. The remaining 55 percent is minor soils.

The Groseclose, Poplimento, and Duffield soils are on broad ridgetops and side slopes. They have a loam or silt loam surface layer and a clay subsoil. In some areas the surface layer is cherty.

The minor soils in this map unit are in the Berks, Caneyville, Lowell, Opequon, Rayne, Vertrees, Ernest, McGary, Ross, and Weaver series. The well drained Berks, Caneyville, Lowell, Opequon, Rayne, and Vertrees soils and moderately well drained Ernest soils are on ridgetops and side slopes; and the somewhat poorly drained McGary, the well drained Ross, and the moderately well drained Weaver soils are on flood plains.

Most of the acreage is cleared for agricultural and urban use.

The soils in this map unit are well suited to farming. The soils on the broad, gently sloping ridges are suited to cultivated crops, such as corn, small grains, and alfalfa. The steeper soils are suited to pasture. The major limitations for farming are the low natural fertility and the acidity of the soils. The erosion hazard is severe in steep areas. Scattered areas of stony and rocky soils are poorly suited to cultivation.

Potential for timber production is very high or high in most areas. Woodland management concerns are slight.

The clayey subsoil, slow permeability, low strength, high shrink-swell potential, and slope limit the nonfarm uses of these soils. Slope limits urban development in about 30 percent of this unit. Ground-water pollution by seepage from septic tank absorption fields is a hazard in limestone areas that have sinkholes.

2. Caneyville-Opequon-Rock outcrop

Moderately deep and shallow, well drained, moderately steep to very steep soils that have a clayey subsoil and formed in limestone and shale residuum, and Rock outcrop; on highly dissected uplands

These soils and Rock outcrop are on highly dissected uplands that have deep, winding, V-shaped hollows. They are drained by tributaries of the north and south forks of the Roanoke River. Some areas have sinkholes and subsurface drainage. Slopes are dominantly 25 to more than 60 percent, but a few areas on ridgetops and flood plains and along drainageways have gentler slopes.

This map unit covers about 17 percent of the survey area. It is about 20 percent Caneyville soils, 17 percent Opequon soils, and 13 percent Rock outcrop. The remaining 50 percent is minor soils.

The Caneyville and Opequon soils and Rock outcrop are commonly on long side slopes and narrow, convex ridgetops. The moderately deep Caneyville soils have a silt loam surface layer and a clay subsoil. The Opequon soils have a silty clay loam surface layer and a clay subsoil.

The minor soils in this map unit are in the Berks, Frederick, Groseclose, Lowell, Rayne, Wurno, Ernest, Duffield, Weaver, and Ross series. The well drained Berks, Frederick, Groseclose, Lowell, Rayne, and Wurno soils and moderately well drained Ernest soils are on ridgetops and side slopes; the well drained Duffield soils are on foot slopes, in upland depressions, and along drainageways; and the moderately well drained Weaver soils and well drained Ross soils are on flood plains.

The soils in this map unit are mostly in woodland. Potential for timber production is moderately high or high in most areas. Slope and Rock outcrop limit the use of equipment for managing and harvesting timber. The erosion hazard is severe.

Slope, depth to bedrock, and Rock outcrop are major limitations for agricultural and urban uses of these soils. Slope limits urban development in about 95 percent of this map unit.

3. Berks-Groseclose-Lowell

Moderately deep and deep, well drained, gently sloping to very steep soils that have a loamy and clayey subsoil and formed in shale, limestone, and sandstone residuum; on moderately dissected uplands

These soils are on moderately dissected uplands. Some areas have trellised drainage patterns and narrow, linear ridges with common shale outcrops. A few areas have scattered sinkholes. Slopes are dominantly 0 to 25 percent, but steeper slopes are near the New River and other streams.

This map unit covers about 8 percent of the survey area. It is about 30 percent Berks soils, 15 percent Groseclose soils, and 15 percent Lowell soils. The remaining 40 percent is minor soils.

The Berks, Groseclose, and Lowell soils are on broad and narrow ridgetops and sloping to steep side slopes. The moderately deep Berks soils have a shaly silt loam or shaly loam surface layer and subsoil. The deep Groseclose soils have a loam or silt loam surface layer and a clay subsoil. The deep Lowell soils have a silt loam surface layer and a silty clay subsoil. Shale or limestone outcrops occur in scattered areas.

The minor soils in this map unit are in the Braddock, Unison, Caneyville, Opequon, Rayne, Ernest, Duffield, Jefferson, McGary, Ross, and Weaver series. The well drained Braddock and Unison soils are on dissected stream terraces; the well drained Caneyville, Opequon, and Rayne soils and moderately well drained Ernest soils are on side slopes and ridgetops; the well drained Duffield and Jefferson soils are in drainageways and on colluvial fans; and the somewhat poorly drained McGary, well drained Ross, and moderately well drained Weaver soils are on flood plains.

The soils in this map unit are well suited to farming, and most of the acreage is cleared for cultivation or pasture. The soils on the broad, gently sloping ridges are suited to corn, small grains, and alfalfa. The steeper soils are suited to pasture. The major limitations for farming are the low natural fertility and the acidity of the soils. The low available water capacity is also a limitation for the Berk soils. The erosion hazard is severe on side slopes. Scattered areas of stony and rocky soils are poorly suited to cultivation.

Potential for timber production is high or moderately high in most areas. Woodland management concerns are slight.

The clayey subsoil, low strength, slow permeability, high shrink-swell potential, depth to bedrock, and slope are limitations for nonfarm uses of these soils. Slope limits urban development in about 25 percent of this unit. Ground-water pollution by seepage from septic tank absorption fields is a hazard, especially in limestone areas that have sinkholes.

4. Berks-Lowell-Rayne

Moderately deep and deep, well drained, moderately steep to very steep soils that have a loamy and clayey subsoil and formed in shale, limestone, and sandstone residuum; on highly dissected uplands

These soils are on highly dissected uplands that have rounded hills and deep, winding, V-shaped valleys. They are drained by tributaries of the south fork of the Roanoke River. Slopes are dominantly 25 to more than 60 percent, but a few areas on ridgetops and flood plains and along drainageways have gentler slopes.

This map unit covers about 12 percent of the survey area. It is about 40 percent Berk soils, 25 percent Lowell

soils, and 15 percent Rayne soils. The remaining 20 percent is minor soils.

The Berks, Lowell, and Rayne soils are in complex patterns on side slopes and ridgetops. The moderately deep Berks soils have a shaly silt loam or shaly loam surface layer and subsoil. The deep Lowell soils have a silt loam surface layer and a silty clay subsoil. The deep Rayne soils have a silt loam or shaly silt loam surface layer and a silty clay loam or shaly clay loam subsoil. Shale or limestone outcrops are in scattered areas.

The minor soils in this map unit are in the Caneyville, Opequon, Ernest, Duffield, Hayter, Jefferson, McGary, Ross, and Weaver series. The well drained Caneyville and Opequon soils and the moderately well drained Ernest soils are on side slopes; the well drained Duffield, Hayter, and Jefferson soils are along drainageways and on terraces and colluvial fans; and the somewhat poorly drained McGary soils, the well drained Ross soils, and the moderately well drained Weaver soils are on flood plains.

The soils in this map unit are mostly in woodland. Potential for timber production is moderately high or high. Slope limits the use of equipment for managing and harvesting timber. The erosion hazard is severe.

Slope is the major limitation for agricultural and nonfarm uses of these soils. Slope limits urban development in more than 95 percent of this map unit.

5. Berks-Weikert

Moderately deep and shallow, well drained, moderately steep to very steep soils that have a loamy subsoil and formed in acid shale and sandstone residuum; on mountains and highly dissected uplands

These soils are on highly dissected uplands. Slopes are dominantly 15 to more than 60 percent. Very steep areas are on Poor Mountain, and moderately steep areas are north of Ironto.

This map unit covers about 32 percent of the survey area. It is about 40 percent Berks soils, 16 percent Weikert soils, and 44 percent minor soils.

The Berks and Weikert soils are on side slopes and narrow to moderately broad ridgetops. They have a shaly silt loam surface layer and subsoil. The Berks soils are moderately deep, and the Weikert soils are shallow to shale bedrock. Rock outcrop and stones are common in mountainous areas.

The minor soils in this map unit are in the Clymer, Craigsville, and Jefferson series. The well drained Clymer soils are on ridgetops; the well drained Craigsville soils are on flood plains; and the well drained Jefferson soils are on colluvial fans and along drainageways.

The soils in this map unit are mostly in woodland. Potential for timber production is low to moderately high. Seedling mortality is a concern on the Weikert soil. Slope limits the use of equipment for managing and harvesting timber.

Slope, low available water capacity, acidity, and low natural fertility are the major limitations for farming. Slope limits urban development in more than 80 percent of this map unit. Depth to bedrock is also a limitation.

6. Glenelg-Parker

Deep, well drained and somewhat excessively drained, gently sloping to steep soils that have a loamy subsoil and formed in granite, gneiss, and schist residuum; on moderately to highly dissected uplands

These soils are on dissected uplands that have broad, gently sloping to sloping ridgetops and moderately steep to steep side slopes (fig. 1). Drainage patterns are mainly dendritic. Slopes are dominantly 0 to 45 percent. Steep areas are near Little River and Bottom Creek, and sloping areas are south and east of Pilot.

This map unit covers about 5 percent of the survey area. It is about 50 percent Glenelg soils, 25 percent Parker soils, and 25 percent minor soils.

The Glenelg and Parker soils are on ridgetops and side slopes. The well drained, gently sloping to very steep Glenelg soils typically have a loam surface layer and a silty clay loam subsoil. The somewhat excessively drained, strongly sloping to very steep Parker soils typically have a gravelly or channery loam surface layer and subsoil.

The minor soils in this map unit are in the Hayter and French series. The well drained Hayter soils are on terraces and alluvial fans, and the somewhat poorly drained French soils are on flood plains. A few areas have scattered granite outcrops and quartz pebbles and cobblestones on the surface.

The soils in this map unit are well suited to farming, and most of the acreage is cleared for pasture or cultivation. Slope and low available water capacity are limitations for the Parker soils. The soils on the broad, gently sloping and sloping ridgetops and side slopes are suited to corn, small grains, and alfalfa. The steeper areas are suited to pasture. The erosion hazard is severe on side slopes.

Potential for timber production is moderately high or high in most areas. Woodland management concerns are slight.

Slope, depth to rock, and moderate permeability limit nonfarm uses of these soils. The broad, gently sloping ridges are generally well suited to dwellings.

7. Unison-Braddock

Deep, well drained, gently sloping to moderately steep soils that have a clayey subsoil and formed in old alluvium; on stream terraces and alluvium fans

These soils are on remnants of old stream terraces and on alluvial fans. Most surfaces are broad and gently sloping and have common sinkholes where the old alluvium is underlain by limestone. Small areas of

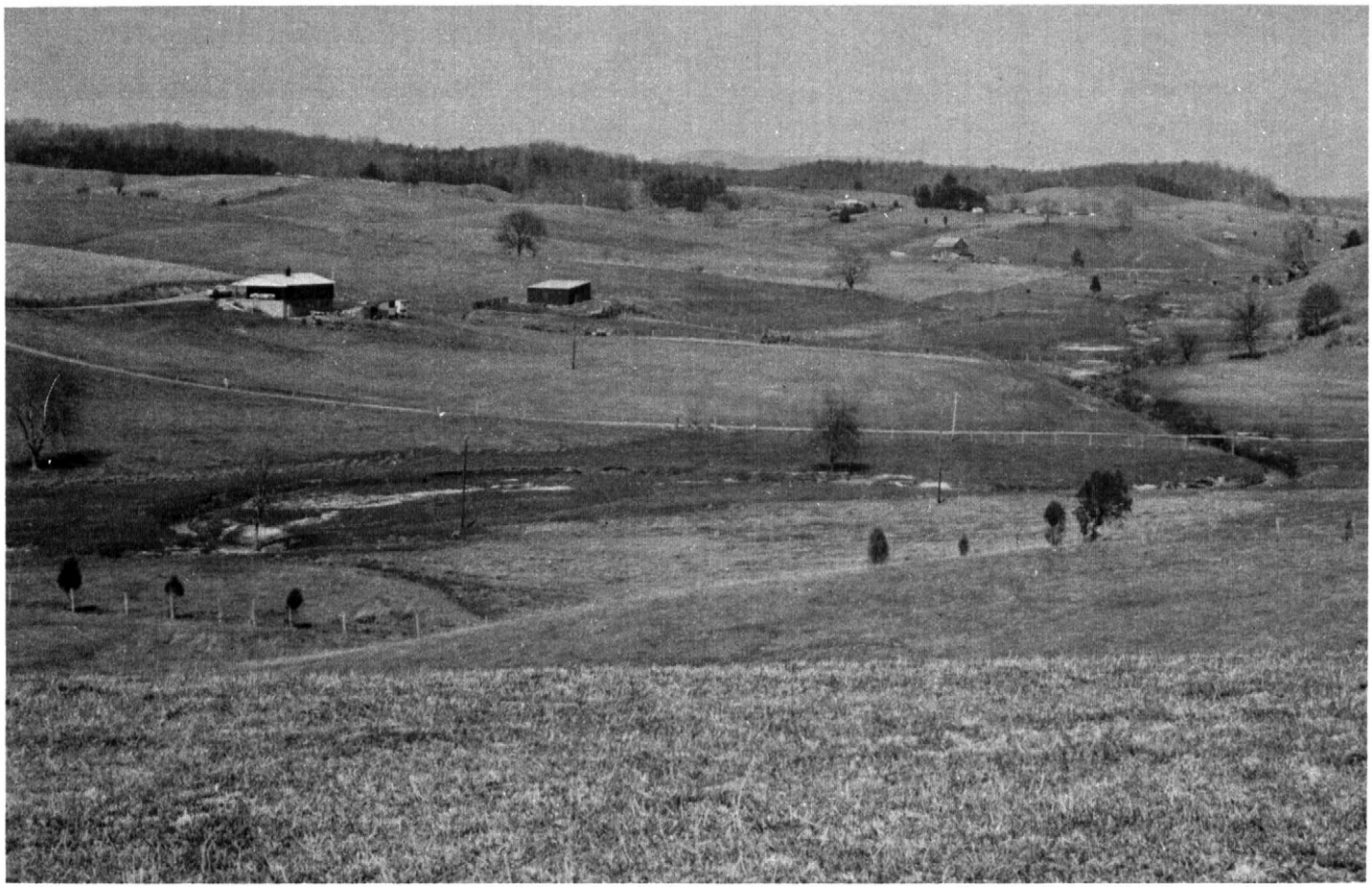


Figure 1.—Glenelg and Parker soils are on uplands, and French and Guernsey soils are along drainageways. This area near Pilot is a typical Glenelg-Parker landscape.

residual soils are on the steep side slopes created by stream downcutting. A few areas of moderately steep terrace soils occur where material from the original surface layer has been beveled or reworked. Slopes are dominantly 0 to 25 percent, but areas of steeper slopes are included.

This map unit makes up about 4 percent of the survey area. It is about 34 percent Unison soils, 15 percent Braddock soils, and 51 percent minor soils.

The surface layer of the Unison and Braddock soils is fine sandy loam or loam, and the subsoil is clay. Rounded pebbles and cobblestones are on the surface and throughout the soil in some areas.

The minor soils in this map unit are in the Berks, Caneyville, Groseclose, Opequon, Weikert, Duffield, Hayter, Guernsey, McGary, Ross, and Weaver series. The well drained Berks, Caneyville, Groseclose, Opequon, and Weikert soils are on side slopes and ridgetops; the well drained Duffield soils are on foot slopes, in upland depressions, and along drainageways; the well drained Hayter soils and moderately well drained Guernsey soils are on terraces; and the somewhat poorly drained McGary soils, well drained Ross soils, and moderately well drained Weaver soils are on flood plains.

Most of the acreage is cleared for agricultural and urban use.

The soils in this map unit are well suited to farming. The soils in the broad, gently sloping areas are suited to corn, small grains, and alfalfa. The steeper areas are suited to pasture. The major limitations for farming are the acidity of the soil, the low natural fertility, and, in some areas, the high content of coarse fragments. The erosion hazard is severe on side slopes.

Potential for timber production is moderately high to high. Woodland management concerns are slight.

The clayey subsoil, moderate permeability, low strength, and slope limit nonfarm uses of these soils.

detailed soil map units

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

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

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

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

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Glenelg loam, 2 to 7 percent slopes, is one of several phases in the Glenelg series.

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

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Berks-Groseclose complex, 7 to 15 percent slopes is an example.

An *undifferentiated group* is made up of two or more soils that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils in a mapped area are not uniform. An area can be made up of only one of the major soils, or it can be made up of all of them. Berks and Weikert soils, 25 to 65 percent slopes is an undifferentiated group in this survey area.

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. Gravel pit is an example. Miscellaneous areas are shown by a special symbol on the soil maps.

Table 5 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

1C—Berks-Clymer complex, 7 to 15 percent slopes. These well drained, strongly sloping soils are on ridgetops and side slopes. This complex is about 50 percent moderately deep Berks soils, 30 percent deep Clymer soils, and 20 percent other soils. The Berks and Clymer soils are so intermingled that they could not be shown separately at the scale selected for mapping. Areas range from about 5 to 50 acres.

In a typical profile of the Berks soil (fig. 2), the surface layer is very dark grayish brown and brown shaly silt loam about 5 inches thick. The subsoil is yellowish brown shaly silt loam about 17 inches thick. The substratum is yellowish brown very shaly silt loam about 5 inches thick. Soft shale bedrock is at a depth of about 27 inches.

In a typical profile of the Clymer soil, the surface layer is yellowish brown loam about 9 inches thick. The subsoil is about 23 inches thick. It is yellowish brown clay loam in the upper part and channery sandy clay loam in the lower part. The substratum is channery sandy loam mottled in shades of brown, yellow, and red and is about 17 inches thick. Hard sandstone bedrock is at a depth of 49 inches.

Included with this complex in mapping are small areas

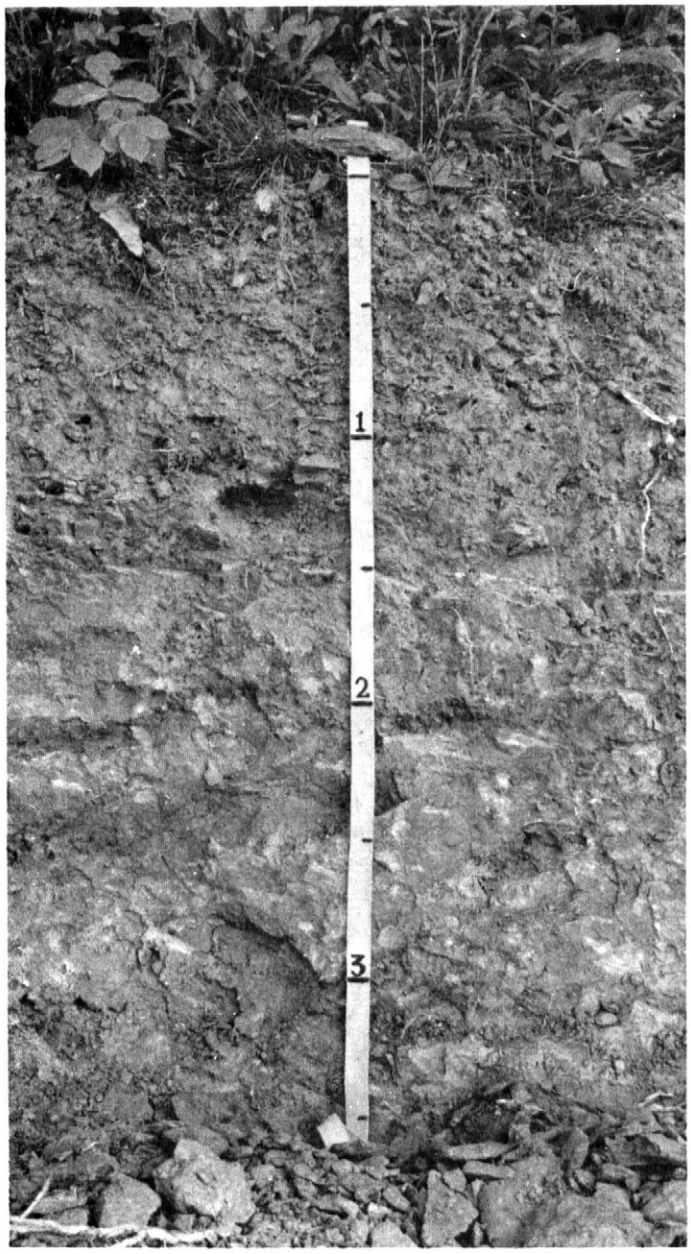


Figure 2.—Profile of Berks soil in an area of Berks-Clymer complex, 7 to 15 percent slopes, showing high concentration of shale fragments.

of Jefferson and Weikert soils. Weikert soils are on ridgetops and side slopes. Jefferson soils are on foot slopes and along drainageways. Some delineations contain soils with reddish colors derived from red shale and sandstone. These soils have the same use and management as the Berks and Clymer soils. Outcrops of shale, sandstone, and quartzite and areas with stones are in some delineations.

Permeability is moderate in the Berks and Clymer soils, and the available water capacity is low. Surface runoff is rapid. Potential frost action is low in the Berks soil and moderate in the Clymer soil. The shrink-swell potential is low in both soils. Natural fertility is low, and the organic matter content is low or moderate. The rooting zone and depth to bedrock range from 20 to 40 inches in the Berks soils and from 40 to 60 inches in the Clymer soil. Root growth is restricted in the Berks soil by a high content of coarse fragments. The surface layer and subsoil in unlimed areas are extremely acid through strongly acid.

These soils are used mainly for woodland.

Cultivated crops are fairly well suited to these soils, especially corn, small grains, and grasses and legumes. Crop production is limited by a severe erosion hazard, by a high content of coarse fragments in the Berks soil, and by the low available water capacity, acidity, and low natural fertility in both soils. Tilth is fair. The high content of coarse fragments in the Berks soil interferes with tillage and reduces plant populations. If these soils are cultivated, contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff and help control erosion. Crop yields can be increased by applications of lime and fertilizer.

Pasture grasses and legumes are fairly well suited to these soils. The major limitations are low available water capacity, acidity, low natural fertility, and a high content of coarse fragments. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer are useful management procedures.

Timber production is moderately high on the Berks soil and high on the Clymer soil. These soils are easily managed for woodland. Urban development of these soils is limited by depth to bedrock, seepage, small stones, and slope.

This complex is in capability subclass IIIe.

2B—Berks-Groseclose complex, 2 to 7 percent slopes. These well drained, gently sloping soils are on ridgetops. This complex is about 40 percent moderately deep Berks soils, 35 percent deep Groseclose soils, and 25 percent other soils. The Berks and Groseclose soils are so intermingled that they could not be shown separately at the scale selected for mapping. Areas range from about 5 to 50 acres.

In a typical profile of the Berks soil, the surface layer is brown shaly silt loam about 5 inches thick. The subsoil is yellowish brown shaly silt loam about 17 inches thick. The substratum is very shaly silt loam mottled in shades of brown, yellow, and red. It is about 7 inches thick. Soft shale bedrock is at a depth of about 29 inches.

In a typical profile of the Groseclose soil, the surface layer is brown silt loam about 6 inches thick. The subsoil is strong brown, sticky and plastic clay mottled in shades of brown, yellow, and red. It is about 29 inches thick.

The substratum is clay loam mottled in shades of yellow, brown, and red below a depth of about 35 inches.

Included with this complex in mapping are small areas of Carbo, Lowell, Rayne, Weikert, Braddock, Unison, Duffield, and Ernest soils. Carbo, Lowell, Rayne, and Weikert soils are on ridgetops. Braddock and Unison soils are on stream terraces. Duffield and Ernest soils are on foot slopes, in upland depressions, and along drainageways. Some delineations contain soils with reddish colors derived from red shale and sandstone. These soils have the same use and management as the Berks and Groseclose soils. Outcrops of shale, siltstone, limestone, and sandstone and areas with cobbles and pebbles are in some delineations.

Permeability is moderate in the Berks soil and slow in the Groseclose soil. The available water capacity is low in the Berks soil and moderate in the Groseclose soil. Surface runoff is medium from both soils. Potential frost action is low in the Berks soil and moderate in the Groseclose soil. Shrink-swell potential is low in the Berks soil and high in the Groseclose soil. The natural fertility of both soils is low. The organic matter content is low to moderate in the Berks soil and in the Groseclose soil. The thickness of the rooting zone and depth to bedrock range from 20 to 40 inches in the Berks soil and are more than 48 inches in the Groseclose soil. Root growth is restricted in the Berks soil by a high content of coarse fragments. The surface layer and subsoil in unlimed areas range from extremely acid through strongly acid.

These soils are used mainly for cultivated crops and pasture.

Cultivated crops are well suited to these soils, especially corn, small grains, alfalfa, and grasses and legumes. Crop production is limited by a high content of coarse fragments and the low available water capacity of the Berks soil and by a moderate erosion hazard. Tilth is only fair. A high content of coarse fragments interferes with tillage and reduces plant populations. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff and help to control erosion. Crop yields can be increased by applications of lime and fertilizer.

Pasture grasses and legumes are well suited to these soils. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer are useful management procedures.

Timber production is moderately high on the Berks soil and high on the Groseclose soil. These soils are easily managed for woodland.

Urban development of these soils is limited by depth to bedrock, slow permeability, a clayey subsoil, high shrink-swell potential, low strength, seepage, and small stones.

This complex is in capability subclass IIe.

2C—Berks-Groseclose complex, 7 to 15 percent slopes. These well drained, strongly sloping soils are on side slopes and ridgetops. This complex is about 40 percent moderately deep Berks soils, 35 percent deep Groseclose soils, and about 25 percent other soils. The Berks and Groseclose soils are so intermingled that they could not be shown separately at the scale selected for mapping. Areas range from about 5 to 50 acres.

In a typical profile of the Berks soil, the surface layer is brown shaly silt loam about 5 inches thick. The subsoil is yellowish brown shaly silt loam about 17 inches thick. The substratum is very shaly silt loam mottled in shades of brown, yellow, and red. It is about 7 inches thick. Soft shale bedrock is at a depth of about 29 inches.

In a typical profile of the Groseclose soil, the surface layer is brown silt loam about 6 inches thick. The subsoil is strong brown clay mottled with brownish yellow, yellowish red, and dark red. It is about 29 inches thick. The substratum is clay loam mottled in shades of yellow, brown, and red and is below a depth of about 35 inches.

Included with this complex in mapping are small areas of Braddock, Unison, Carbo, Lowell, Rayne, Weikert, Duffield, and Ernest soils. Braddock and Unison soils are on stream terraces. Carbo, Lowell, Rayne, and Weikert soils are on side slopes and ridgetops. Duffield and Ernest soils are on foot slopes, in upland depressions, and along drainageways. Some delineations contain soils with reddish colors derived from red shale and sandstone. These soils have the same use and management as the Berks and Groseclose soils. Outcrops of shale, siltstone, limestone, and sandstone and areas with cobbles and pebbles are in some delineations.

Permeability is moderate in the Berks soil and slow in the Groseclose soil. The available water capacity is low in the Berks soil and moderate in the Groseclose soil. Surface runoff is rapid from both soils. Potential frost action is low in the Berks soil and moderate in the Groseclose soil. The shrink-swell potential is low in the Berks soil and high in the Groseclose soil. Natural fertility is low in both soils. The organic matter content is low to moderate in the Berks soil and in the Groseclose soil. The thickness of the rooting zone and depth to bedrock range from 20 to 40 inches in the Berks soil and are more than 48 inches in the Groseclose soil. Root growth is restricted in the Berks soil by a high content of coarse fragments. The surface layer and subsoil in unlimed areas range from extremely acid through strongly acid.

These soils are used mainly for cultivated crops and pasture.

Cultivated crops are well suited to these soils, especially corn, small grains, alfalfa, and grasses and legumes for hay. Crop production is limited by a high content of coarse fragments and the low available water capacity of the Berks soil and by a severe erosion hazard. Tilth is only fair. A high content of coarse

fragments interferes with tillage and reduces plant populations. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff and help control erosion. Crop yields can be increased by applications of lime and fertilizer.

Pasture grasses and legumes are well suited to these soils. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer are useful management procedures.

Timber production is moderately high on the Berks soil and high on the Groseclose soil. These soils are easily managed for woodland.

Urban development of these soils is limited by depth to bedrock, slow permeability, a clayey subsoil, high shrink-swell potential, low strength, seepage, small stones, and slope.

This complex is in capability subclass IIIe.

3D—Berks-Lowell-Rayne complex, 15 to 25 percent slopes. These well drained, moderately steep soils are on side slopes. This complex is about 35 percent moderately deep Berks soils, 30 percent deep Lowell soils, 20 percent deep Rayne soils, and 15 percent other soils. Berks, Lowell, and Rayne soils are so intermingled that they could not be shown separately at the scale selected for mapping. Areas range from about 5 to 50 acres.

In a typical profile of the Berks soil, the surface layer is dark brown shaly silt loam about 7 inches thick. The subsoil is brown shaly silt loam mottled with brownish yellow. It is about 16 inches thick. The substratum is brownish yellow very shaly silt loam about 10 inches thick. Soft shale bedrock is at a depth of about 33 inches.

In a typical profile of the Lowell soil, the surface layer is dark brown and light yellowish brown silt loam about 7 inches thick. The subsoil is sticky and plastic silty clay about 25 inches thick. It is yellowish brown in the upper part and strong brown in the lower part. The substratum is strong brown channery clay about 18 inches thick. Calcareous shale and limestone bedrock is at a depth of about 50 inches.

In a typical profile of the Rayne soil, the surface layer is dark yellowish brown shaly loam about 7 inches thick. The subsoil is strong brown shaly silty clay loam mottled in shades of brown, yellow, green, and black. It is about 46 inches thick. The substratum is shaly silty clay loam mottled in shades of brown, yellow, green, and red.

Included with this complex in mapping are small areas of Braddock, Unison, Carbo, Weikert, Duffield, and Ernest soils. Carbo and Weikert soils are on side slopes. Braddock and Unison soils are on stream terraces. Duffield and Ernest soils are on foot slopes, in upland depressions, and along drainageways. Some delineations contain soils with reddish colors derived from red shale and sandstone. These soils have the same use and management as the Berks, Lowell, and Rayne soils. Rock outcrop, gullies, and crescent-shaped slip scars are in some delineations.

Permeability is moderate in the Berks and Rayne soils and moderately slow in the Lowell soil. The available water capacity is low in the Berks and Lowell soils and moderate in the Rayne soil. Surface runoff is rapid from all soils. Potential frost action is low in the Berks soil and moderate in the Lowell and Rayne soils. The shrink-swell potential is low in the Berks and Rayne soils and moderate in the Lowell soil. Natural fertility is low in the Berks and Rayne soils and high in the Lowell soil. The organic matter content is low to moderate in all soils. The thickness of the rooting zone and depth to bedrock range from 20 to 40 inches in the Berks soil and are more than 40 inches in the Lowell and Rayne soils. Root growth is restricted in the Berks soil by a high content of coarse fragments. The surface layer and subsoil in unlimed areas are extremely acid through slightly acid in the Berks soil, very strongly acid through slightly acid in the Lowell soil, and very strongly acid or strongly acid in the Rayne soil.

These soils are used mainly for woodland and pasture.

Cultivated crops are poorly suited to these soils. Crop production is limited by slope and a severe erosion hazard in all these soils and by a high content of coarse fragments in the Berks soil. Tilth is fair. A high content of coarse fragments interferes with tillage and reduces plant populations. If these soils are cultivated, contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff and help control erosion. Crop yields can be increased by applications of lime and fertilizer.

Pasture grasses and legumes are well suited to these soils. Slope, the low available water capacity in the Berks soil, and low natural fertility and acidity in the Berks and Rayne soils are the major limitations. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer are useful management procedures.

Timber production is moderately high on the north slopes of the Berks soil and high on the north slopes of the Lowell and Rayne soils. It is moderate on the south slopes of the Berks soil and moderately high on the south slopes of the Lowell and Rayne soils. Slope limits the use of equipment.

Urban development of these soils is limited by slope, depth to bedrock, seepage, moderately slow permeability, a clayey subsoil, low strength, and small stones.

This complex is in capability subclass IVe.

3E—Berks-Lowell-Rayne complex, 25 to 65 percent slopes. These well drained, steep and very steep soils are on side slopes. This complex is about 35 percent moderately deep Berks soils, 30 percent deep Lowell

soils, 20 percent deep Rayne soils, and 15 percent other soils. The Berks, Lowell, and Rayne soils are so intermingled that they could not be shown separately at the scale selected for mapping. Areas range from about 5 to 200 acres.

In a typical profile of the Berks soil, the surface layer is dark brown shaly silt loam about 7 inches thick. The subsoil is brown shaly silt loam mottled with brownish yellow. It is about 16 inches thick. The substratum is brownish yellow very shaly silt loam about 10 inches thick. Soft shale bedrock is at a depth of about 33 inches.

In a typical profile of the Lowell soil, the surface layer is dark brown and dark yellowish brown silt loam about 7 inches thick. The subsoil is sticky and plastic silty clay about 25 inches thick. It is yellowish brown in the upper part and strong brown in the lower part. The substratum is strong brown channery clay about 18 inches thick. Calcareous shale and limestone bedrock is at a depth of about 50 inches.

In a typical profile of the Rayne soils, the surface layer is dark yellowish brown shaly loam about 7 inches thick. The subsoil is strong brown shaly silty clay loam mottled in shades of brown, yellow, green, and black. It is about 46 inches thick. The substratum is shaly silty clay loam mottled in shades of brown, yellow, green, and red and is below a depth of about 53 inches.

Included with this complex in mapping are small areas of Braddock, Unison, Carbo, Weikert, Duffield, and Ernest soils. Braddock and Unison soils are on stream terraces. Carbo and Weikert soils are on side slopes. Duffield and Ernest soils are on foot slopes, in upland depressions, and along drainageways. Some delineations contain soils with reddish colors derived from red shale and sandstone. These soils have the same use and management as the Berks, Lowell, and Rayne soils. Rock outcrop, gullies, and crescent-shaped slip scars are in some delineations.

Permeability is moderate in the Berks and Rayne soils and moderately slow in the Lowell soil. The available water capacity is low in the Berks and Lowell soils and moderate in the Rayne soil. Surface runoff is very rapid from all soils. Potential frost action is low in the Berks soil and moderate in the Lowell and Rayne soils. The shrink-swell potential is low in the Berks and Rayne soils and moderate in the Lowell soil. Natural fertility is low in the Berks and Rayne soils and high in the Lowell soil. The organic matter content is low to moderate in all soils. The thickness of the rooting zone and depth to bedrock range from 20 to 40 inches in the Berks soil and are more than 40 inches in the Lowell and Rayne soils. Root growth is restricted in the Berks soil by a high content of coarse fragments. The surface layer and subsoil in unlimed areas are extremely acid through slightly acid in the Berks soil, very strongly acid through slightly acid in the Lowell soil, and very strongly acid or strongly acid in the Rayne soil.

These soils are used mainly for woodland.

Cultivated crops are poorly suited to these soils. Crop production is limited by slope and a severe erosion hazard (fig. 3).

Pasture grasses and legumes are poorly suited to these soils. Slope, the low available water capacity in the Berks soil, and acidity and low natural fertility in the Berks and Rayne soils are the major limitations.

Timber production is moderately high on the north slopes of the Berks soil and high on the north slopes of the Lowell and Rayne soils. It is moderate on the south slopes of the Berks soil and moderately high on the south slopes of the Lowell and Rayne soils. Slope limits the use of equipment.

Urban development of this complex is limited by slope, depth to bedrock, seepage, moderately slow permeability, a clayey subsoil, low strength, and small stones.

This complex is in capability subclass VIIe.

4E—Berks-Rock outcrop complex, 25 to 70 percent slopes. This unit consists of well drained, steep and very steep, moderately deep Berks soils and Rock outcrop on side slopes. This complex is about 50 percent Berks soils, 30 percent Rock outcrop, and 20 percent other soils. The Berks soils and Rock outcrop are so intermingled that they could not be shown separately at the scale selected for mapping. Areas range from about 5 to 700 acres.

In a typical profile of the Berks soil, the surface layer is very dark grayish brown and brown shaly silt loam about 5 inches thick. The subsoil is yellowish brown shaly silt loam about 17 inches thick. The substratum is yellowish brown very shaly silt loam about 5 inches thick. Soft shale bedrock is at a depth of about 27 inches.

Rock outcrop is shale, sandstone, and quartzite outcrops roughly 10 to 30 feet apart.

Included with this complex in mapping are small areas of Jefferson and Weikert soils. Jefferson soils are on foot slopes and along drainageways. Weikert soils are on side slopes. In some areas the soil is 15 to 50 percent stones.

Permeability is moderate in the Berks soil, and the available water capacity is low. Surface runoff is very rapid. Potential frost action is low. The shrink-swell potential is low. Natural fertility is low, and the organic matter content is low to moderate. The thickness of the rooting zone and depth to bedrock range from 20 to 40 inches. Root growth is restricted by a high content of coarse fragments. The surface layer and subsoil in unlimed areas are extremely acid through strongly acid.

The Berks soil is used mainly for woodland.

Cultivated crops are poorly suited to the soil. Crop production is limited by slope, rock outcrop (fig. 4), low natural fertility, acidity, shallow rooting depth, and a severe erosion hazard.

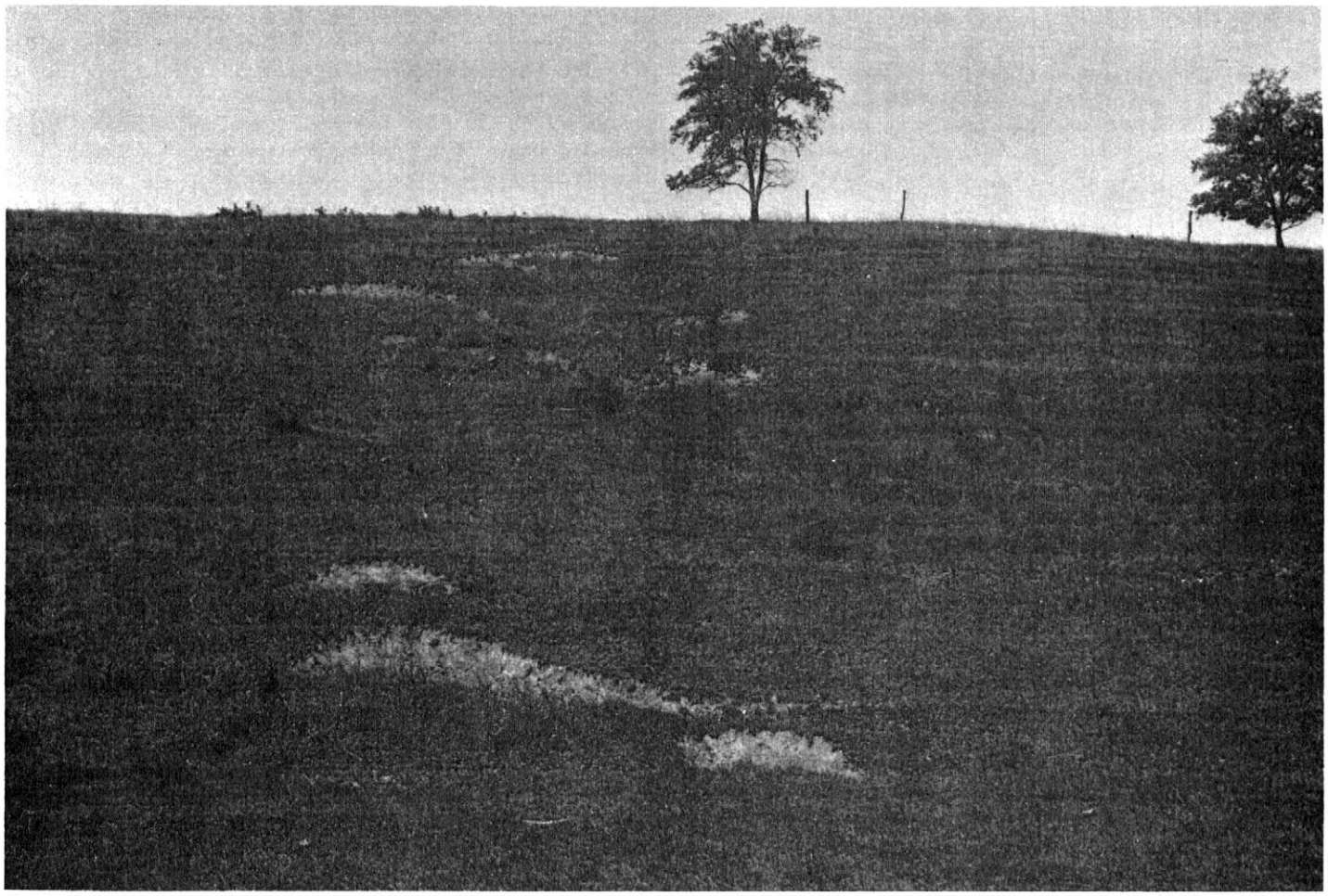


Figure 3.—Slip scars and catsteps showing soil creep in an area of Berks-Lowell-Rayne complex, 25 to 65 percent slopes.

Pasture grasses and legumes are poorly suited to the soil. Slope, rock outcrop, low natural fertility, acidity, and a severe erosion hazard are the major limitations.

Timber production is moderately high on the north slopes and moderate on the south slopes. The low available water capacity and low natural fertility limit tree growth. Rock outcrop and slope limit the use of equipment.

Urban development of this complex is limited by slope, depth to bedrock, seepage, rock outcrop, and large stones.

This complex is in capability subclass VIIe.

5D—Berks-Weikert complex, 15 to 25 percent slopes. These well drained, moderately steep soils are on side slopes. This complex is about 50 percent moderately deep Berks soils, 30 percent shallow Weikert soils, and 20 percent other soils. The Berks and Weikert soils are so intermingled that they could not be shown separately at the scale selected for mapping. Areas range from about 5 to 100 acres.

In a typical profile of the Berks soil, the surface layer is very dark grayish brown and brown shaly silt loam about 5 inches thick. The subsoil is yellowish brown shaly silt loam about 17 inches thick. The substratum is yellowish brown very shaly silt loam about 5 inches thick. Soft shale bedrock is at a depth of about 27 inches.

In a typical profile of the Weikert soil, the surface layer is dark brown shaly silt loam about 4 inches thick. The subsoil is yellowish brown shaly silt loam about 9 inches thick. Soft shale bedrock is at a depth of about 13 inches.

Included with this complex in mapping are small areas of Jefferson soils on foot slopes and along drainageways. Some delineations contain soils with reddish colors derived from red shale and sandstone. These soils have the same use and management as the

Berks and Weikert soils. Stones and outcrops of shale, siltstone, sandstone, and quartzite are in some delineations.

Permeability is moderate in the Berks soil and moderately rapid in the Weikert soil. The available water capacity is low in the Berks soil and very low in the Weikert soil. Surface runoff is rapid from these soils. Potential frost action is low in the Berks soil and moderate in the Weikert soil. The shrink-swell potential is low in both soils. Natural fertility is low, and the organic matter content is low to moderate. The thickness of the rooting zone and depth to bedrock range from 20 to 40 inches in the Berks soil and from 10 to 20 inches in the Weikert soil. The surface layer and subsoil in unlimed areas are extremely acid through strongly acid in the Berks soil and very strongly acid or strongly acid in the Weikert soil.

These soils are used mainly for woodland.

Cultivated crops are poorly suited to these soils. Crop production is limited by slope, a high content of coarse fragments, shallow rooting depth, the very low available water capacity, acidity, low natural fertility, and a severe erosion hazard. Tilth is poor. A high content of coarse fragments interferes with tillage and reduces plant populations.

Pasture grasses and legumes are poorly suited to these soils. The major limitations are slope, the very low available water capacity, acidity, low natural fertility, a high content of coarse fragments, and a severe erosion hazard. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds,

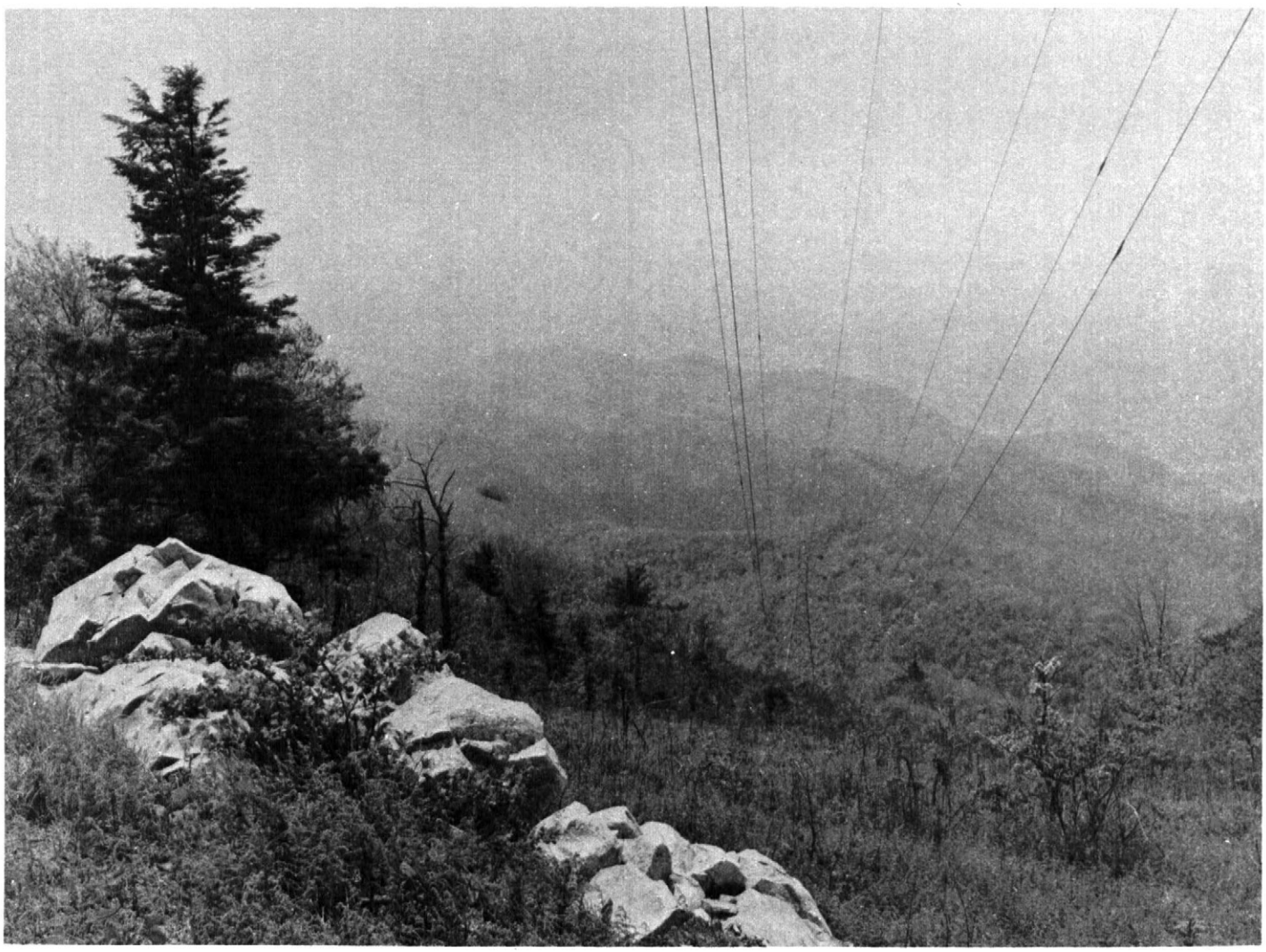


Figure 4.—Berks-Rock outcrop complex, 25 to 70 percent slopes, is in the foreground, and Berks-Lowell-Rayne complex, 25 to 65 percent slopes, is in the background.

proper stocking, and applying lime and fertilizer are useful management procedures.

Timber production is moderately high on the north slopes of the Berks soil and moderate on the north slopes of the Weikert soil. It is moderate on the south slopes of the Berks soil and low on the south slopes of the Weikert soil. The low or very low available water capacity, acidity, and low natural fertility limit tree growth. Depth to bedrock restricts root growth in the Weikert soil and makes trees susceptible to uprooting during periods of high wind.

Urban development of these soils is limited by slope, depth to bedrock, seepage, and small stones.

This complex is in capability subclass VIe.

6E—Berks and Weikert soils, 25 to 65 percent slopes. These well drained, steep and very steep soils are on side slopes. This unit is about 50 percent Berks soils, 25 percent Weikert soils (fig. 5), and 25 percent other soils. Individual areas are made up of Berks soils, Weikert soils, or a combination of both soils. These soils were mapped together because they do not differ in use and management. Areas range from about 5 to 500 acres.

In a typical profile of the Berks soil, the surface layer is very dark grayish brown and brown shaly silt loam about 5 inches thick. The subsoil is yellowish brown shaly silt loam about 17 inches thick. The substratum is yellowish brown very shaly silt loam about 5 inches thick. Soft shale bedrock is at a depth of about 27 inches.

In a typical profile of the Weikert soil, the surface layer is dark brown shaly silt loam about 4 inches thick. The subsoil is yellowish brown shaly silt loam about 9 inches thick. Soft shale bedrock is at a depth of about 13 inches.

Included with these soils in mapping are small areas of Jefferson soils on foot slopes and along drainageways. Some delineations contain soils with reddish colors derived from shale and sandstone. These soils have the same use and management as the Berks and Weikert soils. Stones and outcrops of shale, siltstone, sandstone, and quartzite are in some delineations.

Permeability is moderate in the Berks soil and moderately rapid in the Weikert soil. The available water capacity is low in the Berks soil and very low in the Weikert soil. Surface runoff is very rapid from both soils. Potential frost action is low in the Berks soil and moderate in the Weikert soil. Shrink-swell potential is low in both soils. Natural fertility is low, and the organic matter content is low to moderate. The thickness of the rooting zone and depth to bedrock range from 20 to 40 inches in the Berks soil and from 10 to 20 inches in the Weikert soil. The surface layer and subsoil in unlimed areas are extremely acid through strongly acid in the Berks soil and very strongly acid or strongly acid in the Weikert soil.

These soils are used mainly for woodland.

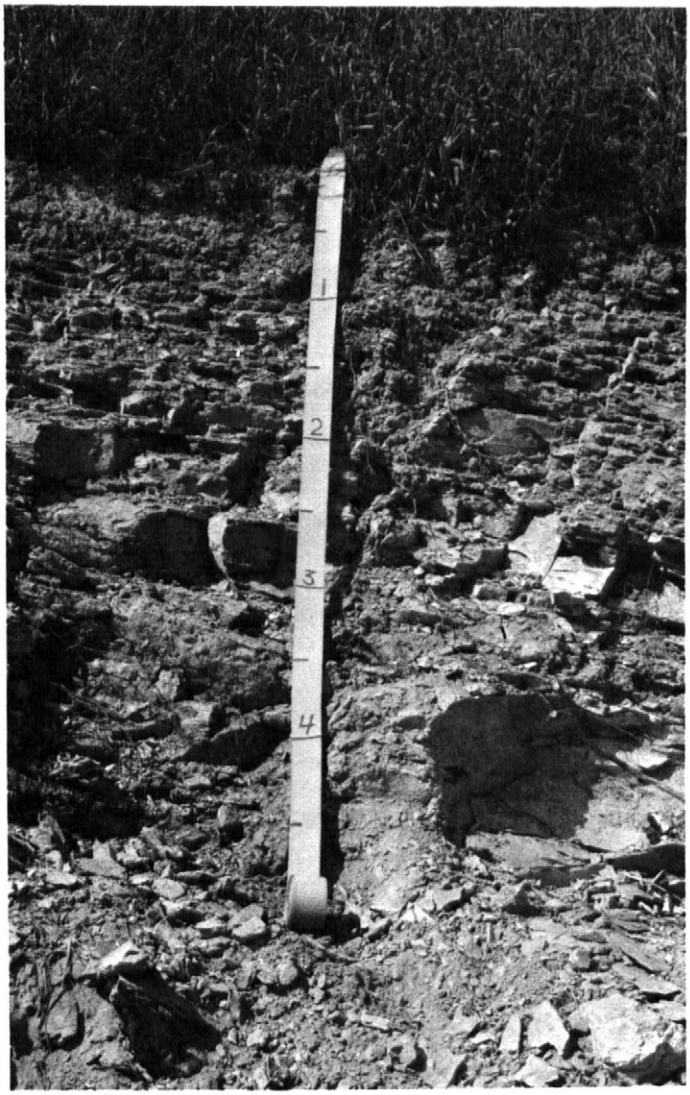


Figure 5.—Profile of Weikert shaly silt loam in an area of Berks and Weikert soils, 25 to 65 percent slopes, showing shallow depth to bedrock.

Cultivated crops are poorly suited to these soils. Crop production is limited by slope, a high content of coarse fragments, shallow rooting depth, low and very low available water capacity, acidity, low natural fertility, and a severe erosion hazard. Tilth is poor. A high content of coarse fragments interferes with tillage and reduces plant populations.

Pasture grasses and legumes are poorly suited to these soils. The major limitations are slope, the low and very low available water capacity, acidity, low natural fertility, high content of coarse fragments, and a severe erosion hazard.

Timber production is moderately high on the north slopes of the Berks soil and moderate on the north

slopes of the Weikert soil. It is moderate on the south slopes of the Berks soil and low on the south slopes of the Weikert soil. The low or very low available water capacity and low natural fertility limit tree growth. Depth to bedrock restricts root growth in the Weikert soil and makes trees susceptible to uprooting during periods of high wind. Slope limits the use of equipment.

Urban development of this map unit is limited by slope, depth to bedrock, seepage, and small stones.

This map unit is in capability subclass VIIe.

7D—Berks and Weikert very stony soils, 15 to 35 percent slopes. These well drained, moderately steep and steep soils are on ridgetops and side slopes. This unit is about 50 percent moderately deep Berks soils, 25 percent shallow Weikert soils, and 25 percent other soils. Individual areas are made up of Berks soils, Weikert soils, or a combination of both soils. These soils were mapped together because they do not differ in use and management. Areas range from about 5 to 50 acres. Stones cover from 3 to 15 percent of the surface.

In a typical profile of the Berks soil, the surface layer is grayish brown and brown very stony silt loam about 5 inches thick. The subsoil is yellowish brown shaly silt loam about 17 inches thick. The substratum is yellowish brown very shaly silt loam about 5 inches thick. Soft shale bedrock is at a depth of about 27 inches.

In a typical profile of the Weikert soil, the surface layer is dark brown very stony silt loam about 4 inches thick. The subsoil is yellowish brown, very friable shaly silt loam about 9 inches thick. Soft shale bedrock is at a depth of about 13 inches.

Included with these soils in mapping are small areas of Jefferson soils on foot slopes and along drainageways. Some delineations contain soils with reddish colors derived from red shale and sandstone. These soils have the same use and management as the Berks and Weikert soils. Outcrops of shale, siltstone, sandstone, and quartzite are in some delineations.

Permeability is moderate in the Berks soil and moderately rapid in the Weikert soil. The available water capacity is low in the Berks soil and very low in the Weikert soil. Surface runoff is rapid from both soils. Potential frost action is low in the Berks soil and moderate in the Weikert soil. The shrink-swell potential is low in both soils. The natural fertility of both soils is low, and the organic matter content is low to moderate. The thickness of the rooting zone and depth to bedrock range from 20 to 40 inches in the Berks soil and from 10 to 20 inches in the Weikert soil. The surface layer and subsoil in unlimed areas are extremely acid through strongly acid in the Berks soil and very strongly acid or strongly acid in the Weikert soil.

These soils are used mainly for woodland.

Cultivated crops are poorly suited to these soils. Crop production is limited by stones, slope, a high content of coarse fragments, depth to bedrock, the low and very low available water capacity, acidity, low natural fertility, and a severe erosion hazard. Tilth is poor. A high content of stones and coarse fragments interferes with tillage and reduces plant populations.

Pasture grasses and legumes are fairly well suited to these soils. The major limitations are the low and very low available water capacity, acidity, low natural fertility, stones, a high content of coarse fragments, and a severe erosion hazard. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer are useful management procedures.

Timber production is moderately high on the north slopes of the Berks soil and moderate on the north slopes of the Weikert soil. It is moderate on the south slopes of the Berks soil and low on the south slopes of the Weikert soil. The low and very low available water capacity and low natural fertility limit tree growth. Depth to bedrock restricts root growth in the Berks and Weikert soils and makes trees susceptible to uprooting during periods of high wind.

Urban development of these soils is limited by slope, depth to rock, seepage, and large stones.

This map unit is in capability subclass VIIs.

8D—Caneyville-Opequon-Rock outcrop complex, 7 to 25 percent slopes. These well drained, strongly sloping and moderately steep soils are on ridgetops and side slopes. This complex is about 30 percent moderately deep Caneyville soils, 25 percent shallow Opequon soils, 20 percent Rock outcrop, and 25 percent other soils. The Caneyville soils, Opequon soils, and Rock outcrop are so intermingled that they could not be shown separately at the scale selected for mapping. Areas range from about 5 to 50 acres.

In a typical profile of the Caneyville soil, the surface layer is dark brown and light brown silt loam about 8 inches thick. The subsoil is yellowish red, sticky and plastic clay mottled with light brown. It is about 24 inches thick. Hard limestone bedrock is at a depth of about 32 inches.

In a typical profile of the Opequon soil, the surface layer is brown, sticky and plastic silty clay loam about 4 inches thick. The subsoil is yellowish red, very sticky and very plastic clay about 11 inches thick. Hard limestone bedrock is at a depth of about 15 inches.

Rock outcrop is limestone and dolomite roughly 10 to 30 feet apart.

Included with this complex in mapping are small areas of Carbo, Frederick, Groseclose, Vertrees, Wurno, Duffield, and Ernest soils. Carbo, Frederick, Groseclose, Vertrees, and Wurno soils are on ridgetops and side slopes. Duffield and Ernest soils are on foot slopes, in upland depressions, and along drainageways. Sinkholes and soils that have a black surface layer 2 to 8 inches thick over limestone bedrock are in some delineations.

Permeability is moderately slow in the Caneyville soil and moderately slow or moderate in the Opequon soil. The available water capacity is low in the Caneyville soil and very low in the Opequon soil. Surface runoff is rapid from both soils. Potential frost action is moderate. The shrink-swell potential is moderate in the Caneyville soil and high in the Opequon soil. Natural fertility is medium in both soils, and the organic matter content is moderate. The thickness of the rooting zone and depth to bedrock range from 20 to 40 inches in the Caneyville soil and from 12 to 20 inches in the Opequon soil. The surface layer and subsoil in unlimed areas are strongly acid through neutral in the Caneyville soil and medium acid through mildly alkaline in the Opequon soil.

These soils are used mainly for woodland.

Cultivated crops are poorly suited to these soils. Crop production is limited by the low and very low available water capacity, Rock outcrop, slope, and a severe erosion hazard.

Pasture grasses and legumes are fairly well suited to these soils. The low and very low available water capacity, Rock outcrop (fig. 6), slope, and a severe erosion hazard are the major limitations. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying fertilizer are useful management procedures.

Timber production is high on the north slopes of the Caneyville soil and moderately high on the north slopes of the Opequon soil. It is moderately high on the south slopes of the Caneyville and Opequon soils. Rock outcrop and slope limit the use of equipment.

Urban development of this complex is limited by depth to bedrock, Rock outcrop, slope, a clayey subsoil, slow

Figure 6.—Rock outcrop in the foreground and background limits the Caneyville-Opequon-Rock outcrop complex, 7 to 25 percent slopes, to pasture and recreation.

permeability, low strength, and high shrink-swell potential.

This complex is in capability subclass VIe.

8E—Caneyville-Opequon-Rock outcrop complex, 25 to 60 percent slopes. These well drained, steep and very steep soils are on side slopes. This complex is about 30 percent moderately deep Caneyville soils, 25 percent shallow Opequon soils, 20 percent Rock outcrop, and 25 percent other soils. The Caneyville soils, Opequon soils, and Rock outcrop are so intermingled that they could not be shown separately at the scale selected for mapping. Areas range from about 5 to 50 acres.

In a typical profile of the Caneyville soil, the surface layer is dark brown and light brown silt loam about 8 inches thick. The subsoil is yellowish red, sticky and plastic clay mottled with light brown. It is about 24 inches thick. Hard limestone bedrock is at a depth of about 32 inches.

In a typical profile of the Opequon soil, the surface layer is brown, sticky and plastic silty clay loam about 4 inches thick. The subsoil is yellowish red, very sticky and very plastic clay about 11 inches thick. Hard limestone bedrock is at a depth of about 15 inches.

Rock outcrops of limestone and dolomite are roughly 10 to 30 feet apart.

Included with this complex in mapping are small areas of Carbo, Frederick, Groseclose, Vertrees, Wurno, Duffield, and Ernest soils. Carbo, Frederick, Groseclose, Vertrees, and Wurno soils are on side slopes. Duffield and Ernest soils are on foot slopes, in upland depressions, and along drainageways. Sinkholes and soils that have a black surface layer 2 to 8 inches thick over limestone bedrock are in some delineations.

Permeability is moderately slow in the Caneyville soil and moderately slow or moderate in the Opequon soil. The available water capacity is low in the Caneyville soil and very low in the Opequon soil. Surface runoff is very rapid from both soils. Potential frost action is moderate. The shrink-swell potential is moderate in the Caneyville soil and high in the Opequon soil. Natural fertility is medium in both soils, and the organic matter content is moderate. The thickness of the rooting zone and depth to bedrock range from 20 to 40 inches in the Caneyville soil and from 12 to 20 inches in the Opequon soil. The surface layer and subsoil in unlimed areas are strongly acid through neutral in the Caneyville soil and medium acid through mildly alkaline in the Opequon soil.

These soils are used mainly for woodland.

Cultivated crops are poorly suited to these soils. Crops production is limited by slope, the low and very low available water capacity, Rock outcrop, and a severe erosion hazard.

Pasture grasses and legumes are poorly suited to these soils. Slope, Rock outcrop, the low and very low available water capacity, and a severe erosion hazard are the major limitations.

Timber production is high on the north slopes of the Caneyville soil and moderately high on the north slopes of the Opequon soil. It is moderately high on the south slopes of the Caneyville and Opequon soils. Slope and Rock outcrop limit the use of equipment.

Urban development of these soils is limited by slope (fig. 7), depth to bedrock, Rock outcrop, a clayey subsoil, slow permeability, low strength, and high shrink-swell potential.

This complex is in capability subclass VIIe.

9C—Carbo and Chilhowie soils, 7 to 15 percent slopes. These well drained, strongly sloping soils are on ridgetops and side slopes. This unit is about 40 percent moderately deep Carbo soils, 35 percent moderately deep Chilhowie soils, and 25 percent other soils. Individual areas are made up of Carbo soils, Chilhowie soils, or a combination of both soils. These soils were mapped together because there are no major differences in their use and managment. Areas range from about 5 to 25 acres.

In a typical profile of the Carbo soil, the surface layer is yellowish brown silty clay loam about 7 inches thick. The subsoil is very sticky and very plastic clay about 23 inches thick. It is strong brown in the upper part and yellowish brown in the lower part. Hard limestone and shale bedrock is at a depth of about 30 inches.

In a typical profile of the Chilhowie soil, the surface layer is very dark grayish brown silty clay about 2 inches thick. The subsoil is yellowish brown, sticky and plastic clay about 13 inches thick. The substatum is olive brown, sticky and plastic very shaly clay about 15 inches thick. Hard interbedded shale and limestone bedrock is at a depth of about 30 inches.

Included with these soils in mapping are small areas of Poplimento, Vertrees, Wurno, Duffield, and Ernest soils. Poplimento, Vertrees, and Wurno soils are on ridgetops and side slopes. Duffield and Ernest soils are on foot slopes, in upland depressions, and along drainageways. Sinkholes and outcrops of limestone and shale are in some delineations.

Permeability is slow in the Carbo and Chilhowie soils. The available water capacity is low in the Carbo soil and very low in the Chilhowie soil. Surface runoff is rapid from both soils. Potential frost action is moderate. Shrink-swell potential is high. The natural fertility is high. The organic matter content is low to moderate in the Carbo soil and low in the Chilhowie soil. The thickness of the rooting zone and depth to bedrock range from 20 to 40 inches. The surface layer and subsoil in unlimed areas are very strongly acid through mildly alkaline in the Carbo soil and slightly acid through mildly alkaline in the Chilhowie soil.

These soils are used mainly for pasture and woodland.

Cultivated crops are poorly suited to these soils. Crop

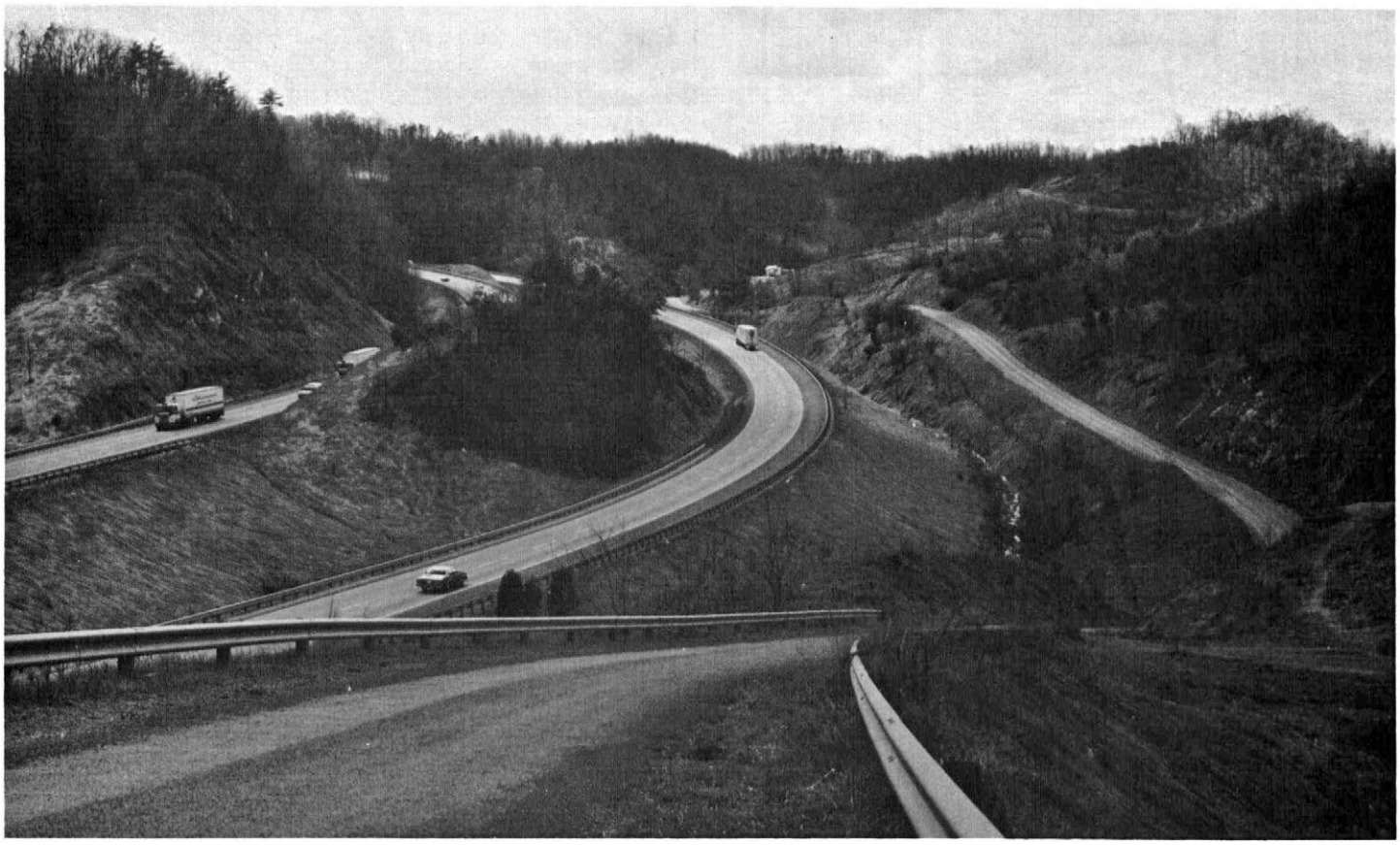


Figure 7.—Slope and shallow depth to bedrock limit excavation during highway construction, and slope and low strength limit the use of the Caneyville-Opequon-Rock outcrop complex, 25 to 60 percent slopes, as a source of roadfill.

production is limited by the low and very low available water capacity and a severe erosion hazard. Tilth is poor. The plow layer is hard and breaks into clods when the soil is dry, and it sticks to the plowshares when the soil is wet. If these soils are cultivated, contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff and help control erosion. Crop yields can be increased by applications of fertilizer.

Pasture grasses and legumes are fairly well suited to the Carbo and Chilhowie soils. The low and very low available water capacity and a severe erosion hazard are the major limitations. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying fertilizer are useful management procedures.

Timber production is moderately high on the Carbo soil and moderate on the Chilhowie soil. These soils are easily managed for woodland.

Urban development of these soils is limited by depth to bedrock, slow permeability, a clayey subsoil, high shrink-swell potential, low strength, and slope.

This map unit is in capability subclass IVe.

9D—Carbo and Chilhowie soils, 15 to 25 percent slopes. These well drained, moderately steep soils are on side slopes. This unit consists of about 40 percent moderately deep Carbo soil, 35 percent moderately deep Chilhowie soil, and 25 percent other soils. Individual areas are made up of Carbo soil, Chilhowie soil, or a combination of both soils. These soils were mapped together because there are no major differences in their use and management. Areas range from about 5 to 25 acres.

In a typical profile of the Carbo soil, the surface layer is yellowish brown silty clay loam about 7 inches thick. The subsoil is very sticky and very plastic clay about 23 inches thick. It is strong brown in the upper part and yellowish brown in the lower part. Hard limestone and shale bedrock is at a depth of about 30 inches.

In a typical profile of the Chilhowie soil, the surface layer is very dark grayish brown silty clay about 2 inches thick. The subsoil is yellowish brown, sticky and plastic clay about 13 inches thick. The substratum is olive brown, sticky and plastic very shaly clay about 15 inches thick. Hard interbedded shale and limestone bedrock is at a depth of 30 inches.

Included with these soils in mapping are small areas of Poplimento, Vertrees, Wurno, Duffield, and Ernest soils. Poplimento, Vertrees, and Wurno soils are on side slopes. Duffield and Ernest soils are on foot slopes, in upland depressions, and along drainageways. Sinkholes and outcrops of limestone and shale are in some delineations.

Permeability is slow in the Carbo and Chilhowie soils. The available water capacity is low in the Carbo soil and very low in the Chilhowie soil. Surface runoff is rapid from both soils. Potential frost action is moderate. The shrink-swell potential is high. Natural fertility is high. The organic matter content is low to moderate in the Carbo soil and low in the Chilhowie soil. The thickness of the rooting zone and depth to bedrock range from 20 to 40 inches. The surface layer and subsoil in unlimed areas are very strongly acid through mildly alkaline in the Carbo soil and slightly acid through mildly alkaline in the Chilhowie soil.

These soils are used mainly for pasture and woodland.

Cultivated crops are not suited to these soils. Crop production is limited by slope, the low and very low available water capacity, and a severe erosion hazard. Tilth is poor. The plow layer is hard and breaks into clods when the soil is dry, and it sticks to the plowshares when the soil is wet.

Pasture grasses and legumes are fairly well suited to the Carbo and Chilhowie soils. The low and very low available water capacity and a severe erosion hazard are the major limitations. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying fertilizer are useful management procedures.

Timber production is moderately high on the Carbo soil and moderate on the Chilhowie soil. These soils are easily managed for woodland.

Urban development of these soils is limited by depth to bedrock, slow permeability, slope, a clayey subsoil, high shrink-swell potential, and low strength.

This map unit is in capability subclass VIe.

10—Craigsville soils. Craigsville soils are well drained, deep, and nearly level. They are on flood plains. They have different surface textures so intermingled that it was not practical to map them separately. Areas range from about 5 to 25 acres. These soils are frequently flooded for very brief periods.

In a typical profile of a Craigsville soil, the surface layer is dark yellowish brown cobbly sandy loam about 8 inches thick. The subsoil is strong brown cobbly sandy loam about 22 inches thick. The substratum is brown, friable very cobbly sandy loam below a depth of about 30 inches.

Included with these soils in mapping are small areas of Hayter, Jefferson, McGary, Purdy, and Weaver soils. Hayter, Jefferson, McGary, and Purdy soils are on second bottoms and low stream terraces. Weaver soils are on flood plains. Stones are in some delineations.

Permeability is rapid in the Craigsville soils. The available water capacity is low. Potential frost action is moderate. The shrink-swell potential is low. Natural fertility is low, and the organic matter content is low to moderate. The thickness of the rooting zone is more than 60 inches, but root growth is restricted by a high content of coarse fragments. Depth to bedrock is more than 6 feet. The surface layer and subsoil in unlimed areas are very strongly acid or strongly acid.

The Craigsville soils are used mainly for woodland and pasture.

Cultivated crops are fairly well suited to these soils, especially corn, small grains, and grasses and legumes for hay. Crop production is limited by flooding, a high content of coarse fragments, the low available water capacity, acidity, and natural fertility. Flooding can damage crops and delay planting and harvesting. Tilth is poor. A high content of coarse fragments interferes with tillage and reduces plant populations. Alfalfa stands are short lived. The erosion hazard is slight. Crop yields can be increased by applications of lime and fertilizer.

Pasture grasses and legumes are well suited to these soils. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer are useful management procedures.

Timber production is high on these soils. They are easily managed for woodland.

Urban development of these soils is limited by flooding, seepage, and large stones.

This map unit is in capability subclass IIIs.

11B—Duffield-Ernest complex, 2 to 7 percent slopes. The Duffield soils are well drained, and the Ernest soils are moderately well drained. These gently sloping soils are along intermittent drainageways, on foot slopes, and in upland depressions, such as saddles and sinkholes. This complex is about 45 percent deep Duffield soils, 35 percent deep Ernest soils, and 20 percent other soils. The Duffield and Ernest soils are so intermingled that they could not be shown separately at the scale selected for mapping. Areas range from about 5 to 150 acres.

In a typical profile of the Duffield soil, the surface layer is dark brown silt loam about 7 inches thick. The subsoil is about 57 inches thick. It is dark yellowish brown silt loam between depths of 7 and 23 inches; yellowish brown silty clay loam between depths of 23 and 37 inches; yellowish brown, sticky and plastic clay mottled in shades of yellow and red between depths of 37 and 47 inches; and is mottled, yellowish red, yellowish brown, and yellow, sticky and plastic clay between depths of 47 and 64 inches.

In a typical profile of the Ernest soil, the surface layer is dark brown silt loam about 6 inches thick. The subsoil is about 44 inches thick. It is light yellowish brown silty clay loam between depths of 6 and 12 inches and is yellowish brown silty clay loam mottled with light gray

between depths of 12 and 26 inches. The fragipan is mottled, strong brown and pale brown, very firm and brittle silty clay loam between depths of about 26 and 50 inches. The substratum is mottled, very pale brown and strong brown, sticky and plastic silty clay loam.

Included with this complex in mapping are small areas of Berks, Frederick, Groseclose, Poplimento, Vertrees, McGary, and Purdy soils. Berks, Frederick, Groseclose, Poplimento, and Vertrees soils are on convex ridgetops and side slopes. The McGary and Purdy soils are along intermittent drainageways, on foot slopes, and in upland depressions. Some areas along broad drainageways are frequently flooded for very brief periods. Some delineations contain poorly drained soils that have a clayey black surface layer along small streams, in slack-water areas, and in sinkholes.

Permeability is moderate in the Duffield soil and slow in the Ernest soil. The available water capacity is high in the Duffield soil and low in the Ernest soil. Potential frost action is moderate in both soils. The shrink-swell potential is moderate. The natural fertility level is medium in the Duffield soil and low in the Ernest soil. The organic matter content is low to moderate in the Duffield soil and moderate in the Ernest soil. The rooting zone is more than 48 inches in thickness in the Duffield soil and is restricted at depths of 20 to 36 inches by a fragipan in the Ernest soil. Depth to bedrock is more than 48 inches in the Duffield soil and more than 60 inches in the Ernest soil. The surface layer and subsoil in unlimed areas are strongly acid through neutral in the Duffield soil and very strongly acid or strongly acid in the Ernest soil. The seasonal high water table is deeper than 48 inches in the Duffield soil and ranges from 18 to 36 inches in the Ernest soil.

These soils are used mainly for cultivated crops and pasture.

Cultivated crops are well suited to these soils, especially corn, small grains (fig. 8), and grasses and legumes for hay. The wetness of the Ernest soil causes small grains to lodge and alfalfa stands to be short lived. The erosion hazard is moderate.

Contour tillage, conservation tillage, and crop rotations

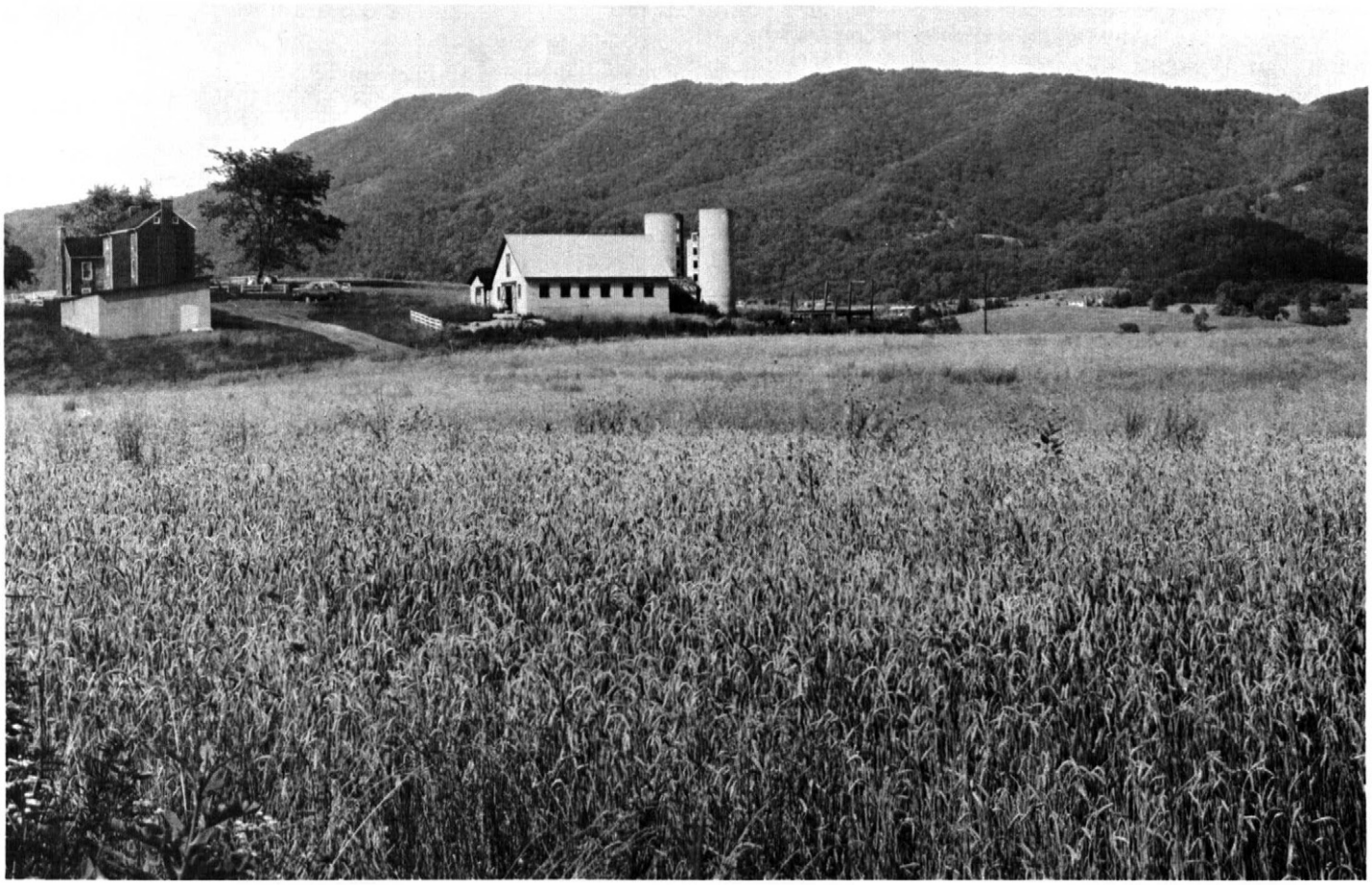


Figure 8.—Small grains are well suited to the Duffield-Ernest complex, 2 to 7 percent slopes, in the foreground. The Wurno-Caneyville complex, 25 to 45 percent slopes, in the background is used mainly for woodland.

that include grasses and legumes reduce runoff and help control erosion. The Ernest soil can be worked earlier in the spring if a subsurface tile drainage system is installed. Crop yields can be increased by applications of lime and fertilizer. Tilth is good.

Pasture grasses and legumes are well suited to these soils. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer are useful management procedures.

Timber production is very high on the Duffield soil and moderately high on the Ernest soil. These soils are easily managed for woodland.

Urban development of these soils is limited by wetness, slow permeability, a clayey subsoil, low strength, shrinking and swelling, seepage, frost action, small stones, and depth to bedrock.

This complex is in capability subclass IIe.

11C—Duffield-Ernest complex, 7 to 15 percent slopes. The Duffield soils are well drained, and the Ernest soils are moderately well drained. These strongly sloping soils are along intermittent drainageways, on foot slopes, and in upland depressions such as saddles and sinkholes. This complex is about 45 percent deep Duffield soils, 35 percent deep Ernest soils, and 20 percent other soils. The Duffield and Ernest soils are so intermingled that they could not be shown separately at the scale selected for mapping. Areas range from about 5 to 150 acres.

In a typical profile of the Duffield soil, the surface layer is dark brown silt loam about 7 inches thick. The subsoil is about 57 inches thick. It is dark yellowish brown silt loam between depths of 7 and 23 inches; yellowish brown silty clay loam between depths of 23 and 37 inches; yellowish brown, sticky and plastic clay mottled in shades of yellow and red between depths of 37 and 47 inches; and mottled, yellowish red, yellowish brown, and yelow, sticky and plastic clay between depths of 47 and 64 inches.

In a typical profile of the Ernest soil, the surface layer is dark brown silt loam about 6 inches thick. The subsoil is about 44 inches thick. It is light yellowish brown silty clay loam between depths of 6 and 12 inches and is yellowish brown silty clay loam mottled with light gray between depths of 12 and 26 inches. The fragipan is mottled, strong brown and pale brown, very firm and brittle silty clay loam between depths of about 26 and 50 inches. The substratum is mottled, very pale brown and strong brown, sticky and plastic silty clay loam.

Included with this complex in mapping are small areas of Berks, Frederick, Groseclose, Poplimento, Vertrees, McGary, and Purdy soils. Berks, Frederick, Groseclose, Poplimento, and Vertrees soils are on convex ridgetops and side slopes. The McGary and Purdy soils are along intermittent drainageways, on foot slopes, and in upland depressions.

Permeability is moderate in the Duffield soil and slow in the Ernest soil. The available water capacity is high in the Duffield soil and low in the Ernest soil. Surface runoff is medium from both soils. Potential frost action is moderate. The shrink-swell potential is moderate. Natural fertility is medium in the Duffield soil and low in the Ernest soil. The organic matter content is low to moderate in the Duffield soil and moderate in the Ernest soil. The rooting zone is more than 48 inches thick in the Duffield soil and is restricted at a depth of 20 to 36 inches by a fragipan in the Ernest soil. Depth to bedrock is more than 48 inches in the Duffield soil and more than 60 inches in the Ernest soil. The surface layer and subsoil in unlimed areas are strongly acid through neutral in the Duffield soil and very strongly acid or strongly acid in the Ernest soil. The seasonal high water table is deeper than 48 inches in the Duffield soil and ranges from a depth of 18 to 36 inches in the Ernest soil.

These soils are used mainly for cultivated crops and pasture.

Cultivated crops are well suited to these soils, especially corn, small grains, and grasses and legumes for hay. Wetness causes small grains to lodge and alfalfa stands to be short-lived. Crop production is limited by the wetness of the Ernest soil and by a severe erosion hazard. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff and help control erosion. The Ernest soil can be worked earlier in the spring if a subsurface tile drainage system is installed. Crop yields can be increased by applications of lime and fertilizer. Tilth is good.

Pasture grasses and legumes are well suited to these soils. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer are useful management procedures.

Timber production is very high on the Duffield soil and moderately high on the Ernest soil. These soils are easily managed for woodland.

Urban development of these soils is limited by wetness, slope, slow permeability, a clayey subsoil, low strength, shrinking and swelling, seepage, frost action, small stones, and depth to bedrock.

This complex is in capability subclass IIIe.

12B—Frederick and Vertrees silt loams, 2 to 7 percent slopes. These well drained, gently sloping soils are on ridgetops. This unit is about 40 percent deep Frederick soils, 35 percent deep Vertrees soils, and 25 percent other soils. Individual areas are made up of Frederick soils, Vertrees soils, or a combination of both soils. These soils were mapped together because there are no major differences in their use and management. Areas range from about 5 to 25 acres.

In a typical profile of the Frederick soil, the surface layer is brown silt loam about 10 inches thick. The subsoil is about 64 inches thick. It is strong brown clay loam between depths of 10 and 18 inches; yellowish red, sticky and plastic clay between depths of 18 and 48

inches; and yellowish red, sticky and plastic clay mottled in shades of brown and yellow between depths of 48 and 74 inches.

In a typical profile of the Vertrees soil, the surface layer is dark brown and yellowish brown silt loam about 10 inches thick. The subsoil is about 56 inches thick. It is yellowish red, sticky and plastic clay between depths of 10 and 50 inches and is sticky and plastic clay mottled in shades of red, brown, and yellow between depths of 50 and 66 inches.

Included with these soils in mapping are small areas of Carbo, Groseclose, Poplimento, Duffield, and Ernest soils. Carbo, Groseclose, and Poplimento soils are on ridgetops. Duffield and Ernest soils are on foot slopes, in upland depressions, and along drainageways. Sinkholes are in some delineations.

Permeability is moderate in the Frederick soil and moderately slow in the Vertrees soil. The available water capacity is moderate in both soils. Surface runoff is medium. Potential frost action is moderate. The shrink-swell potential is high in the Frederick soil and moderate in the Vertrees soil. Natural fertility is low in the Frederick soil and medium in the Vertrees soil. The organic matter content is low to moderate in the Frederick soil and moderate in the Vertrees soil. The thickness of the rooting zone and depth to bedrock are more than 60 inches. The surface layer and subsoil in unlimed areas range from very strongly acid through medium acid.

These soils are used mainly for cultivated crops and pasture.

Cultivated crops are well suited to these soils, especially corn, small grains, alfalfa, and grasses and legumes for hay. The erosion hazard is moderate. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff and help control erosion. Crop yields can be increased by applications of lime and fertilizer. Tilth is good.

Pasture grasses and legumes are well suited to these soils. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer are useful management procedures.

Timber production is high for both soils. These soils are easily managed for woodland.

Urban development of these soils is limited by a clayey subsoil that has low strength, high shrink-swell potential, and moderately slow permeability.

This map unit is in capability subclass IIe.

12C—Frederick and Vertrees silt loams, 7 to 15 percent slopes. These well drained, strongly sloping soils are on ridgetops and side slopes. This unit is about 40 percent deep Frederick soil, 35 percent deep Vertrees soils, and 25 percent other soils. Individual areas are made up of Frederick soils, Vertrees soils, or a combination of both soils. These soils were mapped together because they have no major differences in use and management. Areas range from about 5 to 25 acres.

In a typical profile of the Frederick soil, the surface layer is brown silt loam about 10 inches thick. The subsoil is about 64 inches thick. It is strong brown clay loam between depths of 10 and 18 inches; yellowish red, sticky and plastic clay between depths of 18 and 48 inches; and yellowish red, sticky and plastic clay mottled in shades of brown and yellow between depths of 48 and 74 inches.

In a typical profile of the Vertrees soil, the surface layer is dark brown and yellowish brown silt loam about 10 inches thick. The subsoil is about 56 inches thick. It is yellowish red, sticky and plastic clay between depths of 10 and 50 inches and is sticky and plastic clay mottled in shades of red, brown, and yellow between depths of 50 and 66 inches.

Included with these soils in mapping are small areas of Carbo, Groseclose, Poplimento, Duffield, and Ernest soils. Carbo, Groseclose, and Poplimento soils are on ridgetops and side slopes. Duffield and Ernest soils are on foot slopes, in upland depressions, and along drainageways. Sinkholes are in some delineations.

Permeability is moderate in the Frederick soil and moderately slow in the Vertrees soil. The available water capacity is moderate in both soils. Surface runoff is rapid. Potential frost action is moderate. The shrink-swell potential is high in the Frederick soil and moderate in the Vertrees soil. Natural fertility is low in the Frederick soil and medium in the Vertrees soil. The organic matter content is low to moderate in the Frederick soil and moderate in the Vertrees soil. The thickness of the rooting zone and depth to bedrock are more than 60 inches. The surface layer and subsoil in unlimed areas are very strongly acid through medium acid.

These soils are used mainly for cultivated crops and pasture.

Cultivated crops are well suited to these soils, especially corn, small grains, alfalfa, and grasses and legumes for hay. The erosion hazard is severe. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff and help control erosion. Crop yields can be increased by applications of lime and fertilizer. Tilth is good.

Pasture grasses and legumes are well suited to these soils. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer are useful management procedures.

Timber production is high for both soils. These soils are easily managed for woodland.

Urban development of these soils is limited by slope, a clayey subsoil that has low strength, high shrink-swell potential, and moderately slow permeability.

This map unit is in capability subclass IIIe.

13B—Frederick and Vertrees cherty silt loams, 2 to 7 percent slopes. These well drained, gently sloping soils are on ridgetops. This unit is about 40 percent deep Frederick soils, 35 percent deep Vertrees soils, and 25 percent other soils. Individual areas are made up of Frederick soils, Vertrees soil, or a combination of both soils. These soils were mapped together because they have no major differences in use and management. Areas range from about 5 to 25 acres.

In a typical profile of the Frederick soil, the surface layer is dark yellowish brown cherty silt loam about 10 inches thick. The subsoil is about 64 inches thick. It is strong brown, sticky and plastic silty clay mottled with reddish yellow between depths of 10 and 22 inches, and is mottled red, reddish yellow, and yellowish brown, sticky and plastic clay between depths of 22 and 74 inches.

In a typical profile of the Vertrees soil, the surface layer is yellowish brown cherty silt loam about 9 inches thick. The subsoil is about 56 inches thick. It is yellowish red cherty silty clay loam between depths of 9 and 21 inches; yellowish red, sticky and plastic clay between depths of 21 and 36 inches; and red, sticky and plastic clay mottled in shades of brown and yellow between depths of 36 and 65 inches.

Included with these soils in mapping are small areas of Carbo, Groseclose, Poplimento, Duffield, and Ernest soils. Carbo, Groseclose, and Poplimento soils are on ridgetops. Duffield and Ernest soils are on foot slopes, in upland depressions, and along drainageways. Rock outcrop, stones, and sinkholes are in some areas.

Permeability is moderate in the Frederick soil and moderately slow in the Vertrees soil. The available water capacity is moderate in both soils. Surface runoff is medium. Potential frost action is moderate. The shrink-swell potential is high in the Frederick soil and moderate in the Vertrees soil. Natural fertility is low in Frederick soil and medium in Vertrees soil. The organic matter content is low to moderate in Frederick soil and moderate in Vertrees soil. The thickness of the rooting zone and depth to bedrock are more than 60 inches. The surface layer and subsoil in unlimed areas are very strongly acid through medium acid.

These soils are used mainly for cultivated crops and pasture.

Cultivated crops are well suited to these soils, especially corn, small grains, alfalfa, and grasses and legumes for hay. Tilth is fair. A high content of chert fragments interferes with tillage and planting. The erosion hazard is moderate. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff and help control erosion. Yields can be increased by applications of lime and fertilizer.

Pasture grasses and legumes are well suited to these soils. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer are useful management procedures.

Timber production is high for both soils. These soils are easily managed for woodland.

Urban development of these soils is limited by a clayey subsoil, low strength, high shrink-swell potential, moderately slow permeability, and small stones.

This map unit is in capability subclass IIe.

13C—Frederick and Vertrees cherty silt loams, 7 to 15 percent slopes. These well drained, strongly sloping soils are on ridgetops and side slopes. This unit is about 40 percent deep Frederick soils, 35 percent deep Vertrees soils, and 25 percent other soils. Individual areas are made up of Frederick soils, Vertrees soils, or a combination of both soils. These soils were mapped together because there is no major difference in their use and management. Areas range from 5 to 25 acres.

In a typical profile of the Frederick soil, the surface layer is dark yellowish brown cherty silt loam about 10 inches thick. The subsoil is about 64 inches thick. It is strong brown, sticky and plastic silty clay mottled with reddish yellow between depths of 10 and 22 inches and is mottled red, reddish yellow, and yellowish brown, sticky and plastic clay between depths of 22 and 74 inches.

In a typical profile of the Vertrees soil, the surface layer is yellowish brown cherty silt loam about 9 inches thick. The subsoil is about 56 inches thick. It is yellowish red cherty silty clay loam between depths of 9 and 21 inches; yellowish red, sticky and plastic clay between depths of 21 and 36 inches; and red, sticky and plastic clay mottled in shades of brown and yellow between depths of 36 and 65 inches.

Included with these soils in mapping are small areas of Carbo, Groseclose, Poplimento, Duffield, and Ernest soils. Carbo, Groseclose, and Poplimento soils are on ridgetops and side slopes. Duffield and Ernest soils are on foot slopes, in upland depressions, and along drainageways. Rock outcrop, stones, and sinkholes are in some delineations.

Permeability is moderate in the Frederick soil and moderately slow in the Vertrees soil. The available water capacity is moderate in both soils. Surface runoff is rapid. Potential frost action is moderate. The shrink-swell potential is high in the Frederick soil and moderate in the Vertrees soil. Natural fertility is low in the Frederick soil and medium in the Vertrees soil. The organic matter content is low to moderate in the Frederick soil and moderate in the Vertrees soil. The thickness of the rooting zone and depth to bedrock are more than 60 inches. The surface layer and subsoil in unlimed areas are very strongly acid through medium acid.

These soils are used mainly for cultivated crops and pasture.

Cultivated crops are well suited to these soils, especially corn, small grains, alfalfa, and grasses and

legumes for hay. Tilth is fair. A high content of chert fragments interferes with tillage and planting. The erosion hazard is severe. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff and help control erosion. Yields can be increased by applications of lime and fertilizer.

Pasture grasses and legumes are well suited to these soils. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer are useful management procedures.

Timber production is high for both soils. These soils are easily managed for woodland.

Urban development of these soils is limited by slope, a clayey subsoil, low strength, high shrink-swell potential, moderately slow permeability, and small stones.

This map unit is in capability subclass IIIe.

13D—Frederick and Vertrees cherty silt loams, 15 to 25 percent slopes. These well drained, moderately steep soils are on side slopes. This unit is about 40 percent deep Frederick soils, 35 percent deep Vertrees soils, and 25 percent other soils. Individual areas are made up of Frederick soils, Vertrees soils, or a combination of both soils. These soils were mapped together because there is no major difference in their use and management. Areas range from 5 to 25 acres.

In a typical profile of the Frederick soil, the surface layer is dark yellowish brown cherty silt loam about 10 inches thick. The subsoil is about 64 inches thick. It is strong brown, sticky and plastic silty clay mottled with reddish yellow between depths of 10 and 22 inches and is mottled red, reddish yellow, and yellowish brown, sticky and plastic clay between depths of 22 and 74 inches.

In a typical profile of the Vertrees soil, the surface layer is yellowish brown cherty silt loam about 9 inches thick. The subsoil is about 56 inches thick. It is yellowish red cherty silty clay loam between depths of 9 and 21 inches; yellowish red, sticky and plastic clay between depths of 21 and 36 inches; and red, sticky and plastic clay mottled in shades of brown and yellow between depths of 36 and 65 inches.

Included with these soils in mapping are small areas of Carbo, Groseclose, Poplimento, Duffield, and Ernest soils. Carbo, Groseclose, and Poplimento soils are on side slopes. Duffield and Ernest soils are on foot slopes, in upland depressions, and along drainageways. Rock outcrop, stones, and sinkholes are in some delineations.

Permeability is moderate in the Frederick soil and moderately slow in the Vertrees soil. The available water capacity is moderate in both soils. Surface runoff is rapid. Potential frost action is moderate. The shrink-swell potential is high in the Frederick soil and moderate in the Vertrees soil. Natural fertility is low in the Frederick soil and medium in the Vertrees soil. The organic matter content is low to moderate in the Frederick soil and moderate in the Vertrees soil. The thickness of the rooting zone and depth to bedrock are more than 60 inches. The surface layer and subsoil in unlimed areas are very strongly acid through medium acid.

These soils are used mainly for pasture and woodland.

Cultivated crops are poorly suited to these soils. Crop production is limited by slope and a severe erosion hazard. If these soils are cultivated, contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff and help control erosion. Tilth is fair. A high content of chert fragments interferes with tillage and planting. Crop yields can be increased by applications of lime and fertilizer.

Pasture grasses and legumes are well suited to these soils. Maintaining a mixture of grasses and legumes, rotating pasture, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer are useful management procedures.

Urban development of these soils is limited by slope, clayey subsoil, low strength, high shrink-swell potential, moderate permeability, and small stones.

This map unit is in capability subclass IVe.

14—French soils. The French soils are somewhat poorly drained, deep, and nearly level. They are on flood plains. These soils have different surface textures so intermingled that it was not practical to map them separately. Areas range from about 5 to 50 acres. These soils are commonly flooded for brief periods in winter and spring.

In a typical profile of a French soil, the surface layer is dark brown loam about 4 inches thick. The subsoil is dark yellowish brown loam mottled in shades of gray, brown, and red. It is about 26 inches thick. The substratum is very dark grayish brown, gravelly sand.

Included with this unit in mapping are small areas of Hayter and Guernsey soils on stream terraces. In some areas stones and cobbles are in the substratum, and in other areas the depth to bedrock is shallower.

Permeability in the French soils is moderate in the surface layer and subsoil and rapid in the substratum. The available water capacity is low. Potential frost action is high. The shrink-swell potential is low. Natural fertility is low, and the organic matter content is low to moderate. The thickness of the rooting zone and depth to the water table range from 1 foot to 2.5 feet. Depth to sandy or gravelly layers ranges from 20 to 40 inches, and depth to bedrock is more than 60 inches. The surface layer and subsoil in unlimed areas range from strongly acid through slightly acid.

These soils are used mainly for pasture.

Cultivated crops are fairly well suited to these soils, especially corn and grasses and legumes for hay. Alfalfa, however, is poorly suited to these soils. Crop production is limited by wetness and flooding. Wetness and flooding can damage crops and delay planting and harvesting.

Crop yields can be increased by applications of lime and fertilizer. Tilth is good.

Pasture grasses and legumes are fairly well suited to these soils. Wetness is the major limitation. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer are useful management procedures.

Timber production is very high on these soils. Wetness limits the use of equipment.

Urban development of these soils is limited by wetness and flooding.

This map unit is in capability subclass IIIw.

15B—Glenelg loam, 2 to 7 percent slopes. This well drained, deep, gently sloping soil is on ridgetops. Areas range from about 5 to 100 acres.

In a typical profile of the Glenelg soil, the surface layer is dark brown loam about 6 inches thick. The subsoil is about 21 inches thick. It is strong brown silty clay loam mottled with dark brown between depths of 6 and 19 inches and is strong brown, friable loam mottled with brownish yellow between depths of 19 and 27 inches. The substratum is brownish yellow, firm sandy loam mottled in shades of brown, green, and black.

Included with this soil in mapping are small areas of Parker, Guernsey, and Hayter soils. Parker soils are on ridgetops. Guernsey and Hayter soils are on stream terraces and alluvial fans.

Permeability is moderate in the Glenelg soil. The available water capacity is high. Surface runoff is medium. Potential frost action is moderate. The shrink-swell potential is low. Natural fertility is low, and the organic matter content is low to moderate. The thickness of the rooting zone and depth to bedrock are more than 48 inches. The surface layer and subsoil in unlimed areas are very strongly acid or strongly acid.

This soil is used mainly for cultivated crops and pasture.

Cultivated crops are well suited to this soil, especially corn, small grains, alfalfa, and grasses and legumes for hay. The erosion hazard is moderate. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff and help control erosion. Crop yields can be increased by applications of lime and fertilizer. Tilth is good.

Pasture grasses and legumes are well suited to this soil. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer are useful management procedures.

Timber production is high on this soil. It is easily managed for woodland.

Urban development of this soil is limited by depth to bedrock, seepage, low strength, and frost action.

This soil is in capability subclass IIe.

15C—Glenelg loam, 7 to 15 percent slopes. This well drained, deep, strongly sloping soil is on ridgetops and side slopes. Areas range from about 5 to 50 acres.

In a typical profile of the Glenelg soil, the surface layer is dark brown loam about 6 inches thick. The subsoil is about 21 inches thick. It is strong brown silty clay loam mottled with dark brown between depths of 6 and 19 inches and is strong brown, friable loam mottled with brownish yellow between depths of 19 and 27 inches. The substratum is brownish yellow, firm sandy loam mottled in shades of brown, green, and black.

Included with this soil in mapping are small areas of Parker, Guernsey, and Hayter soils. Parker soils are on ridgetops and side slopes. Guernsey and Hayter soils are on stream terraces and alluvial fans.

Permeability is moderate in the Glenelg soil. The available water capacity is high. Surface runoff is rapid. Potential frost action is moderate. The shrink-swell potential is low. Natural fertility is low, and the organic matter content is low to moderate. The thickness of the rooting zone and depth to bedrock are more than 48 inches. The surface layer and subsoil in unlimed areas are very strongly acid or strongly acid.

This soil is used mainly for cultivated crops and pasture.

Cultivated crops are well suited to this soil, especially corn, small grains, alfalfa, and grasses and legumes for hay. Crop production is limited by a severe erosion hazard. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff and help control erosion. Crop yields can be increased by applications of lime and fertilizer. Tilth is good.

Pasture grasses and legumes are well suited to this soil. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer are useful management procedures.

Timber production is high on this soil. It is easily managed for woodland.

Urban development of this soil is limited by depth to bedrock, slope, seepage, low strength, and frost action.

This soil is in capability subclass IIIe.

15D—Glenelg loam, 15 to 25 percent slopes. This well drained, deep, moderately steep soil is on side slopes. Areas range from about 5 to 100 acres.

In a typical profile of the Glenelg soil, the surface layer is dark brown loam about 6 inches thick. The subsoil is 21 inches thick. It is strong brown silty clay loam mottled with dark brown between depths of 6 and 19 inches and is strong brown, friable loam mottled with brownish yellow between depths of 19 and 27 inches. The substratum is brownish yellow, firm sandy loam mottled in shades of brown, green, and black.

Included with this soil in mapping are small areas of Guernsey, Hayter, and Parker soils. Guernsey and

Hayter soils are on stream terraces and alluvial fans. Parker soils are on side slopes.

Permeability is moderate in the Glenelg soil. The available water capacity is high. Surface runoff is rapid. Potential frost action is moderate. The shrink-swell potential is low. Natural fertility is low, and the organic matter content is low to moderate. The thickness of the rooting zone and depth to bedrock are more than 48 inches. The surface layer and subsoil in unlimed areas are very strongly acid or strongly acid.

This soil is used mainly for cultivated crops and pasture.

Cultivated crops are poorly suited to this soil. Crop production is limited by slope and a severe erosion hazard. If this soil is cultivated, contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff and help control erosion. Crop yields can be increased by applications of lime and fertilizer. Tilth is good.

Pasture grasses and legumes are well suited to this soil. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer are useful management procedures.

Timber production is high on this soil. It is easily managed for woodland.

Urban development of this soil is limited by slope, depth to bedrock, seepage, low strength, and frost action.

This soil is in capability subclass IVe.

16B—Groseclose and Poplimento soils, 2 to 7 percent slopes. These well drained, gently sloping soils are on ridgetops. This map unit is about 45 percent deep Groseclose soils, 40 percent deep Poplimento soils, and 15 percent other soils. Individual areas are made up of Groseclose soils, Poplimento soils, or a combination of both soils. These soils were mapped together because there are no major differences in their use and management. Areas range from about 5 to 100 acres.

In a typical profile of the Groseclose soil, the surface layer is brown loam about 10 inches thick. The subsoil is sticky and plastic clay about 29 inches thick. It is yellowish brown between depths of 10 and 28 inches and is mottled in shades of brown, yellow, and red between depths of 28 and 39 inches. The substratum is mottled in shades of brown, yellow, and red between depths of 39 and 72 inches. It is sticky and plastic clay between depths of 39 and 51 inches and clay loam between depths of 51 and 72 inches.

In a typical profile of the Poplimento soil, the surface layer is dark brown and light yellowish brown silt loam about 12 inches thick. The subsoil is about 43 inches thick. It is yellowish brown, sticky and plastic clay mottled in shades of brown, yellow, green, and gray between depths of 12 and 55 inches. The substratum is yellowish brown shaly silty clay loam mottled in shades of brown, yellow, green, and gray.

Included with these soils in mapping are small areas of Carbo, Frederick, Opequon, Vertrees, Duffield, and Ernest soils. Carbo, Frederick, Opequon, and Vertrees soils are on ridgetops. Duffield and Ernest soils are on foot slopes, in upland depressions, and along drainageways. Rock outcrop and sinkholes are in some delineations.

Permeability is slow in the Groseclose soil and moderately slow in the Poplimento soil. The available water capacity is moderate in both soils. Surface runoff is medium. Potential frost action is moderate. The shrink-swell potential is high. Natural fertility is low in the Groseclose soil and medium in the Poplimento soil. The organic matter content is low to moderate in the Groseclose soil and low in the Poplimento soil. The thickness of the rooting zone and depth to bedrock are more than 48 inches. The surface layer and subsoil in unlimed areas are extremely acid through strongly acid in the Groseclose soil and very strongly acid through slightly acid in the Poplimento soil.

These soils are used mainly for cultivated crops and pasture.

Cultivated crops are well suited to these soils, especially corn, small grains, alfalfa, and grasses and legumes for hay. The erosion hazard is moderate. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff and help control erosion. Crop yields can be increased by applications of lime and fertilizer. Tilth is good.

Pasture grasses and legumes are well suited to the soils. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer are useful management procedures.

Timber production is high on both soils. These soils are easily managed for woodland.

Urban development of these soils is limited by a clayey subsoil, low strength, high shrink-swell potential, slow permeability, and depth to bedrock.

This map unit is in capability subclass IIe.

16C—Groseclose and Poplimento soils, 7 to 15 percent slopes. These well drained, strongly sloping soils are on ridgetops and side slopes. This unit is about 45 percent deep Groseclose soils, 40 percent deep Poplimento soils, and 15 percent other soils. Individual areas are made up of Groseclose soils, Poplimento soils, or a combination of both soils. These soils were mapped together because there are no major differences in their use and management. Areas range from about 5 to 100 acres.

In a typical profile of the Groseclose soil, the surface layer is brown loam about 10 inches thick. The subsoil is sticky and plastic clay about 29 inches thick. It is yellowish brown between depths of 10 and 28 inches

and is mottled in shades of brown, yellow, and red between depths of 28 and 39 inches. The substratum is mottled in shades of brown, yellow, and red between depths of about 39 and 72 inches. It is sticky and plastic clay between depths of 39 and 51 inches and clay loam between depth of 51 and 72 inches.

In a typical profile of the Poplimento soil, the subsurface layer is dark brown and light yellowish brown silt loam about 12 inches thick. The subsoil is about 43 inches thick. It is yellowish brown, sticky and plastic clay mottled in shades of brown, yellow, green, and gray between depths of 12 and 55 inches. The substratum is yellowish brown shaly silty clay loam mottled in shades of brown, yellow, green, and gray.

Included with these soils in mapping are small areas of Carbo, Frederick, Opequon, Vertrees, Duffield, and Ernest soils. Carbo, Frederick, Opequon, and Vertrees soils are on ridgetops and side slopes. Duffield and Ernest soils are on foot slopes, in upland depressions, and along drainageways. Rock outcrop and sinkholes are in some delineations.

Permeability is slow in the Groseclose soil and moderately slow in the Poplimento soil. The available water capacity is moderate in both soils. Surface runoff is rapid. Potential frost action is moderate. The shrink-swell potential is high. Natural fertility is low in the Groseclose soil and medium in the Poplimento soil. The organic matter content is low to moderate in the Groseclose soil and low in the Poplimento soil. The thickness of the rooting zone and depth to bedrock are more than 48 inches. The surface layer and subsoil in unlimed areas are extremely acid through strongly acid in the Groseclose soil and very strongly acid through slightly acid in the Poplimento soil.

These soils are used mainly for cultivated crops and pasture.

Cultivated crops are well suited to these soils, especially corn, small grains, alfalfa, and grasses and legumes for hay. Crop production is limited by a severe erosion hazard. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff and help control erosion. Crop yields can be increased by applications of lime and fertilizer. Tilth is good.

Pasture grasses and legumes are well suited to these soils. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer are useful management procedures.

Timber production is high on both soils. These soils are easily managed for woodland.

Urban development of these soils is limited by a clayey subsoil, low strength, high shrink-swell potential, slow permeability, slope, and depth to bedrock.

This map unit is in capability subclass IIIe.

16D—Groseclose and Poplimento soils, 15 to 25 percent slopes. These well drained, moderately steep soils are on side slopes. This unit is about 45 percent deep Groseclose soils, 40 percent deep Poplimento soils, and 15 percent other soils. Individual areas are made up of Groseclose soils, Poplimento soils, or a combination of both soils. These soils were mapped together because there are no major differences in their use and management. Areas range from about 5 to 100 acres.

In a typical profile of the Groseclose soil, the surface layer is brown loam about 10 inches thick. The subsoil is sticky and plastic clay about 29 inches thick. It is yellowish brown between depths of 10 and 28 inches and is mottled in shades of brown, yellow, and red between depths of 28 and 39 inches. The substratum is mottled in shades of brown, yellow, and red between depths of about 39 and 72 inches. It is sticky and plastic clay between depths of 39 and 51 inches and clay loam between depths of 51 and 72 inches.

In a typical profile of the Poplimento soil, the surface layer is dark brown and light yellowish brown silt loam about 12 inches thick. The subsoil is about 43 inches thick. It is yellowish brown, sticky and plastic clay mottled in shades of brown, yellow, green, and gray between depths of 12 and 55 inches. The substratum is yellowish brown shaly silty clay loam mottled in shades of brown, yellow, green, and gray and is below a depth of about 55 inches.

Included with these soils in mapping are small areas of Carbo, Frederick, Opequon, Vertrees, Duffield, and Ernest soils. Carbo, Frederick, Opequon, and Vertrees soils are on side slopes. Duffield and Ernest soils are on foot slopes, in upland depressions, and along drainageways. Rock outcrop, gullies, and crescent-shaped slip scars are in some delineations.

Permeability is slow in the Groseclose soil and moderately slow in the Poplimento soil. The available water capacity is moderate in both soils. Surface runoff is rapid. Potential frost action is moderate. The shrink-swell potential is high. Natural fertility is low in the Groseclose soil and medium in the Poplimento soil. The organic matter content is low to moderate in the Groseclose soil and low in the Poplimento soil. The thickness of the rooting zone and depth to bedrock are more than 48 inches. The surface layer and subsoil in unlimed areas are extremely acid through strongly acid in the Groseclose soil and very strongly acid through slightly acid in the Poplimento soil.

These soils are used mainly for pasture and woodland.

Cultivated crops are poorly suited to these soils. Crop production is limited by slope and a severe erosion hazard. If these soils are cultivated, contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff and help control erosion. Crop yields can be increased by applications of lime and fertilizer. Tilth is good.

Pasture grasses and legumes are well suited to these soils. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer are useful management procedures.

Timber production is high on both soils. Slope limits the use of equipment.

Urban development of these soils is limited by slope, a clayey subsoil, low strength, high shrink-swell potential, slow permeability, and depth to bedrock.

This map unit is in capability subclass IVe.

16E—Groseclose and Poplimento soils, 25 to 60 percent slopes. These well drained, steep and very steep soils are on side slopes. This unit is about 45 percent deep Groseclose soils, 40 percent deep Poplimento soils, and 15 percent other soils. Individual areas are made up of Groseclose soils, Poplimento soils, or a combination of both soils. The soils were mapped together because there are no major differences in their use and management. Areas range from about 5 to 100 acres.

In a typical profile of the Groseclose soil, the surface layer is brown loam about 10 inches thick. The subsoil is sticky and plastic clay about 29 inches thick. It is yellowish brown between depths of 10 and 28 inches and is mottled in shades of brown, yellow, and red between depths of 28 and 39 inches. The substratum is mottled in shades of brown, yellow, and red between depths of about 39 and 72 inches. It is sticky and plastic clay between depths of 39 and 51 inches and is clay loam between depths of 51 and 72 inches.

In a typical profile of the Poplimento soil, the surface layer is dark brown and light yellowish brown silt loam about 12 inches thick. The subsoil is about 43 inches thick. It is yellowish brown, sticky and plastic clay mottled in shades of brown, yellow, green, and gray to a depth of 55 inches. The substratum is yellowish brown shaly silty clay loam mottled in shades of brown, yellow, green, and gray.

Included with these soils in mapping are small areas of Carbo, Frederick, Opequon, Vertrees, Duffield, and Ernest soils. Carbo, Frederick, Opequon, and Vertrees soils are on side slopes. Duffield and Ernest soils are on foot slopes, in upland depressions, and along drainageways. Rock outcrop, gullies, and crescent-shaped slip scars are in some delineations.

Permeability is slow in the Groseclose soil and moderately slow in the Poplimento soil. The available water capacity is moderate in both soils. Surface runoff is very rapid. Potential frost action is moderate. The shrink-swell potential is high. Natural fertility is low in the Groseclose soil and medium in the Poplimento soil. The organic matter content is low to moderate in the Groseclose soil and low in the Poplimento soil. The thickness of the rooting zone and depth to bedrock are more than 48 inches. The surface layer and subsoil in unlimed areas are extremely acid through strongly acid in the Groseclose soil and very strongly acid through slightly acid in the Poplimento soil.

These soils are used mainly for pasture and woodland.

Cultivated crops are poorly suited to these soils. Crop production is limited by slope and a severe erosion hazard.

Pasture grasses and legumes are fairly well suited to these soils. Slope is the major limitation. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer are useful management procedures.

Timber production is high on both soils. Slope limits the use of equipment.

Urban development of these soils is limited by slope, a clayey subsoil, low strength, high shrink-swell potential, slow permeability, and depth to bedrock.

This map unit is in capability subclass VIIe.

17C—Groseclose and Poplimento cherty soils, 7 to 15 percent slopes. These well drained, strongly sloping soils are on ridgetops and side slopes. This unit is about 40 percent deep Groseclose soils, 35 percent deep Poplimento soils, and 25 percent other soils. Individual areas are made up of Groseclose soils, Poplimento soils, or a combination of both soils. These soils were mapped together because there are no major differences in their use and management. Areas range from about 5 to 100 acres.

In a typical profile of the Groseclose soil, the surface layer is brown cherty loam about 10 inches thick. The subsoil is sticky and plastic clay about 29 inches thick. It is yellowish brown between depths of 10 and 28 inches and is mottled in shades of brown, yellow, and red between depths of 28 and 39 inches. The substratum is mottled in shades of brown, yellow, and red between depths of about 39 and 72 inches. It is sticky and plastic clay between depths of 39 and 51 inches and is clay loam between depths of 51 and 72 inches.

In a typical profile of the Poplimento soil, the surface layer is dark brown and light yellowish brown cherty silt loam about 12 inches thick. The subsoil is about 43 inches thick. It is yellowish brown, sticky and plastic clay mottled in shades of brown, yellow, green, and gray between depths of 12 and 55 inches. The substratum is yellowish brown shaly silty clay loam mottled in shades of brown, yellow, green, and gray.

Included with these soils in mapping are small areas of Carbo, Frederick, Opequon, Vertrees, Duffield, and Ernest soils. Carbo, Frederick, Opequon, and Vertrees soils are on ridgetops and side slopes. Duffield and Ernest soils are on foot slopes, in upland depressions, and along drainageways. Rock outcrop and sinkholes are in some delineations.

Permeability is slow in the Groseclose soil and moderately slow in the Poplimento soil. The available

water capacity is moderate in both soils. Surface runoff is rapid. Potential frost action is moderate. The shrink-swell potential is high. Natural fertility is low in the Groseclose soil and medium in the Poplimento soil. The organic matter content is low to moderate in the Groseclose soil and low in the Poplimento soil. The thickness of the rooting zone and depth to bedrock are more than 48 inches. The surface layer and subsoil in unlimed areas are extremely acid through strongly acid in the Groseclose soil and very strongly acid through slightly acid in the Poplimento soil.

These soils are used mainly for cultivated crops and pasture.

Cultivated crops are well suited to these soils, especially corn, small grains, alfalfa, and grasses and legumes for hay. Crop production is limited by a severe erosion hazard and a high content of chert fragments, which interfere with tillage and planting. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff and help control erosion. Crop yields can be increased by applications of lime and fertilizer.

Pasture grasses and legumes are well suited to these soils. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer are useful management procedures.

Timber production is high on both soils. These soils are easily managed for woodland.

Urban development of these soils is limited by a clayey subsoil, low strength, high shrink-swell potential, slow permeability, slope, depth to bedrock, and a high content of coarse fragments.

This map unit is in capability subclass IIIe.

18B—Groseclose-Urban land complex, 2 to 7 percent slopes. The Groseclose soils and Urban land are gently sloping. This unit is on ridgetops in the towns of Blacksburg and Christiansburg. This complex consists of about 50 percent deep and well drained Groseclose soils, 20 percent Urban land, and 30 percent other soils. The Groseclose soils and Urban land are so intermingled that they could not be shown separately at the scale selected for mapping.

In undisturbed areas, a typical profile of a Groseclose soil has a brown loam surface layer about 10 inches thick. The subsoil is sticky and plastic clay about 29 inches thick. It is yellowish brown between depths of 10 and 28 inches and mottled in shades of brown, yellow, and red between depths of 28 and 39 inches. The substratum is mottled in shades of brown, yellow, and red between depths of about 39 and 72 inches. It is sticky and plastic clay between depths of 39 and 51 inches and is clay loam between depths of 51 and 72 inches.

Urban land is land covered by streets, parking lots, buildings, and other structures. The original soil has been so altered or obscured that classification is not practical.

Included with this unit in mapping are small areas of Berks, Caneyville, Frederick, Opequon, Poplimento, Udorthents, Vertrees, Duffield, Ernest, Guernsey, McGary, Purdy, and Weaver soils. Berks, Caneyville, Frederick, Opequon, Poplimento, Udorthents, and Vertrees soils are on ridgetops and side slopes. Duffield and Ernest soils are on foot slopes, in depressions, and along drainageways. Guernsey, McGary, and Purdy soils are on low stream terraces. Weaver soils are on flood plains. Rock outcrop and sinkholes are in some delineations.

Permeability is slow in the Groseclose soils. The available water capacity is moderate. Surface runoff is medium. Potential frost action is moderate. The shrink-swell potential is high. Natural fertility and the organic matter content are low. The thickness of the rooting zone and depth to bedrock are more than 48 inches. The surface layer and subsoil in unlimed areas are extremely acid through strongly acid. Permeability, the available water capacity, potential frost action, the shrink-swell potential, natural fertility, the organic matter content, and reaction are extremely variable in disturbed areas.

The soils in this unit are used for lawns, vegetable gardens, parks, golf fairways, playgrounds, and boulevards.

Lawns, golf fairways, and boulevards are well suited to undisturbed areas of the Groseclose soils. These uses are limited in disturbed areas, where the soils have a lower available water capacity and a clayey surface layer. The erosion hazard is moderate.

Vegetable gardens are well suited to undisturbed areas of the Groseclose soils, especially sweet corn, potatoes, cabbage, peas, beans, and other vegetables. The erosion hazard is moderate. Yields can be increased by applications of lime and fertilizer. Tilth is good. Crop production is limited in disturbed areas that have a clayey surface layer and a low available water capacity.

Shade trees and ornamental shrubs are well suited to these soils.

Urban development of this complex is limited by a clayey subsoil, low strength, high shrink-swell potential, slow permeability, and depth to bedrock.

This complex is not assigned to a capability subclass.

18C—Groseclose-Urban land complex, 7 to 15 percent slopes. The Groseclose soils and Urban land are strongly sloping. This unit is on ridgetops and side slopes in the towns of Blacksburg and Christiansburg. This complex consists of about 50 percent deep and well drained Groseclose soils, 20 percent Urban land, and 30 percent other soils. The Groseclose soils and Urban land are so intermingled that they could not be shown separately at the scale selected for mapping.

In undisturbed areas, a typical profile of a Groseclose soil has a brown loam surface layer about 10 inches thick. The subsoil is sticky and plastic clay about 29 inches thick. It is yellowish brown between depths of 10 and 28 inches and is mottled in shades of brown, yellow, and red between depths of 28 and 39 inches. The substratum is mottled in shades of brown, yellow, and red between depths of 39 and 72 inches. It is sticky and plastic clay between depths of 39 and 51 inches and is clay loam between depths of 51 and 72 inches.

Urban land is land covered by streets, parking lots, buildings, and other structures. The original soil has been so altered or obscured that classification is not practical.

Included with this unit in mapping are small areas of Berks, Caneyville, Frederick, Opequon, Poplimento, Udorthents, Vertrees, Duffield, Ernest, Guernsey, McGary, Purdy, and Weaver soils. Berks, Caneyville, Frederick, Opequon, Poplimento, Udorthents, and Vertrees soils are on ridgetops and side slopes. Duffield and Ernest soils are on foot slopes, in depressions, and along drainageways. Guernsey, McGary, and Purdy soils are on low stream terraces. Weaver soils are on flood plains. Rock outcrop and sinkholes are in some delineations.

Permeability is slow in the Groseclose soils. The available water capacity is moderate. Surface runoff is medium. Potential frost action is moderate. The shrink-swell potential is high. Natural fertility and the organic matter content are low. The thickness of the rooting zone and depth to bedrock are more than 48 inches. The surface layer and subsoil in unlimed areas are extremely acid through strongly acid. Permeability, the available water capacity, potential frost action, the shrink-swell potential, natural fertility, the organic matter content, and reaction are extremely variable in disturbed areas.

The soils in this unit are used for lawns, vegetable gardens, parks, golf fairways, playrounds, and boulevards.

Lawns, golf fairways, and boulevards are fairly well suited to undisturbed areas of the Groseclose soils. These uses are limited in disturbed areas, where the soils have a lower available water capacity and a clayey surface layer. The erosion hazard is severe.

Vegetable gardens are fairly well suited to undisturbed areas of the Groseclose soils, especially sweet corn, potatoes, cabbage, peas, beans, and other vegetables. The erosion hazard is severe. Yields can be increased by applications of lime and fertilizer. Tilth is good. Crop production is limited in disturbed areas that have a clayey surface layer and a low available water capacity.

Shade trees and ornamental shrubs are well suited to these soils.

Urban development of this complex is limited by a clayey subsoil, low strength, high shrink-swell potential, slow permeability, depth to bedrock, and slope.

This complex is not assigned to a capability subclass.

18D—Groseclose-Urban land complex, 15 to 25 percent slopes. The Groseclose soils and Urban land are moderately steep. This unit is on side slopes in the towns of Blacksburg and Christiansburg. This complex is about 40 percent deep and well drained Groseclose soils, 20 percent Urban land, and 40 percent other soils. The Groseclose soils and Urban land are so intermingled that they could not be shown separately at the scale selected for mapping.

In undisturbed areas, a typical profile of a Groseclose soil has a brown loam surface layer about 10 inches thick. The subsoil is sticky and plastic clay about 29 inches thick. It is yellowish brown between depths of 10 and 28 inches and is mottled in shades of brown, yellow, and red between depths of 28 and 39 inches. The substratum is mottled in shades of brown, yellow, and red between depths of about 39 and 72 inches. It is sticky and plastic clay between depths of 39 and 51 inches and is clay loam between depths of 51 and 72 inches.

Urban land is land covered by streets, parking lots, buildings, and other structures. The original soil has been so altered or obscured that classification is not practical.

Included with this unit in mapping are small areas of Berks, Caneyville, Frederick, Opequon, Poplimento, Udorthents, Vertrees, Duffield, Ernest, Guernsey, McGary, Purdy, and Weaver soils. Berks, Caneyville, Frederick, Opequon, Poplimento, Udorthents, and Vertrees soils are on ridgetops and side slopes. Duffield and Ernest soils are on foot slopes, in depressions, and along drainageways. Guernsey, McGary, and Purdy soils are on low stream terraces. Weaver soils are on flood plains. Rock outcrop and sinkholes are in some delineations.

Permeability is slow in the Groseclose soils. The available water capacity is moderate. Surface runoff is rapid. Potential frost action is moderate. The shrink-swell potential is high. Natural fertility and the organic matter content are low. The thickness of the rooting zone and depth to bedrock are more than 48 inches. The surface layer and subsoil in unlimed areas are extremely acid through strongly acid. Permeability, the available water capacity, potential frost action, the shrink-swell potential, natural fertility, the organic matter content, and reaction are extremely variable in disturbed areas.

The soils in this unit are used for lawns, parks, golf fairways, and boulevards.

Lawns, golf fairways, and boulevards are poorly suited to undisturbed areas of the Groseclose soils. Slope is the main limitation. These uses are limited in disturbed areas, where the soils have a lower available water capacity and a clayey surface layer. The erosion hazard is severe.

Vegetable gardens are fairly well suited to undisturbed areas of the Groseclose soils, especially sweet corn, potatoes, cabbage, peas, and beans. The erosion hazard is severe. If these soils are used for vegetable gardens, yields can be increased by applications of lime and

fertilizer. Tilth is good. Crop production is limited in disturbed areas that have a clayey surface layer and a low available water capacity.

Shade trees and ornamental shrubs are well suited to these soils.

Urban development of this complex is limited by slope, a clayey subsoil, low strength, high shrink-swell potential, slow permeability, and depth to bedrock.

This complex is not assigned to a capability subclass.

19B—Guernsey silt loam, 2 to 7 percent slopes. This moderately well drained, deep, gently sloping soil is on stream terraces. Areas range from about 3 to 25 acres.

In a typical profile of the Guernsey soil, the surface layer is dark brown silt loam about 10 inches thick. The subsoil is about 43 inches thick. It is yellowish brown silty clay loam mottled with dark brown between depths of 10 and 14 inches, yellowish brown silty clay loam mottled with grayish brown between depths of 14 and 20 inches, and grayish brown, sticky and plastic clay mottled with yellowish brown and gray between depths of 20 and 53 inches. The substratum is brownish yellow, friable loam mottled in shades of gray and black.

Included with this soil in mapping are small areas of Groseclose, Duffield, Ernest, Hayter, and Weaver soils. Groseclose soils are on uplands. Duffield and Ernest soils are on foot slopes, in upland depressions, and along drainageways. Hayter soils are on stream terraces. Weaver soils are on flood plains.

Permeability is slow in the Guernsey soil. The available water capacity is high. Surface runoff is medium. A perched seasonal high water table ranges from 24 to 42 inches. Potential frost action is moderate (fig. 9). The shrink-swell potential is moderate. Natural fertility is high, and the organic matter content is low. The thickness of the rooting zone and depth to bedrock are more than 50 inches. The surface layer and subsoil in unlimed areas are very strongly acid through mildly alkaline.

This soil is used mainly for cultivated crops and pasture.

Cultivated crops are well suited to this soil, especially

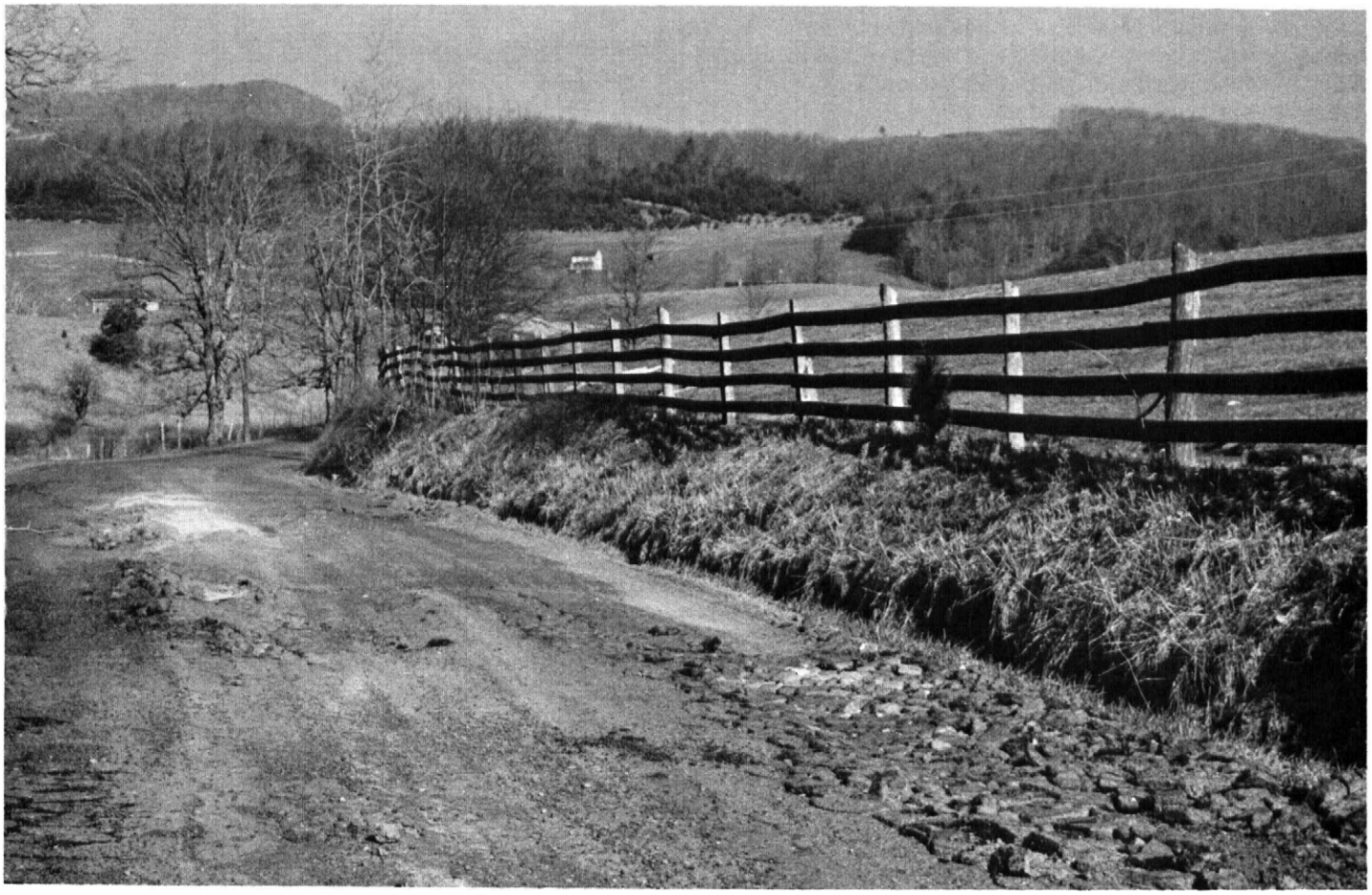


Figure 9.—Frost heaving on Guernsey silt loam, 2 to 7 percent slopes, causes disintegration of pavement.

corn, small grains, and grasses and legumes for hay. Wetness causes small grains to lodge and alfalfa stands to be short-lived. The erosion hazard is moderate. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes help control erosion. Crop yields can be increased by applications of lime and fertilizer. Tilth is good.

Pasture grasses and legumes are well suited to this soil. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer are useful management procedures.

Timber production is high on this soil. It is easily managed for woodland.

Urban development of this soil is limited by wetness, slow permeability, a clayey subsoil, and low strength.

This soil is in capability subclass IIe.

20B—Hayter loam, 2 to 7 percent slopes. This well drained, deep, gently sloping soil is on stream terraces and alluvial fans. Areas range from about 5 to 50 acres.

In a typical profile of the Hayter soil, the surface layer is very dark grayish brown loam about 14 inches thick. The subsoil is about 41 inches thick. It is brown loam between depths of 14 and 38 inches and is brown cobbly sandy clay loam mottled in shades of yellow and black between depths of 38 and 55 inches. The substratum is brown cobbly loam.

Included with this soil in mapping are small areas of Guernsey, McGary, and Purdy soils. Guernsey soils are commonly in depressions near the base of terrace escarpments. McGary and Purdy soils are on flood plains and low terraces.

Permeability is moderately rapid in the Hayter soil. The available water capacity is moderate. Surface runoff is medium. Potential frost action is moderate. The shrink-swell potential is moderate. Natural fertility is medium, and the organic matter content is low to moderate. The thickness of the rooting zone and depth to bedrock are more than 48 inches. The surface layer and subsoil in unlimed areas are strongly acid through slightly acid.

This soil is used mainly for cultivated crops and pasture.

Cultivated crops are well suited to this soil, especially corn (fig. 10), small grains, and grasses and legumes for hay. The erosion hazard is moderate. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff and help control erosion. Crop yields can be increased by applications of lime and fertilizer. Tilth is good.

Pasture grasses and legumes are well suited to this soil. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer are useful management procedures.

Timber production is very high on this soil. It is easily managed for woodland.

Urban development of this soil is limited by seepage, low strength, frost action, and depth to bedrock.

This soil is in capability subclass IIe.

21C—Hayter soils, 7 to 15 percent slopes. These well drained, deep, strongly sloping soils are on stream terraces and alluvial fans. They have different surface textures so intermingled that it was not practical to map them separately. Areas range from about 5 to 50 acres.

In a typical profile of a Hayter soil, the surface layer is very dark grayish brown cobbly loam about 14 inches thick. The subsoil is about 41 inches thick. It is brown loam between depths of 14 and 38 inches and is brown cobbly sandy clay loam mottled in shades of yellow and black between depths of 38 and 55 inches. The substratum is brown cobbly loam.

Included with this unit in mapping are small areas of Guernsey, McGary, and Purdy soils. Guernsey soils are commonly in depressions near the base of terrace escarpments. McGary and Purdy soils are on flood plains and low terraces.

Permeability is moderately rapid in the Hayter soils. The available water capacity is moderate. Surface runoff is rapid. Potential frost action is moderate. The shrink-swell potential is moderate.

Cultivated crops are well suited to these soils, especially corn, small grains, and grasses and legumes for hay. Crop production is limited by a severe erosion hazard. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff and help control erosion. Crop yields can be increased by applications of lime and fertilizer. Tilth is good.

Pasture grasses and legumes are well suited to these soils. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer are useful management procedures.

Timber production is very high on these soils. They are easily managed for woodland.

Urban development of these soils is limited by seepage, low strength, slope, frost action, and depth to bedrock.

This map unit is in capability subclass IIIe.

22C—Jefferson soils, 7 to 15 percent slopes. These well drained, deep, strongly sloping soils are on foot slopes and alluvial fans. They have different surface textures so intermingled that it was not practical to map them separately. Areas range from about 5 to 20 acres.

In a typical profile of a Jefferson soil, the surface layer is light yellowish brown gravelly loam about 8 inches thick. The subsoil is about 47 inches thick. It is yellowish brown gravelly loam between depths of 8 and 13 inches, yellowish brown gravelly clay loam between depths of 13 and 31 inches, and gravelly sandy clay loam mottled in shades of brown, red, and yellow between depths of 31

Figure 10.—Hayter loam, 2 to 7 percent slopes, in the foreground, is well suited to row crops, especially corn. Caneyville-Opequon-Rock outcrop complex, 25 to 60 percent slopes, is in the Pedlar Hills in the background.

and 55 inches. The substratum is very shaly clay loam mottled in shades of yellow, brown, and red.

Included with this unit in mapping are small areas of Berks, Clymer, Weikert, Groseclose, Duffield, and Ernest soils. Berks, Clymer, and Weikert soils are on convex ridgetops and side slopes. Groseclose soils are in areas where alluvial and colluvial fans merge with limestone uplands. Duffield and Ernest soils are on foot slopes and alluvial and colluvial fans.

Permeability is moderately rapid in the Jefferson soils, and the available water capacity is low. Surface runoff is rapid. Potential frost action is moderate. The shrink-swell potential is low. Natural fertility and the organic matter content are low to moderate. The thickness of the rooting zone and depth to bedrock are more than 5 feet. The surface layer and subsoil in unlimed areas are very strongly acid or strongly acid.

These soils are used mainly for pasture and woodland.

Cultivated crops are fairly well suited to these soils, especially corn, small grains, and grasses and legumes for hay. Crop production is limited by low natural fertility, acidity, and a severe erosion hazard. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff and help control erosion. Crop yields can be increased by applications of lime and fertilizer. Tilth is good.

Pasture grasses and legumes are fairly well suited to these soils. Low natural fertility and the acidity of the soil are the major limitations. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer are useful management procedures.

Timber production is moderately high on these soils. They are easily managed for woodland.

Urban development of these soils is limited by slope, seepage, and small stones.

This map unit is in capability subclass IIIe.

23C—Jefferson very stony soils, 7 to 15 percent slopes. These well drained, deep, strongly sloping soils are on foot slopes and alluvial and colluvial fans. They have different surface textures so intermingled that it was not practical to map them separately. Areas range from about 5 to 20 acres. Stones cover from 3 to 15 percent of the surface.

In a typical profile of a Jefferson soil, the surface layer is light yellowish brown gravelly loam about 8 inches thick. The subsoil is about 47 inches thick. It is yellowish brown gravelly loam between depths of 8 and 13 inches. It is yellowish brown gravelly clay loam between depths of 13 and 31 inches and gravelly sandy clay loam mottled in shades of brown, red, and yellow between depths of 31 and 55 inches. The substratum is very shaly clay loam mottled in shades of yellow, brown, and red.

Included with this unit in mapping are small areas of Berks, Clymer, Weikert, Groseclose, Duffield, and Ernest soils. Berks, Clymer, and Weikert soils are on convex ridgetops and side slopes. Groseclose soils are in areas where alluvial and colluvial fans merge with limestone uplands. Duffield and Ernest soils are on foot slopes and alluvial and colluvial fans.

Permeability is moderately rapid in the Jefferson soils, and the available water capability is low. Surface runoff is rapid. Potential frost action is moderate. The shrink-swell potential is low. Natural fertility and the organic matter content are low to moderate. The thickness of the rooting zone and depth to bedrock are more than 5 feet. The surface layer and subsoil in unlimed areas are very strongly acid or strongly acid.

These soils are used mainly for woodland and pasture.

Cultivated crops are poorly suited to these soils. Crop production is limited by surface stones, low natural fertility, acidity, and a moderate erosion hazard.

Pasture grasses and legumes are fairly well suited to these soils. Surface stones, low natural fertility, and the acidity of the soil are the major limitations. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer are useful management procedures.

Timber production is moderately high on these soils. They are easily managed for woodland.

Urban development of these soils is limited by slope, seepage, and small stones.

This map unit is in capability subclass IVs.

24D—Jefferson extremely stony soils, 7 to 25 percent slopes. These well drained, strongly sloping and moderately steep soils are on foot slopes and alluvial and colluvial fans. They have different surface textures so intermingled that it was not practical to map them separately. Areas range from about 5 to 20 acres. Stones cover 15 to 50 percent of the surface.

In a typical profile of a Jefferson soil, the surface layer is light yellowish brown gravelly loam about 8 inches thick. The subsoil is about 47 inches thick. It is yellowish brown gravelly loam between depths of 8 and 13 inches, yellowish brown gravelly clay loam between depths of 13 and 31 inches, and gravelly sandy clay loam mottled in shades of brown, red, and yellow between depths of 31 and 55 inches. The substratum is friable very shaly clay loam mottled in shades of yellow, brown, and red.

Included with this unit in mapping are small areas of Berks, Clymer, Weikert, Groseclose, Duffield, and Ernest soils. Berks, Clymer, and Weikert soils are on convex ridgetops and side slopes. Groseclose soils are in areas where alluvial and colluvial fans merge with limestone uplands. Duffield and Ernest soils are on foot slopes and alluvial and colluvial fans.

Permeability is moderately rapid in the Jefferson soils, and the available water capacity is low. Surface runoff is rapid. Potential frost action is moderate. The shrink-swell potential is low. Natural fertility and the organic matter content are low to moderate. The thickness of the rooting zone and depth to bedrock are more than 5 feet. The surface layer and subsoil in unlimed areas are very strongly acid or strongly acid.

These soils are used mainly for woodland.

Cultivated crops are poorly suited to these soils. Crop production is limited by large stones, the low natural fertility, acidity, slope, and a severe erosion hazard.

Pasture grasses and legumes are poorly suited to these soils. Large stones, the low natural fertility, acidity, and slope are the major limitations.

Timber production is moderately high on these soils. Large stones limit the use of equipment.

Urban development of these soils is limited by large stones, slope, and seepage.

This map unit is in capability subclass VIIs.

25—McGary and Purdy soils. The McGary soils are somewhat poorly drained, and the Purdy soils are poorly drained and very poorly drained. These nearly level soils are on flood plains and low terraces. This unit is about 40 percent deep McGary soils, 35 percent deep Purdy soils, and 25 percent other soils. Individual areas are made up of McGary soils, Purdy soils, or a combination of both soils. These soils were mapped together because there are no major difference in their use and management. Areas range from about 5 to 25 acres. Some areas are ponded or flooded for brief periods during wet seasons.

In a typical profile of the McGary soil, the surface layer is dark gray silt loam about 9 inches thick. The subsoil is about 28 inches thick. It is yellowish brown, sticky and plastic clay mottled with gray in the upper part and is mottled gray and light yellowish brown, very sticky and very plastic clay in the lower part. The substratum is gray, sticky and plastic clay mottled with yellowish brown and is below a depth of about 48 inches.

In a typical profile of the Purdy soil, the surface layer is very dark grayish brown and grayish brown loam about 11 inches thick. The subsoil is grayish brown, sticky and plastic clay mottled with yellowish brown and is about 23 inches thick. The substratum is mottled light gray and gray, sticky and plastic clay loam below a depth of about 34 inches.

Included with these soils in mapping are small areas of Guernsey, Ross, and Weaver soils. Guernsey soils are on low terraces. Ross and Weaver soils are on flood plains.

Permeability is slow or very slow in the McGary and Purdy soils. The available water capacity is moderate. Surface runoff is slow. Potential frost action is moderate in the McGary soil and high in the Purdy soil. The shrink-swell potential is high in the McGary soil and moderate in the Purdy soil. Natural fertility is high in the McGary soil and low in the Purdy soil. The organic matter content is low to moderate. The thickness of the rooting zone and depth to bedrock are more than 5 feet in the McGary soil and more than 4 feet in the Purdy soil. The surface layer and subsoil in unlimed areas are strongly acid through mildly alkaline in the McGary soil and extremely acid or very strongly acid in the Purdy soil. The seasonally high water table is 1 foot to 3 feet below the surface of the McGary soil and is 1 foot above the surface to 1 foot below in the Purdy soil. The McGary soil is flooded for brief periods in winter and spring.

These soils are used mainly for pasture.

Cultivated crops are fairly well suited to these soils, especially corn and grasses and legumes for hay. Alfalfa, however, is poorly suited to these soils. Crop production is limited by wetness and flooding, which can damage crops and delay planting and harvesting. The erosion hazard is slight. Crop yields can be increased by applications of lime and fertilizer.

Pasture grasses and legumes are fairly well suited to these soils. Wetness is the major limitation. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer are useful management procedures.

Timber production is moderately high on these soils. Wetness limits the use of equipment.

Urban development of these soils is limited by wetness, flooding, slow permeability, a clay subsoil, high shrink-swell potential, and low strength.

This map unit is in capability subclass IVw.

26C—Parker-Glenelg complex, 7 to 15 percent slopes. The Parker soils are somewhat excessively drained, and the Glenelg soils are well drained. These strongly sloping soils are on ridgetops and side slopes. This complex is about 45 percent deep Parker soils, 35 percent deep Glenelg soils, and 20 percent other soils. The Parker and Glenelg soils are so intermingled that they could not be shown separately at the scale selected for mapping. Areas range from about 5 to 15 acres.

In a typical profile of the Parker soil, the surface layer is dark brown gravelly loam about 4 inches thick. The subsoil is brownish yellow gravelly loam about 21 inches thick. The substratum is strong brown very gravelly loam mottled in shades of black, red, and white and is below a depth of about 25 inches.

In a typical profile of the Glenelg soil, the surface layer is dark brown loam about 6 inches thick. The subsoil is about 21 inches thick. It is strong brown silty clay loam mottled with dark brown between depths of 6 and 19 inches and is strong brown loam mottled with brownish yellow between depths of 19 and 27 inches. The substratum is brownish yellow sandy loam mottled in shades of green, brown, and black and is below a depth of about 27 inches.

Included with this complex in mapping are small areas of Guernsey, Hayter, McGary, French, and Purdy soils. Guernsey, Hayter, and McGary soils are on stream terraces and alluvial fans. French and Purdy soils are on flood plains. Rock outcrop is in some delineations.

Permeability is moderately rapid in the Parker soil and moderate in the Glenelg soil. The available water capacity is low in the Parker soil and moderate in the Glenelg soil. Surface runoff is rapid from both soils. Potential frost action is moderate. The shrink-swell potential is low. Natural fertility is low. The organic matter content is low in the Parker soil and low to moderate in the Glenelg soil. The thickness of the rooting zone and depth to bedrock are more than 48 inches. The surface layer and subsoil in unlimed areas are very strongly acid or strongly acid.

These soils are used mainly for pasture and cultivated crops.

Cultivated crops are fairly well suited to these soils, especially corn, small grains, alfalfa, and grasses and legumes for hay. Crop production is limited by the low available water capacity of the Parker soil and by a severe erosion hazard. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff and help control erosion. Tilth is fair. A high content of gravel in the surface layer of the Parker soil interferes with tillage and planting. Crop yields can be increased by applications of lime and fertilizer.

Pasture grasses and legumes are well suited to these soils The low available water capacity of the Parker soil is a limitation. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer are useful management procedures.

Timber production is moderately high on the Parker soil and high on the Glenelg soil. These soils are easily managed for woodland.

Urban development of these soils is limited by small stones, low strength, seepage, frost action, and depth to bedrock.

This complex is in capability subclass IIIe.

26D—Parker-Glenelg complex, 15 to 25 percent slopes. The Parker soils are somewhat excessively drained, and the Glenelg soils are well drained. These moderately steep soils are on side slopes. This complex is about 45 percent deep Parker soils, 35 percent deep

Glenelg soils, and 20 percent other soils. The Parker and Glenelg soils are so intermingled that they could not be shown separately at the scale selected for mapping. Areas range from about 5 to 15 acres.

In a typical profile of the Parker soil, the surface layer is dark brown gravelly loam about 4 inches thick. The subsoil is brownish yellow gravelly loam about 21 inches thick. The substratum is strong brown very gravelly loam mottled in shades of black, red, and white and is below a depth of about 25 inches.

In a typical profile of the Glenelg soil, the surface layer is dark brown loam about 6 inches thick. The subsoil is about 21 inches thick. It is strong brown silty clay loam mottled with dark brown between depths of 6 and 19 inches and is strong brown loam mottled with brownish yellow between depths of 19 and 27 inches. The substratum is brownish yellow sandy loam mottled in shades of green, brown, and black and is below a depth of about 27 inches.

Included with this complex in mapping are small areas of Guernsey, Hayter, McGary, French, and Purdy soils. Guernsey, Hayter, and McGary soils are on stream terraces and alluvial fans. French and Purdy soils are on flood plains. Rock outcrop is in some delineations.

Permeability is moderately rapid in the Parker soil and moderate in the Glenelg soil. The available water capacity is low in the Parker soil and moderate in the Glenelg soil. Surface runoff is rapid from both soils. Potential frost action is moderate. The shrink-swell potential is low. Natural fertility is low. The organic matter content is low in the Parker soil and low to moderate in the Glenelg soil. The thickness of the rooting zone and depth to bedrock are more than 48 inches. The surface layer and subsoil in unlimed areas are very strongly acid or strongly acid.

These soils are used mainly for pasture and woodland.

Cultivated crops are poorly suited to these soils. Hay grasses and legumes, however, are fairly well suited to these soils. Crop production is limited by a severe erosion hazard and by slope in both soils and by the low available water capacity in the Parker soil. Tilth is fair. A high content of gravel in the surface layer of the Parker soil interferes with tillage and planting. If these soils are cultivated, contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff and help control erosion. Crop yields can be increased by applications of lime and fertilizer.

Pasture grasses and legumes are well suited to these soils. The low available water capacity in the Parker soil is a limitation. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer are useful management procedures.

Timber production is moderately high on the Parker soil and high on the Glenelg soil. Slope limits the use of equipment.

Urban development of these soils is limited by slope, small stones, low strength, seepage, frost action, and depth to bedrock.

This complex is in capability subclass IVe.

26E—Parker-Glenelg complex, 25 to 50 percent slopes. The Parker soils are somewhat excessively drained, and the Glenelg soils are well drained. These steep and very steep soils are on side slopes. This complex is about 45 percent deep Parker soils, 35 percent deep Glenelg soils, and 20 percent other soils. The Parker and Glenelg soils are so intermingled that they could not be shown separately at the scale selected for mapping. Areas range from about 5 to 15 acres.

In a typical profile of the Parker soil, the surface layer is dark brown gravelly loam about 4 inches thick. The subsoil is brownish yellow gravelly loam about 21 inches thick. The substratum is strong brown very gravelly loam mottled in shades of black, red, and white and is below a depth of about 25 inches.

In a typical profile of the Glenelg soil, the surface layer is dark brown loam about 6 inches thick. The subsoil is about 21 inches thick. It is strong brown silty clay loam mottled with dark brown between depths of 6 and 19 inches and is strong brown loam mottled with brownish yellow between depths of 19 and 27 inches. The substratum is yellowish brown sandy loam mottled in shades of green, brown, and black and is below a depth of about 27 inches.

Included with this complex in mapping are small areas of Guernsey, Hayter, McGary, French, and Purdy soils. Guernsey, Hayter, and McGary soils are on stream terraces and alluvial fans. French and Purdy soils are on flood plains. Rock outcrop is in some delineations.

Permeability is moderately rapid in the Parker soil and moderate in the Glenelg soil. The available water capacity is low in the Parker soil and moderate in the Glenelg soil. Surface runoff is very rapid from both soils. Potential frost action is moderate. The shrink-swell potential is low. Natural fertility is low. The organic matter content is low in the Parker soil and low to moderate in the Glenelg soil. The thickness of the rooting zone and depth to bedrock are more than 48 inches. The surface layer and subsoil in unlimed areas are very strongly acid or strongly acid.

These soils are used mainly for woodland and pasture.

Cultivated crops are poorly suited to these soils. Crop production is limited by slope and a severe erosion hazard.

Pasture grasses and legumes are fairly well suited to these soils. Slope and a severe erosion hazard are the major limitations. Other limitations are the low available water capacity and a high content of gravel in the surface layer of the Parker soil. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer are useful management procedures.

Timber production is moderately high on the Parker soil and high on the Glenelg soil. Slope limits the use of equipment.

This complex is in capability subclass VIe.

27E—Parker-Rock outcrop complex, 25 to 50 percent slopes. The Parker soils are somewhat excessively drained and steep and very steep. The unit is on side slopes. This complex consists of about 45 percent deep Parker soils, 35 percent Rock outcrop, and 20 percent other soils. The Parker soils and Rock outcrop are so intermingled that they could not be shown separately at the scale selected for mapping. Areas range from about 5 to 200 acres.

In a typical profile of the Parker soil, the surface layer is dark brown gravelly sandy loam about 4 inches thick. The subsoil is brownish yellow gravelly loam about 21 inches thick. The substratum is strong brown very gravelly loam mottled in shades of black, red, and white and is below a depth of about 25 inches.

Rock outcrop is granite, gneiss, and schist. Outcrops are roughly 10 to 30 feet apart.

Included with this complex in mapping are small areas of Glenelg, Guernsey, Hayter, McGary, French, and Purdy soils. Glenelg soils are on side slopes. Guernsey, Hayter, and McGary soils are on stream terraces. French and Purdy soils are on flood plains.

Permeability is moderately rapid in the Parker soil. The available water capacity is low. Surface runoff is very rapid. Potential frost action is moderate. Shrink-swell potential is low. Natural fertility and the organic matter content are low. The thickness of the rooting zone and depth to bedrock are more than 48 inches. The surface layer and subsoil in unlimed areas are very strongly acid or strongly acid.

The Parker soil is used mainly for woodland.

Cultivated crops are poorly suited to the soil. Crop production is limited by slope, Rock outcrop, the low available water capacity, and a severe erosion hazard.

Pasture grasses and legumes are poorly suited to the soil. Slope, Rock outcrop, and a severe erosion hazard are the major limitations.

Timber production is moderately high on the Parker soil. The low available water capacity and low natural fertility limit tree growth. Rock outcrop and slope limit the use of equipment.

Urban development of this complex is limited by slope, depth to bedrock, seepage, Rock outcrop, and large stones.

This complex is in capability subclass VIs.

28—Ross soils. Ross soils are well drained, deep, and nearly level. They are on levees adjacent to streams and in scour channels on flood plains. They have different surface textures so intermingled that it was not practical to map them separately. Areas range from about 5 to 30 acres. These soils are commonly flooded for very brief periods (fig. 11).

In a typical profile of a Ross soil, the surface layer is dark brown loam about 10 inches thick. The subsoil is dark brown loam about 25 inches thick. The substratum is brown loam below a depth of about 35 inches.

Included with these soils in mapping are small areas of McGary, Purdy, and Weaver soils. The McGary, Purdy, and Weaver soils are in scour channels and slack-water areas adjacent to uplands. In areas below limestone springs and at intersections of small streams that drain limestone uplands, the soil contains secondary lime concretions.

Permeability is moderate in the Ross soils. The available water capacity is high. Surface runoff is slow. Potential frost action is moderate. The shrink-swell potential is low. Natural fertility is high, and the organic matter content is moderate to high. The thickness of the rooting zone and depth to bedrock are more than 60 inches. The surface layer and subsoil in unlimed areas are slightly acid through moderately alkaline.

These soils are used mainly for cultivated crops and pasture.

Cultivated crops are well suited to these soils, especially corn, small grains, mixed hay, and vegetable crops. Crop production is limited by flooding and by weeds (fig. 12), such as johnsongrass. Weed control is necessary for maximum crop yields. Flooding causes small grains to lodge and alfalfa stands to be short-lived. Flooding can damage crops and delay planting and harvesting. The erosion hazard is slight. Crop yields can be increased by applications of fertilizer.

Pasture grasses and legumes are well suited to these soils. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer are useful management procedures.

Timber production is very high on these soils. They are easily managed for woodland.

Urban development of this map unit is limited by flooding, seepage, wetness, low strength, and frost action.

This map unit is in capability subclass IIw.

29—Udorthents and Urban land. Udorthents are well drained, moderately well drained, or somewhat poorly drained soils. They are shallow to deep and range from nearly level and gently sloping to strongly sloping and moderately steep. Urban land is land covered by streets, parking lots, buildings, and other structures. The original soil has been so altered or obscured that classification is not practical. This map unit is about 45 percent Udorthents, 30 percent Urban land, and 25 percent other soils. Individual areas are made up of Udorthents, Urban land, or a combination of both. Udorthents and Urban land were mapped together because there is no major difference in their use.

Figure 11.—Ross soils are well suited to pasture, but flooding is a limitation for community development.

Because of the variability of Udorthents, a typical profile is not described. The surface layer ranges from about 5 to 15 inches in thickness and is variable in color and texture. The underlying material generally extends to a depth of several feet, but in some areas it is as shallow as 10 inches. It is generally mottled in shades of red, brown, and yellow.

Included with this unit in mapping are small areas of Berks, Frederick, Groseclose, Poplimento, Vertrees, Braddock, Duffield, Ernest, Guernsey, McGary, Unison, Purdy, Ross, and Weaver soils. Berks, Frederick, Groseclose, Poplimento, and Vertrees soils are on ridgetops and side slopes. Braddock, Guernsey, McGary and Unison soils are on stream terraces. Duffield and Ernest soils are on foot slopes, in upland depressions, and along drainageways. Purdy, Ross, and Weaver soils are on flood plains. Rock outcrop, escarpments, and sinkholes are in some delineations.

Permeability of the Udorthents ranges from slow to moderately rapid. The available water capacity ranges from low to high depending on the texture, thickness, and the content of coarse fragments of the soil. Natural fertility and the organic matter content range from low to high. The thickness of the rooting zone and depth to

bedrock range from 10 inches to several feet. The surface layer in unlimed areas ranges from extremely acid through moderately alkaline. Surface runoff is very slow to rapid. Potential frost action is low to high. Shrink-swell potential ranges from low to high.

Onsite investigations are necessary to determine the potential productivity of these soils for farming and trees and their limitations for nonfarm uses.

This map unit is not assigned to a capability subclass.

30B—Unison and Braddock soils, 2 to 7 percent slopes. These well drained, gently sloping soils are on stream terraces and alluvial fans. This unit is about 45 percent deep Unison soils, 40 percent deep Braddock soils, and 15 percent other soils. Individual areas are made up of Unison soils, Braddock soils, or a combination of both soils. These soils were mapped together because there are no major differences in their use and management. Areas range from about 5 to 75 acres.

In a typical profile of the Unison soil, the surface layer is dark brown and brown loam about 15 inches thick. The subsoil is yellowish red, sticky and plastic clay about 43 inches thick. The substratum is red sandy clay loam below a depth of about 58 inches.

In a typical profile of the Braddock soil, the surface layer is dark yellowish brown and strong brown loam about 17 inches thick. The subsoil is about 42 inches thick. It is yellowish red, sticky and plastic clay between depths of 17 and 28 inches and is dark red, sticky and plastic clay between depths of 28 and 59 inches. The substratum is red gravelly sandy clay loam below a depth of about 59 inches.

Included with these soils in mapping are small areas of Berks, Frederick, Groseclose, Vertrees, Duffield, Ernest, Guernsey, Hayter, McGary, and Purdy soils. Berks, Frederick, Groseclose, and Vertrees soils are on ridgetops and side slopes. Duffield and Ernest soils are on foot slopes, in upland depressions, and along drainageways. Guernsey, Hayter, and McGary soils are

Figure 12.—Ross soils in the foreground are productive, but weed control is a problem. The Berks and Weikert soils, 25 to 65 percent slopes, on Ft. Lewis Mountain in the background are used primarily for woodland.

on stream terraces and alluvial fans. Purdy soils are on flood plains. Sinkholes are in some delineations.

Permeability is moderate in the Unison and Braddock soils. The available water capacity is moderate. Surface runoff is medium. Potential frost action is moderate. The shrink-swell potential is moderate. Natural fertility is low. The organic matter content is low to moderate. The thickness of the rooting zone and depth to bedrock are more than 60 inches. The surface layer and subsoil in unlimed areas are strongly acid through medium acid in the Unison soil and very strongly acid or strongly acid in the Braddock soil.

These soils are used mainly for pasture and cultivated crops.

Cultivated crops are well suited to these soils, especially corn, small grains, alfalfa, and grasses and legumes for hay. The erosion hazard is moderate. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff and help control erosion. Crop yields can be increased by application of lime and fertilizer. Tilth is good.

Pasture grasses and legumes are well suited to these soils. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer are useful management procedures.

Timber production is very high on the Unison soil and is high on the Braddock soil. These soils are easily managed for woodland.

Urban development of these soils is limited by a clayey subsoil, low strength, moderate shrink-swell potential, and moderate permeability.

This map unit is in capability subclass IIe.

30C—Unison and Braddock soils, 7 to 15 percent slopes. These well drained, strongly sloping soils are on stream terraces and alluvial fans. This unit is about 45 percent deep Unison soils, 40 percent deep Braddock soils, and 15 percent other soils. Individual areas are made up of Unison soils, Braddock soils, or a combination of both. These soils were mapped together because there are no major differences in their use and management. Areas range from about 5 to 75 acres.

In a typical profile of the Unison soil, the surface layer is dark brown and brown loam about 15 inches thick. The subsoil is yellowish red, sticky and plastic clay about 43 inches thick. The substratum is red sandy clay loam below a depth of about 58 inches.

In a typical profile of the Braddock soil, the surface layer is dark yellowish brown and strong brown loam about 17 inches thick. The subsoil is about 42 inches thick. It is yellowish red, sticky and plastic clay between depths of 17 and 28 inches and is dark red, sticky and plastic clay between depths of 28 and 59 inches. The substratum is red gravelly sandy clay loam.

Included with these soils in mapping are small areas of Berks, Frederick, Groseclose, Vertrees, Duffield, Ernest, Guernsey, Hayter, McGary, and Purdy soils. Berks, Frederick, Groseclose, and Vertrees soils are on ridgetops and side slopes. Duffield and Ernest soils are on foot slopes, in upland depressions, and along drainageways. Guernsey, Hayter, and McGary soils are on stream terraces and alluvial fans. Purdy soils are on flood plains. Sinkholes are in some delineations.

Permeability is moderate in the Unison and Braddock soils. The available water capacity is moderate. Surface runoff is rapid. Potential frost action is moderate. The shrink-swell potential is moderate. Natural fertility is low. The organic matter content is low to moderate. The thickness of the rooting zone and depth to bedrock are more than 60 inches. The surface layer and subsoil in unlimed areas are strongly acid through medium acid in the Unison soil and very strongly acid or strongly acid in the Braddock soil.

These soils are used mainly for pasture and cultivated crops.

Cultivated crops are well suited to these soils, especially corn, small grains, alfalfa, and grasses and legumes for hay. Crop production is limited by a severe erosion hazard. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff and help control erosion. Crop yields can be increased by applications of lime and fertilizer. Tilth is good.

Pasture grasses and legumes are well suited to these soils. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer are useful management procedures.

Timber production is very high on the Unison soil and high on the Braddock soil. These soils are easily managed for woodland.

Urban development of these soils is limited by a clayey subsoil, low strength, moderate shrink-swell potential, moderate permeability, and slope.

This map unit is in capability subclass IIIe.

30D—Unison and Braddock soils, 15 to 25 percent slopes. These well drained, moderately steep soils are on stream terraces and alluvial fans. This unit is about 45 percent deep Unison soils, 30 percent deep Braddock soils, and 25 percent other soils. Individual areas are made up of Unison soils, Braddock soils, or a combination of both soils. These soils were mapped together because there are no major differences in their use and management. Areas range from about 5 to 75 acres.

In a typical profile of the Unison soil, the surface layer is dark brown and brown loam about 15 inches thick. The subsoil is yellowish red, sticky and plastic clay about 43 inches thick. The substratum is red sandy clay loam below a depth of about 58 inches.

In a typical profile of the Braddock soil, the surface layer is dark yellowish brown and strong brown loam

about 17 inches thick. The subsoil is about 42 inches thick. It is yellowish red, sticky and plastic clay between depths of 17 and 28 inches and is dark red, sticky and plastic clay between depths of 28 and 59 inches. The substratum is red gravelly sandy clay loam.

Included with these soils in mapping are small areas of Berks, Frederick, Groseclose, Vertrees, Duffield, Ernest, Guernsey, Hayter, McGary, and Purdy soils. Berks, Frederick, Groseclose, and Vertrees soils are on ridgetops and side slopes. Duffield and Ernest soils are on foot slopes, in upland depressions, and along drainageways. Guernsey, Hayter, and McGary soils are on stream terraces and alluvial fans. Purdy soils are on flood plains. Sinkholes are in some delineations.

Permeability is moderate in the Unison and Braddock soils. The available water capacity is moderate. Surface runoff is rapid. Potential frost action is moderate. The shrink-swell potential is moderate. Natural fertility is low. The organic matter content is low to moderate. The thickness of the rooting zone and depth to bedrock are more than 60 inches. The surface layer and subsoil in unlimed areas are strongly acid through medium acid in the Unison soil and very strongly acid or strongly acid in the Braddock soil.

These soils are used mainly for pasture and woodland.

Cultivated crops are poorly suited to these soils. Grasses and legumes for hay, however, are fairly well suited to these soils. Crop production is limited by slope, small stones, and a severe erosion hazard. Crop yields can be increased by applications of lime and fertilizer. Tilth is fair.

Pasture grasses and legumes are well suited to these soils. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer are useful management procedures.

Timber production is very high on the Unison soil and high on the Braddock soil. These soils are easily managed for woodland.

This map unit is in capability subclass IVe.

31C—Unison and Braddock cobbly soils, 7 to 15 percent slopes. Theses well drained, strongly sloping soils are on stream terraces and alluvial fans. This unit is about 45 percent deep Unison soils, 30 percent deep Braddock soils, and 25 percent other soils. Individual areas are made up of Unison soils, Braddock soils, or a combination of both soils. These soils were mapped together because there are no major differences in their use and management. Areas range from about 5 to 75 acres.

In a typical profile of the Unison soil, the surface layer is dark brown and brown cobbly loam about 15 inches thick. The subsoil is yellowish red, sticky and plastic clay about 43 inches thick. The substratum is red sandy clay loam below a depth of about 58 inches.

In a typical profile of the Braddock soil, the surface layer is dark yellowish brown and strong brown cobbly loam about 17 inches thick. The subsoil is about 42 inches thick. It is yellowish red, sticky and plastic clay between depths of 28 and 59 inches. The substratum is red gravelly sandy clay loam below a depth of about 59 inches.

Included with these soils in mapping are small areas of Berks, Frederick, Groseclose, Vertrees, Duffield, Ernest, Guernsey, Hayter, McGary, and Purdy soils. Berks, Frederick, Groseclose, and Vertrees soils are on ridgetops and side slopes. Duffield and Ernest soils are on foot slopes, in upland depressions, and along drainageways. Guernsey, Hayter, and McGary soils are on stream terraces and alluvial fans. Purdy soils are on flood plains. Sinkholes are in some delineations.

Permeability is moderate in the Unison and Braddock soils. The available water capacity is moderate. Surface runoff is rapid. Potential frost action is moderate. The shrink-swell potential is moderate. Natural fertility is low. The organic matter content is low to moderate. The thickness of the rooting zone and depth to bedrock are more than 60 inches. The surface layer and subsoil in unlimed areas are strongly acid through medium acid in the Unison soil and very strongly acid or strongly acid in the Braddock soil.

These soils are used mainly for pasture and cultivated crops.

Cultivated crops are well suited to these soils, especially corn, small grains, and grasses and legumes for hay. Crop production is limited by a severe erosion hazard. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff and help control erosion. Tilth is poor. A high content of cobbles and pebbles interferes with tillage and planting. Crop yields can be increased by applications of lime and fertilizer.

Pasture grasses and legumes are well suited to these soils. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer are useful management procedures.

Timber production is very high on the Unison soil and high on the Braddock soil. These soils are easily managed for woodland.

Urban development of these soils is limited by a clayey subsoil, low strength, moderate shrink-swell potential, moderate permeability, slope, and large stones.

This map unit is in capability subclass IVs.

32B—Unison-Urban land complex, 2 to 7 percent slopes. The Unison soils and Urban land are gently sloping. This unit is on ridgetops in the city of Radford and the Radford Arsenal. This complex consists of about 50 percent deep and well drained Unison soils, 30 percent Urban land, and 20 percent other soils. The Unison soils and Urban land are so intermingled that

they could not be shown separately at the scale selected for mapping.

In an undisturbed area, a typical profile of a Unison soil has a surface layer of dark brown and brown loam about 15 inches thick. The subsoil is yellowish red, sticky and plastic clay about 43 inches thick. The substratum is red sandy clay loam below a depth of about 58 inches.

Urban land is land covered by streets, parking lots, buildings, and other structures. The original soil has been so altered or obscured that classification is not practical.

Included with this complex in mapping are small areas of Berks, Caneyville, Ernest, Groseclose, Opequon, Poplimento, Udorthents, Braddock, Guernsey, Hayter, Duffield, Ross, and Weaver soils. Berks, Caneyville, Ernest, Groseclose, Opequon, and Poplimento soils and Udorthents are on ridgetops and side slopes. Braddock, Guernsey, and Hayter soils are on stream terraces. Duffield and Ernest soils are on foot slopes, in upland depressions, and along drainageways. Ross and Weaver soils are on flood plains. Rock outcrop and sinkholes are in some delineations.

Permeability is moderate in the Unison soils. The available water capacity is moderate. Surface runoff is medium. Potential frost action is moderate. The shrink-swell potential is moderate. Natural fertility is low. The organic matter content is low to moderate. The thickness of the rooting zone and depth to bedrock are more than 60 inches. The surface layer and subsoil in unlimed areas are strongly acid through medium acid in the Unison soils. In disturbed areas, permeability, the available water capacity, potential frost action, shrink-swell potential, natural fertility, the organic matter content, and reaction are extremely variable.

The soils in this unit are used for lawns, vegetable gardens, parks, golf fairways, playgrounds, and boulevards.

Lawns, golf fairways, and boulevards are well suited to undisturbed areas of the Unison soils. These uses are limited in disturbed areas, where the soils have a lower available water capacity and a clayey surface layer. The erosion hazard is moderate.

Vegetable gardens are well suited to undisturbed areas of the Unison soils. The erosion hazard is moderate. Yields can be increased by applications of lime and fertilizer. Tilth is good. Sweet corn, potatoes, cabbage, peas, beans, and other vegetables are suited to these soils. Crop production is limited in disturbed areas that have a clayey surface layer and a lower available water capacity.

Shade trees and ornamental shrubs are well suited to the Unison soils.

Urban development of this complex is limited by a clayey subsoil, low strength, moderate shrink-swell potential, and moderate permeability.

This complex is not assigned to a capability subclass.

32C—Unison-Urban land complex, 7 to 15 percent slopes. The Unison soils and Urban land are strongly sloping. This unit is on side slopes and ridgetops in the city of Radford and the Radford Arsenal. This complex consists of about 50 percent deep and well drained Unison soils, 20 percent Urban land, and 30 percent other soils. The Unison soils and Urban land are so intermingled that they could not be shown separately at the scale selected for mapping.

In an undisturbed area, a typical profile of a Unison soil has a surface layer of dark brown and brown loam about 15 inches thick. The subsoil is yellowish red, sticky and plastic clay about 43 inches thick. The substratum is red sandy clay loam below a depth of about 58 inches.

Urban land is land covered by streets, parking lots, buildings, and other structures. The original soil has been so altered or obscured that classification is not practical.

Included with this complex in mapping are small areas of Berks, Caneyville, Ernest, Groseclose, Opequon, Poplimento, Udorthents, Braddock, Guernsey, Hayter, Duffield, Ross, and Weaver soils. Berks, Caneyville, Ernest, Groseclose, Opequon, and Poplimento soils and Udorthents are on ridgetops and side slopes. Braddock, Guernsey, and Hayter soils are on stream terraces. Duffield and Ernest soils are on foot slopes, in upland depressions, and along drainageways. Ross and Weaver soils are on flood plains. Rock outcrop and sinkholes are in some delineations.

Permeability is moderate in the Unison soils. The available water capacity is moderate. Surface runoff is rapid. Potential frost action is moderate. The shrink-swell potential is moderate. Natural fertility is low. The organic matter content is low to moderate. The thickness of the rooting zone and depth to bedrock are more than 60 inches. The surface layer and subsoil in unlimed areas are strongly acid through medium acid. In disturbed areas, permeability, the available water capacity, potential frost action, shrink-swell potential, natural fertility, the organic matter content, and reaction are extremely variable.

The soils in this unit are used for lawns, vegetable gardens, parks, golf fairways, and boulevards.

Lawns, golf fairways, and boulevards are fairly well suited to undisturbed areas of the Unison soils. These uses are limited in disturbed areas, where the soils have a lower available water capacity and a clayey surface layer. The erosion hazard is severe.

Vegetable gardens are fairly well suited to undisturbed areas of the Unison soils. The erosion hazard is moderate. Yields can be increased by applications of lime and fertilizer. Tilth is good. Sweet corn, potatoes, cabbage, peas, beans, and other vegetables are suited to these soils. Crop production is limited in disturbed areas that have a clayey surface layer and a lower available water capacity.

Shade trees and ornamental shrubs are suited to these soils.

Urban development of this complex is limited by a clayey subsoil, low strength, moderate shrink-swell potential, moderate permeability, and slope.

This complex is not assigned to a capability subclass.

32D—Unison-Urban land complex, 15 to 25 percent slopes. The Unison soils and Urban land are moderately steep. This unit is on side slopes in the city of Radford and the Radford Arsenal. This complex consists of about 45 percent deep and well drained Unison soils, 20 percent Urban land, and 35 percent other soils. The Unison soils and Urban land are so intermingled that they could not be shown separately at the scale selected for mapping.

In an undisturbed area, a typical profile of a Unison soil has a surface layer of dark brown and brown loam about 15 inches thick. The subsoil is yellowish red, sticky and plastic clay about 43 inches thick. The substratum is red sandy clay loam below a depth of about 58 inches.

Urban land is land covered by streets, parking lots, buildings, and other structures. The original soil has been so altered or obscured that classification is not practical.

Included with this complex in mapping are small areas of Berks, Caneyville, Ernest, Groseclose, Opequon, Poplimento, Udorthents, Braddock, Guernsey, Hayter, Duffield, Ross, and Weaver soils. Berks, Caneyville, Ernest, Groseclose, Opequon, and Poplimento soils and Udorthents are on ridgetops and side slopes. Braddock, Guernsey, and Hayter soils are on stream terraces. Duffield and Ernest soils are on foot slopes, in upland depressions, and along drainageways. Ross and Weaver soils are on flood plains. Rock outcrop and sinkholes are in some delineations.

Permeability is moderate in the Unison soils. The available water capacity is moderate. Surface runoff is rapid. Potential frost action is moderate. The shrink-swell potential is moderate. Natural fertility is low. The organic matter content is low to moderate. The thickness of the rooting zone and depth to bedrock are more than 60 inches. The surface layer and subsoil in unlimed areas are strongly acid through medium acid. In disturbed areas, permeability, the available water capacity, potential frost action, shrink-swell potential, natural fertility, the organic matter content, and reaction are extremely variable.

The soils in this unit are used for lawns, parks, golf fairways, and boulevards.

Lawns, golf fairways, and boulevards are poorly suited to undisturbed areas of the Unison soils. Slope is a limitation. These uses are limited in disturbed areas, where the soils have a lower available water capacity and a clayey surface layer. The erosion hazard is severe.

Vegetable gardens are poorly suited to undisturbed areas of the Unison soils. The erosion hazard is severe. If these soils are used for vegetable gardens, yields can be increased by applications of lime and fertilizer. Tilth is good. Sweet corn, potatoes, cabbage, peas, beans, and other vegetables are suited to these soils. Crop production is limited in disturbed areas that have a clayey surface layer and a lower available water capacity.

Shade trees and ornamental shrubs are well suited to these soils.

Urban development of this complex is limited by slope, a clayey subsoil, low strength, moderate shrink-swell potential, and moderate permeability.

This complex is not assigned to a capability subclass.

33—Weaver soils. These moderately well drained, deep, nearly level soils are on flood plains. They have different surface textures so intermingled that it was not practical to map them separately. Areas range from about 3 to 25 acres. These soils are commonly flooded for brief periods.

In a typical profile of a Weaver soil, the surface layer is dark brown silt loam about 10 inches thick. The subsoil is about 39 inches thick. It is brown silt loam between depths of 10 and 18 inches, brown silt loam mottled with grayish brown and black between depths of 18 and 26 inches, dark yellowish brown silt loam mottled with grayish brown between depths of 26 and 30 inches, and dark gray silt loam between depths of 30 and 49 inches. The substratum is dark gray gravelly sandy clay loam below a depth of about 49 inches.

Included with these soils in mapping are small areas of Guernsey, McGary, Purdy, and Ross soils. Guernsey soils are on low terraces. McGary, Purdy, and Ross soils are on flood plains. Also included in some delineations are areas of a soil that has small amounts of pebbles, cobbles, and stones throughout.

Permeability is moderate in the Weaver soils. The available water capacity is high. Surface runoff is slow. The seasonal high water table ranges from 18 to 30 inches. Potential frost action is moderate. The shrink-swell potential is low. Natural fertility is medium, and the organic matter content is low to moderate. The thickness of the rooting zone and depth to bedrock are more than 40 inches. The surface layer and subsoil in unlimed areas are neutral through moderately alkaline.

These soils are used mainly for pasture and cultivated crops.

Cultivated crops are well suited to these soils, especially corn, small grains, mixed hay, and vegetable crops. Crop production is limited by flooding and by weeds, such as johnsongrass. Weed control is necessary for maximum crop yields. Flooding causes small grains to lodge and alfalfa stands to be short-lived. Flooding can damage crops and delay planting and harvesting. The erosion hazard is slight. Crop yields can be increased by applications of fertilizer.

Pasture grasses and legumes are well suited to these soils. Maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds,

proper stocking, and applying lime and fertilizer are useful management procedures.

Timber production is high on these soils. Wetness limits the use of equipment.

Urban development of these soils is limited by flooding, wetness, low strength, and depth to bedrock.

This map unit is in capabiltiy subclass IIw.

34E—Wurno-Caneyville complex, 25 to 45 percent slopes. These well drained, steep and very steep soils are on side slopes. This complex is about 50 percent moderately deep Wurno soils, 30 percent moderately deep Caneyville soils, and 20 percent other soils. The Wurno and Caneyville soils are so intermingled that they could not be shown separately at the scale selected for mapping. Areas range from about 5 to 200 acres.

In a typical profile of the Wurno soil, the surface layer is dark grayish brown shaly silt loam about 6 inches thick. The subsoil is yellowish brown shaly silt loam about 13 inches thick. The substratum is light yellowish brown very shaly silt loam below a depth of about 19 inches. It is difficult to dig below a depth of 33 inches, and shale bedrock is at a depth of 38 inches.

In a typical profile of the Caneyville soil, the surface layer is dark brown and light brown silt loam about 8 inches thick. The subsoil is yellowish red, sticky and plastic clay mottled with light brown and is about 24 inches thick. Hard gray limestone is at a depth of about 32 inches.

Included with this complex in mapping are small areas of Berks, Carbo, Chilhowie, Duffield, Ernest, Jefferson, and Hayter soils. Berks, Carbo, and Chilhowie soils are on side slopes. Duffield and Ernest soils are on foot slopes, in upland depressions, and along drainageways. Jefferson soils are on alluvial fans. Hayter soils are on stream terraces. Rock outcrop is in some delineations.

Permeability is moderate in the Wurno soil and moderately slow in the Caneyville soil. The available water capacity is very low in the Wurno soil and low in the Caneyville soil. Surface runoff is rapid from both soils. Potential frost action is moderate. The shrink-swell potential is low in the Wurno soil and moderate in the Caneyville soil. Natural fertility is medium in both soils. The organic matter content is low in the Wurno soil and moderate in the Caneyville soil. The thickness of the rooting zone and depth to bedrock range from 20 to 40 inches. The surface layer and subsoil in unlimed areas are slightly acid through mildly alkaline in the Wurno soil and strongly acid through neutral in the Caneyville soil.

These soils are used mainly for woodland.

Cultivated crops are poorly suited to these soils. Crop production is limited by slope and a severe erosion hazard.

Pasture grasses and legumes are poorly suited to these soils. Slope and the low available water capacity are the major limitations.

Timber production is moderately high on the north slopes of the Wurno soil and high on the north slopes of the Caneyville soil. It is moderate on south slopes of the Wurno soil and moderately high on the south slopes of the Caneyville soil. Slope limits the use of equipment.

Urban development of these soils is limited by slope, depth to bedrock, moderately slow permeability, a clayey subsoil, and low strength.

This complex is in capability subclass VIIe.

use and management of the soils

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

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

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the 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.

prime farmland

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

Prime farmland is defined as the land best suited to producing food, feed, forage, fiber, and oilseed crops. When treated and managed using acceptable farming methods, it has the soil quality, growing season, and moisture supply needed to produce a sustained high yield of crops. These high yields are produced with minimal expenditure of energy and economic resources, and farming this land results in the least damage to the environment.

Prime farmland may now be cropland, pasture, woodland, or it may be in other uses, but is not urban and built-up land or water areas. It must either be used for producing food or fiber or be available for these uses.

Prime farmland usually has an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The levels of acidity or alkalinity of the soil are 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 flooded during the growing season. The slope ranges mainly from 2 to 7 percent. More information on the criteria for prime farmland can be obtained at the local office of the Soil Conservation Service.

About 13,844 acres, or nearly 5.41 percent, of Montgomery County meets the soil requirements for prime farmland. It is in all parts of the survey area except where mountains are steep and inaccessible.

A recent trend in land use in some parts of the county has resulted in the loss of some prime farmland to industrial and urban uses. This loss to other uses puts pressure on marginal land, which generally are more erodible, droughty, and difficult to cultivate, and usually less productive.

The map units that make up prime farmland in Montgomery County are listed in this section. This list does not constitute a recommendation for a particular land use. The extent of each map unit is listed in table 5. The location is shown on the detailed soil maps in the back of this publication. The soil qualities that affect use and management are described in the section "Detailed soil map units."

The map units that meet the soil requirements for prime farmland are:

2B	Berks-Groseclose complex, 2 to 7 percent slopes

12B	Frederick and Vertrees silt loams, 2 to 7 percent slopes
13B	Frederick and Vertrees cherty silt loams, 2 to 7 percent slopes
15B	Glenelg loam, 2 to 7 percent slopes
16B	Groseclose and Poplimento soils, 2 to 7 percent slopes
19B	Guernsey silt loam, 2 to 7 percent slopes
20B	Hayter loam, 2 to 7 percent slopes
30B	Unison and Braddock soils, 2 to 7 percent slopes

crops and pasture

Lawrence S. Wilkinson, district conservationist, Soil Conservation Service, prepared this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

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

The farms in Montgomery County have decreased in number and increased in size since 1960. Livestock and forage production are their main sources of income. The main types of livestock produced are beef and dairy cattle. Other types include hogs, sheep, and horses. The main forage crops are alfalfa and mixed grass-legume hays. Corn is grown mainly for silage. Small areas of grain and specialty crops are also produced in the county. Grain crops include corn, barley, sorghum, and wheat. Specialty crops include tobacco, strawberries, nursery plants, and Christmas trees.

Soil conservation practices are necessary on almost all cropland in the county. Conservation practices include conservation tillage, stripcropping, crop rotations, winter cover crops, grassed waterways, and diversions. In recent years conservation tillage has replaced contour stripcropping in many fields. The most common conservation tillage practice is no-till planting. The primary cover crop for no-till planting is rye.

Slope, stoniness, and depth to bedrock limit many areas to less intensive uses such as hay and pasture. Grass-clover hay is the primary hay crop, but alfalfa has made a comeback since the weevil almost eliminated its use in the early '60's. Grasses used for hay are mainly orchardgrass and fescue. Pastures are predominately cool-season grasses such as bluegrass, orchardgrass, and fescue. Pastures with limited access to farm machinery tend to be in native grasses. These native grasses are warm-season varieties such as broom sedge and the bluestems.

Many farmers obtain double use from their grassland fields for both hay and pasture. The most common example is stockpiled fescue for winter grazing. One or two hay cuttings are made in the spring, additional nitrogen fertilizer is applied in August, and cattle graze the accumulated growth during the winter. Another common, though less intensive practice is to take a first cutting of orchardgrass and then allow cattle to graze the regrowth in the late spring.

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

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

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

Crops other than those shown in table 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.

land capability classification

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

but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

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

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

Class I soils have slight limitations that restrict their use.

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

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

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

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

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

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

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

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

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

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 (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, c, and r.

Some soils with slope of more than 15 percent have two ordination symbols—one for the north-facing slope (north aspect) and one for the south-facing slope (south aspect). The north aspect receives less direct sunlight than the south, and there is less drying of the soil. The north-facing soils generally have higher potential productivity than the south-facing.

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

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

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

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

Ratings of *windthrow hazard* are based on soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that a few trees may be blown down by normal winds; *moderate*, that some trees will be blown down during periods of excessive soil wetness and

strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in 50 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.

Trees to plant are those that are suited to the soils and to 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 sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 8, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 8 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 11 and interpretations for dwellings without basements and for local roads and streets in table 10.

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

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

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

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

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

wildlife habitat

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

In table 9, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair*

indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

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

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, 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 flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are broom sedge, goldenrod, and beggarweed.

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

Coniferous plants furnish browse, seeds, and cones. 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. The wildlife attracted to these areas include bobwhite quail, woodchuck, 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, white-tailed 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, shore birds, muskrat, mink, and beaver.

engineering

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

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

The information is not site specific and does not eliminate the need for onsite investigation of the soils or

for testing and analysis by personnel experienced in the design and construction of engineering works.

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

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

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

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

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

building site development

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

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

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

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

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock 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 the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

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

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

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

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

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

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

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

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

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

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

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

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a

landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

construction materials

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

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

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

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

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

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

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

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

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

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

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

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

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

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

water management

Table 13 gives information on the soil properties and site features that affect water management. The degree

and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed 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 potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

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

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, 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 characterize key soils.

This publication does not contain engineering test data, but some tests were made by the State Highway Commission of Virginia in cooperation with the Federal Highway Administration, Department of Transportation. Data from these tests were considered in estimating the engineering index properties in table 14.

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

engineering index properties

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

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

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

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

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

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

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

laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

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

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

physical and chemical properties

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

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

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

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

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

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

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

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

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

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

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

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that

can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

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

In table 15, the estimated content of organic matter of the plow layer is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

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

soil and water features

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

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The Weikert soil in table 16 is assigned to two hydrologic soil groups where it is less than 20 inches deep to bedrock. The first letter applies to areas where the bedrock is cracked and pervious, and the second letter applies to areas where the bedrock is impervious or where exposed bedrock makes up more than 25 percent of the surface of the soil.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes are not considered flooding.

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

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

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

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

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 16 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, 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. An artesian water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. 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 specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

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 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 creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

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

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

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*11*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 17, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

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

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquults (*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 pale, plus *aquult*, the suborder of the Ultisols that have 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. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is 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 similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*10*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*11*). 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."

Berks series

Soils of the Berks series are moderately deep and well drained. They formed in residum of shale, siltstone, and sandstone on uplands. Slopes range from 2 to 70 percent.

Berks soils are commonly near Clymer, Groseclose, Lowell, Rayne, and Weikert soils. Berks soils are moderately deep to bedrock and contain more coarse fragments than the deep Clymer, Groseclose, Lowell, and Rayne soils. They are deeper to bedrock than the shallow Weikert soils.

Typical pedon of Berks shaly silt loam, in an area of Berks-Lowell-Rayne complex, 25 to 65 percent slopes, about 1,000 feet east-northeast (90°) of the intersection of State Highways 615 and 674 and about 2.2 miles southeast of Christiansburg.

O2—2 inches to 0; undecomposed and partially decomposed leaves and twigs.
A1—0 to 7 inches; dark brown (10YR 3/3) shaly silt loam; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; many very fine, fine, medium, and coarse roots; 30 percent shale fragments; very strongly acid; gradual smooth boundary.
B2—7 to 23 inches; brown (7.5YR 5/4) shaly silt loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; many very fine, fine, medium, and coarse roots; few thin coatings in pores, on faces of peds, and on shale fragments; 45 percent brownish yellow (10YR 6/6) shale fragments; very strongly acid; gradual wavy boundary.
C—23 to 33 inches; brownish yellow (10YR 6/6), very shaly silt loam; massive; friable, slightly sticky, slightly plastic; common very fine and fine roots in rock crevices; few thin clay films on shale fragments; 70 percent pale olive (5Y 6/4) and yellowish red (5YR 4/6) shale fragments; very strongly acid; clear wavy boundary.
R—33 inches; soft rippable brownish yellow shale.

Solum thickness ranges from 18 to 40 inches. Depth to bedrock ranges from 20 to 40 inches. Rock fragments range from 10 to 50 percent in the A horizon, 15 to 75 percent in the B horizon, and 35 to 90 percent in the C horizon. Reaction is extremely acid through slightly acid, unless the soil has been limed.

The A horizon has hue of 10YR, value of 3 through 5, and chroma of 2 through 4. It is silt loam or loam and their shaly, very shaly, channery, very channery, stony, and very stony analogs. The B horizon has hue of 5YR through 2.5Y, value of 4 through 6, and chroma of 3 through 8. Hue of 5YR is restricted to the lower part. The B horizon is silt loam, silty clay loam, or loam in the fine earth fraction. The C horizon has hue of 5YR through 2.5Y, value of 4 through 6, and chroma of 2 through 6. It is silt loam or loam in the fine earth fraction.

Braddock series

Soils of the Braddock series are deep and well drained. They formed in alluvium of granite, gneiss, schist, sandstone, quartzite, and shale on stream terraces and alluvial fans. Slopes range from 2 to 25 percent. The Braddock soils in this survey area are mapped only with Unison soils.

Braddock soils are near Berks, Groseclose, Guernsey, and Unison soils. The Braddock soils are deeper to bedrock than the Berks soils, have a redder subsoil than the Groseclose and Unison soils, and are better drained than the Guernsey soils.

Typical pedon of Braddock loam, in an area of Unison and Braddock soils, 2 to 7 percent slopes, 0.9 mile west of the junction of State Highways 787 and 600 and Little River and about 9 miles south-southwest of Radford.

Ap—0 to 7 inches; dark yellowish brown (10YR 4/4) loam; moderate very fine and fine granular structure; very friable, slightly sticky, slightly plastic; many very fine and fine roots; many fine pores; many krotovinas; 2 percent rounded quartz pebbles; strongly acid; clear smooth boundary.
A2—7 to 17 inches; strong brown (7.5YR 5/6) loam; weak fine granular structure; friable, slightly sticky, slightly plastic,; common fine roots; many fine pores; many krotovinas filled with material from above; 2 percent rounded quartz pebbles; few fine mica flakes; strongly acid; gradual smooth boundary.
B21t—17 to 28 inches; yellowish red (5YR 5/6) clay; moderate medium subangular blocky structure; firm, sticky, plastic; common fine roots; common fine pores; common krotovinas; many medium clay skins on faces of peds; 2 percent rounded quartz pebbles; few fine mica flakes; very strongly acid; gradual wavy boundary.
B22t—28 to 59 inches; dark red (10R 3/6) clay; moderate medium subangular blocky structure; firm, sticky, plastic; few fine roots; common fine pores; many medium clay films on faces of peds; 2 percent quartz pebbles and cobblestones, few fine mica flakes; very strongly acid; gradual smooth boundary.
IIC—59 to 78 inches; red (10R 4/6) gravelly sandy clay loam; massive; friable, slightly sticky, slightly plastic; 43 percent pebbles; very strongly acid.

Solum thickness is 40 to 60 inches or more. Depth to bedrock is more than 60 inches. Thickness of alluvial deposits ranges from 3.5 to more than 20 feet. Rock fragments range from 0 to 35 percent in the A horizon, range from 0 to 45 percent in the B horizon, and are variable in the C horizon. Reaction is very strongly acid or strongly acid, unless the soil has been limed.

The A horizon has hue of 7.5YR or 10YR, value of 2 through 6, and chroma of 1 through 8. Value of 2 or 3 and chroma of 1 through 3 are limited to a thin A1 horizon. Texture is loam or sandy loam and their gravelly, cobbly, stony, and very stony analogs. The B2t horizon has hue of 10R through 5YR, value of 3 through 5, and chroma of 6 or 8. It is clay loam, sandy clay, or clay in the fine earth fraction. The C or IIC horizon is variable in color. It is loamy or clayey soil material with a variable content of pebbles, cobblestones, and stones.

Caneyville series

Soils of the Caneyville series are moderately deep and well drained. They formed in residuum of limestone on uplands. Slopes range from 7 to 60 percent.

Caneyville soils are commonly near Groseclose, Opequon, and Wurno soils. Caneyville soils are shallower than Groseclose soils, are deeper than Opequon soils, and contain fewer coarse fragments than Wurno soils.

Typical pedon of Caneyville silt loam, in an areas of Caneyville-Opequon-Rock outcrop complex, 25 to 60 percent slopes, about 6,200 feet north-northwest (344°) of the junction of State Highways 822 and 753 and about 1.0 mile north of Shawsville.

O2—1 inch to 0; undecomposed and partially decomposed leaves and twigs.
A1—0 to 3 inches; dark brown (10YR 4/3) silt loam; moderate fine granular structure; friable; many very fine, fine, medium, and coarse roots; medium acid; clear smooth boundary.
A2—3 to 8 inches; light brown (7.5YR 6/4) silt loam; weak fine and medium granular structure; friable; many very fine, fine, medium, and coarse roots; medium acid; clear smooth boundary.
B2t—8 to 32 inches; yellowish red (5YR 4/6) clay; common medium distinct light brown (7.5YR 6/4) mottles; strong medium angular blocky structure; firm, sticky, plastic; common very fine, fine, and medium roots; many thick clay films on faces of peds; slightly acid; abrupt smooth boundary.
R—32 inches; hard limestone bedrock.

Solum thickness and depth to bedrock range from 20 to 40 inches. Coarse fragments range from 0 to 10 percent. Reaction is very strongly acid through neutral in the upper part of the solum and medium acid to mildly alkaline in the lower part.

The A horizon has hue of 7.5YR or 10YR, value of 3 through 6, and chroma of 2 through 4. It is silty clay loam, silt loam, loam or, in eroded areas, silty clay, or it is the stony and very stony analogs of those textures. The Bt horizon has hue of 2.5YR through 10YR, value of 4 or 5, and chroma of 4 through 6. It is silty clay loam, silty clay, or clay. The C horizon, if there is one, is mottled in shades of gray, red, brown, and yellow. It is silty clay or clay.

Carbo series

Soils of the Carbo series are moderately deep and well drained. They formed in residuum of interbedded limestone and shale on ridgetops and side slopes. Slopes range from 7 to 25 percent.

Carbo soils are commonly near Chilhowie, Poplimento, Vertrees, and Wurno soils. Carbo soils have fewer coarse fragments than the Chilhowie and Wurno soils and are shallower than the Poplimento and Vertrees soils.

Typical pedon of Carbo silty clay loam, in an area of Carbo and Chilhowie soils, 7 to 15 percent slopes, approximately 300 feet southwest of the intersection of State Highways 785 and 723 at Lusters Gate.

Ap—0 to 7 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine and medium granular structure; friable, slightly sticky, slightly plastic; many very fine roots; 5 percent shale fragments; slightly acid; clear smooth boundary.
B2t—7 to 21 inches; strong brown (7.5YR 5/8) clay; strong medium subangular blocky structure; very firm, very sticky, very plastic; few fine roots; many medium clay films on faces of peds; very strongly acid; clear smooth boundary.
B3t—21 to 30 inches; yellowish brown (10YR 5/6) clay; strong medium subangular blocky structure; firm, very sticky, very plastic; few fine roots; many medium clay films on faces of peds; 10 percent shale fragments; neutral; clear wavy boundary.
R—30 inches; hard interbedded limestone and shale.

Solum thickness and depth to bedrock range from 20 to 40 inches. Coarse fragments range from 0 to 10 percent in the A horizon and from 0 to 15 percent in the Bt and C horizons. Reaction is very strongly acid through neutral in the A and B2 horizons and medium acid through mildly alkaline in the B3 and C horizons.

The A horizon has hue of 7.5YR or 10YR, value of 3 through 5, and chroma of 3 through 6. It is silt loam or silty clay loam with silty clay or clay in eroded areas. The Bt horizon has hue of 5YR through 10YR, value of 4 through 6, and chroma of 4 through 8 with hue of 5YR restricted to the lower part. Some pedons have a C horizon. It has hue of 7.5YR through 2.5Y, value of 4 or 5, and chroma of 4 through 8. It is silty clay or clay.

Chilhowie series

Soils of the Chilhowie series are moderately deep and well drained. They formed in residuum of interbedded shale and limestone on uplands. Slopes range from 7 to 25 percent. Chilhowie soils in this survey areas are mapped only with Carbo soils.

Chilhowie soils are commonly near Carbo, Caneyville, and Wurno soils. Chilhowie soils have more coarse fragments and a thinner solum than the Carbo and Caneyville soils and have more clay than the Wurno soils.

Typical pedon of Chilhowie silty clay, in an area of Carbo and Chilhowie soils, 7 to 15 percent slopes, about 1,000 feet southeast of the intersection of State Highways 723 and 785 at Lusters Gate.

A1—0 to 2 inches; very dark grayish brown (10YR 3/2) silty clay; strong very fine granular structure; friable, sticky, plastic; many very fine, fine, and medium roots; 10 percent shale and limestone fragments; neutral; clear smooth boundary.

B2t—2 to 15 inches; yellowish brown (10YR 5/4) clay; few medium faint olive brown (2.5Y 4/4) mottles; moderate very fine and fine angular blocky structure; firm, sticky, plastic; many very fine, fine, and medium roots; continuous medium clay films on faces of peds; 10 percent shale and limestone fragments; mildly alkaline; strong effervescence; gradual smooth boundary.

C—15 to 30 inches; olive brown (2.5Y 4/4) very shaly clay; massive; firm, sticky, plastic; common fine roots; 70 percent shale fragments; mildly alkaline; strong effervescence; gradual wavy boundary.

R—30 inches; hard interbedded shale and limestone.

Solum thickness ranges from 10 to 20 inches. Depth to bedrock ranges from 20 to 40 inches. Coarse fragments range from 0 to 15 percent in the solum and from 25 to 80 percent in the C horizon. Reaction is slighly acid through mildly alkaline in the solum and neutral through moderately alkaline in the C horizon.

The A horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 through 4. It is silty clay loam, silty clay, or clay. The Bt horizon has hue of 5YR through 10YR, value of 4 through 6, and chroma of 3 through 8. It is clay or silty clay. The C horizon has hue of 7.5YR through 2.5Y, value of 4 through 6, and chroma of 4 through 8. It is silty clay or clay in the fine earth fraction.

Clymer series

Soils of the Clymer series are deep and well drained. They formed in residuum of sandstone, siltstone, and shale on ridgetops. Slopes range from 7 to 15 percent.

The Clymer soils are commonly near Berks, Jefferson, and Weikert soils. Clymer soils are deeper than the Berks and Weikert soils and have a thinner solum than the Jefferson soils.

Typical pedon of Clymer loam, in an area of Berks-Clymer complex, 7 to 15 percent slopes, about 5,500 feet south of the junction of Preston Forest Road and the fire road on top of Brush Mountain and about 4.5 miles north-northeast of Blacksburg.

O2—3 inches to 0; undecomposed and partially decomposed leaves and twigs.

A1—0 to 9 inches; yellowish brown (10YR 5/4) loam; weak very fine granular structure; very friable; many very fine, fine, medium, and coarse roots; 5 percent sandstone fragments; very strongly acid; gradual smooth boundary.

B2t—9 to 21 inches; yellowish brown (10YR 5/6) clay loam; common medium faint brownish yellow (10YR 6/8) mottles; weak fine and medium subangular blocky structure; very friable, slightly sticky, slightly plastic; many very fine, fine, medium, and coarse roots; common medium patchy clay films on faces of peds; 10 percent sandstone fragments; very strongly acid; clear smooth boundary.

B3t—21 to 32 inches; yellowish brown (10YR 5/6) channery sandy clay loam; many coarse distinct brownish yellow (10YR 6/8) mottles; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few very fine roots; common medium patchy clay films on faces of peds; 30 percent sandstone fragments; very strongly acid; gradual smooth boundary.

C—32 to 49 inches; yellowish brown (10YR 5/6) channery sandy loam, many medium distinct brown (10YR 4/3) and yellow (10YR 7/6) mottles; massive; firm, slightly sticky; few very fine roots; few thin clay flows; 40 percent sandstone fragments; very strongly acid; clear smooth boundary.

R—49 inches; hard sandstone bedrock.

Solum thickness ranges from 24 to 40 inches. Depth to bedrock ranges from 40 to 60 inches. Rock fragments range from 0 to 35 percent in the solum and from 20 to 85 percent in the C horizon. Reaction is extremely acid through strongly acid, unless the soil has been limed.

The A horizon has hue of 10YR, value of 3 through 5, and chroma of 2 through 4. It is loam, sandy loam, or silt loam and their channery, cobbly, stony, very stony, and extremely stony analogs. The Bt horizon has hue of 7.5YR through 2.5Y, value of 4 through 6, and chroma of 4 through 8. It is loam, clay loam, sandy clay loam, or sandy loam in the fine earth fraction. The C horizon has hue of 7.5YR or 10YR and value and chroma of 4 through 6 or is mottled in shades of brown, yellow, red, and gray. It is loam, clay loam, sandy clay loam, or sandy loam in the fine earth fraction.

Craigsville series

Soils of the Craigsville series are deep and well drained. They formed in alluvium derived from sandstone, quartzite, and shale on flood plains. Slopes range from 0 to 2 percent.

Craigsville soils are commonly near Berks, Jefferson, and Weikert soils. Craigsville soils are deeper than the Berks and Weikert soils and contain more coarse fragments than the Jefferson soils.

Typical pedon of Craigsville cobbly sandy loam, in an area of Craigsville soils about 0.5 mile northeast of the intersection of State Highways 607 and 637 and about 7 miles south of Shawsville.

Ap—0 to 8 inches; dark yellowish brown (10YR 4/4) cobbly sandy loam; moderate fine granular structure; very friable, slightly sticky; many very fine, fine, and medium roots; 25 percent cobblestones and pebbles; strongly acid; clear smooth boundary.

B2—8 to 30 inches; strong brown (7.5YR 5/6) cobbly sandy loam; weak medium subangular blocky structure; very friable, slightly sticky; common very fine and fine roots; 45 percent cobblestones and pebbles; strongly acid; clear wavy boundary.

C—30 to 60 inches; brown (7.5YR 5/4) very cobbly sandy loam; massive; friable, slightly sticky; few very fine and fine roots; 60 percent cobblestones and pebbles; strongly acid.

The solum thickness ranges from 20 to 40 inches. Depth to bedrock is more than 60 inches. Coarse fragments range from 5 to 60 percent in the A horizon and 35 to 70 percent in the B and C horizons. Reaction is very strongly acid or strongly acid, unless the soil has been limed.

The A horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 through 4. It is sandy loam, loam, or silt loam and their cobbly analogs. The B horizon has hue of 5YR through 10YR, value of 4 or 5, and chroma of 4 or 6. It is sandy loam or loam in the fine earth fraction. The C horizon has hue of 5YR through 10YR, value or 4 or 5, and chroma of 3 through 6. It is sandy loam or loamy sand in the fine earth fraction.

Duffield series

Soils of the Duffield series are deep and well drained. They formed in loamy colluvial, alluvial, or eolian sediments underlain by loamy and clayey residuum of limestone and shale. Duffield soils are in upland depressions and along small intermittent drainageways. Slopes range from 2 to 15 percent.

Duffield soils are commonly near Berks, Ernest, Frederick, and Groseclose soils. Duffield soils are deeper and contain fewer coarse fragments than the Berks soils, do not have the fragipan that is present in the Ernest soils, and have a higher base saturation than the Frederick and Groseclose soils.

Typical pedon of Duffield silt loam, in an area of Duffield-Ernest complex, 2 to 7 percent slopes, about 1,900 feet east-northeast of the intersection of State Highways 460 and 114, on the Virginia Tech Horticulture Research Farm and about 3 miles south of Blacksburg.

Ap—0 to 7 inches; dark brown (10YR 4/3) silt loam; weak very fine granular structure; very friable, slightly sticky, slightly plastic; many very fine and fine roots; few black concretions; medium acid; clear smooth boundary.

B21t—7 to 23 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; many very fine and fine roots; few thin patchy clay films on faces of peds, in pores, and bridging sand grains; common black concretions; strongly acid; gradual smooth boundary.

B22t—23 to 37 inches; yellowish brown (10YR 5/6) silty clay loam; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; many very fine and fine roots; common medium patchy clay films on faces of peds; many black concretions; 10 percent chert fragments; strongly acid; clear smooth boundary.

B23t—37 to 47 inches; yellowish brown (10YR 5/8) clay; common medium prominent pale yellow (5Y 7/3) and red (2.5YR 5/6) mottles; moderate fine and medium subangular blocky structure; firm, sticky, plastic; few very fine roots; many thick patchy clay films on faces of peds; 10 percent chert, sandstone, and shale fragments; strongly acid; clear smooth boundary.

B24t—47 to 64 inches; mottled yellowish red (5YR 4/6), yellowish brown (10YR 5/8), and yellow (10YR 7/6) clay; moderate medium angular blocky structure; firm, sticky, plastic; 10 percent shale fragments; strongly acid; gradual wavy boundary.

Solum thickness ranges from 40 to 70 inches. Depth to bedrock is more than 48 inches. Coarse fragments range from 0 to 20 percent in the upper part of the solum and from 5 to 40 percent in the lower part. Reaction ranges from strongly acid through neutral to a depth of about 50 inches and from strongly acid to slightly acid below 50 inches.

The A horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 through 4. It is silt loam, silty clay loam, or loam and their gravelly analogs. The Bt horizon has hue of 5YR through 10YR, value of 4 through 6, and chroma of 4 through 8. It is loam, silt loam, silty clay loam, clay loam, clay, or silty clay in the fine earth fraction. Some pedons have a C horizon. It is mottled in shades of red, brown, and yellow. It is loam, silt loam, silty clay loam, or clay in the fine earth fraction.

Ernest series

Soils of the Ernest series are deep and moderately well drained. They formed in colluvium derived from interbedded limestone, shale, and sandstone in upland depressions, in saddles, and on foot slopes. Slopes range from 2 to 15 percent. Ernest soils in this survey are mapped only with Duffield soils.

Ernest soils are commonly near Berks, Duffield, Frederick, and Groseclose soils. Ernest soils have a fragipan, but the other soils do not.

Typical pedon of Ernest silt loam, in an area of Duffield-Ernest complex, 7 to 15 percent slopes, about 8,500 feet west of the intersection of U.S. Route 11 and State Highway 639 in Christiansburg.

Ap—0 to 6 inches; dark brown (10YR 4/3) silt loam; moderate fine granular structure; very friable, slightly sticky, slightly plastic; many very fine and fine roots; 10 percent coarse fragments; very strongly acid; clear smooth boundary.

B21t—6 to 12 inches; light yellowish brown (10YR 6/4) silty clay loam; many medium distinct dark brown (10YR 4/3) mottles; moderate fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; common fine and very fine roots; common thick patchy clay films on faces of peds; 10 percent coarse fragments; very strongly acid; clear smooth boundary.

B22t—12 to 26 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct light gray (10YR 7/2) mottles; moderate fine and medium subangular blocky structure; friable, sticky, slightly plastic; few very fine roots; many thick patchy clay films on faces of peds; 10 percent coarse fragments; very strongly acid; gradual wavy boundary.

Bx—26 to 50 inches; mottled strong brown (7.5YR 4/6) and pale brown (10YR 6/3) silty clay loam; moderate very thick and thick platy structure parting to moderate fine and medium subangular blocky structure; very firm, sticky, slightly plastic, brittle; many thick patchy clay films on faces of peds; 10 percent coarse fragments; very strongly acid; abrupt smooth boundary.

C—50 to 72 inches; mottled very pale brown (10YR 7/3) and strong brown (7.5YR 5/6) silty clay loam; weak very thick and thick platy structure; very firm, sticky, slightly plastic, brittle; 10 percent coarse fragments; very strongly acid.

Solum thickness ranges from 36 to 72 inches. Depth to bedrock is more than 60 inches. Depth to the top of the fragipan ranges from 20 to 36 inches. Coarse fragments range from 0 to 25 percent in the A horizon, from 5 to 30 percent in the Bt horizon, from 5 to 40 percent in the Bx horizon, and from 5 to 50 percent in the C horizon. Reaction is very strongly acid or strongly acid, unless the soil has been limed.

The A horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 through 4. It is silt loam or loam and their channery, shaly, stony, very stony, and extremely stony analogs. The Bt horizon has hue of 7.5YR or 10YR, value of 4 through 6, and chroma of 3 through 8, and it has high- and low-chroma mottles within the upper 10 inches of the argillic horizon. It is silt loam or silty clay loam in the fine earth fraction. The Bx horizon has hue of 7.5YR through 2.5Y, value of 4 through 6, and chroma of 2 through 8. It is loam, silt loam, clay loam, clay loam, or silty clay loam in the fine earth fraction. The C horizon has hue of 7.5YR through 2.5Y, value of 4 through 7, and chroma of 2 through 6. It is silty clay, silty clay loam, clay loam, silt loam, or loam in the fine earth fraction.

Frederick series

Soils of the Frederick series are deep and well drained. They formed in residuum of limestone interbedded with siltstone and shale on ridgetops and side slopes. Slopes range from 2 to 25 percent.

Frederick soils are commonly near Duffield, Ernest, Groseclose, and Vertrees soils. Frederick soils have more clay than the Duffield soils, are better drained than the Ernest soils, have a thicker solum than the Groseclose soils, and have a lower base saturation than the Vertrees soils.

Typical pedon of Frederick cherty silt loam, in an area of Frederick and Vertrees cherty silt loams, 2 to 7 percent slopes, 0.32 mile south-southeast of the intersection of the northbound lane of Interstate 81 and Highway 787, and 28 miles south of the northbound lane of Interstate 81.

Ap—0 to 10 inches; dark yellowish brown (10YR 4/4) cherty silt loam; weak very fine and fine granular structure; very friable, slightly sticky, slightly plastic; many very fine, fine, medium, and coarse roots; 20 percent chert fragments; neutral; clear smooth boundary.

B2t—10 to 22 inches; strong brown (7.5YR 5/6) clay; common medium distinct reddish yellow (5YR 6/6) mottles; moderate fine and medium subangular blocky structure; firm, sticky, plastic; common very fine, fine, and medium roots; many medium clay films on faces of peds; 10 percent chert fragments; very strongly acid; gradual smooth boundary.

B22t—22 to 74 inches; mottled red (2.5YR 5/6), reddish yellow (5YR 6/6), and yellowish brown (10YR 5/6) clay; moderate fine and medium angular blocky structure; firm, sticky, plastic; many thick continuous clay films on faces of peds; 3 percent chert fragments; very strongly acid.

Solum thickness and depth to bedrock are more than 60 inches. Coarse fragments range from 0 to 25 percent to a depth of 24 inches and from 0 to 10 percent below 24 inches. Reaction is very strongly acid through medium acid in the A horizon and very strongly acid or strongly acid in the B2t horizon, unless the soil has been limed.

The A horizon has hue of 5YR through 10YR, value of 3 through 7, and chroma of 1 through 8. Only the thin A1 horizon has value of 3 with chroma of 1 or 2. The A horizon is loam, silt loam, silty clay loam, or clay loam and their cherty and very cherty analogs. The B21t horizon has hue of 2.5YR through 7.5YR. The B22t horizon has hue of 2.5YR or 5YR. The B2t horizon has

value of 4 or 5 and chroma of 4 through 8. It is mottled in shades of red, yellow, brown, and gray in the lower part. It is clay loam or clay in the upper part and clay or silty clay in the lower part.

French series

Soils of the French series are deep and somewhat poorly drained. They formed in recent alluvium of granite, gneiss, schist, phyllite, and other crystalline rocks on flood plains. Slopes range from 0 to 2 percent.

French soils are commonly near Guernsey and Hayter soils, and they are wetter than these soils.

Typical pedon of French soils, 0.2 mile south-southeast of the intersection of State Highways 612 and 614 near the Montgomery-Floyd County line and about 6 miles southeast of Christiansburg.

Ap—0 to 4 inches; dark brown (10YR 4/3) loam; few fine faint grayish brown mottles; moderate fine and medium granular structure; very friable, slightly sticky, slightly plastic; many very fine, fine, and medium roots; 2 percent quartz pebbles; strongly acid; clear smooth boundary.

B21—4 to 9 inches; dark yellowish brown (10YR 4/4) loam; few fine faint grayish brown (10YR 5/2) mottles; weak fine and medium subangular blocky structure; very friable, slightly sticky, slightly plastic; many very fine and fine roots; 2 percent quartz pebbles; strongly acid; clear smooth boundary.

B22—9 to 16 inches; dark yellowish brown (10YR 4/4) loam; few fine faint dark grayish brown (10YR 4/2) and very pale brown (10YR 8/3) mottles; weak fine and medium subangular blocky structure; very friable, slightly sticky, slightly plastic; common very fine and fine roots; 5 percent quartz pebbles; strongly acid; clear wavy boundary.

B23—16 to 30 inches; dark brown (10YR 4/3) loam; common fine distinct dark gray (10YR 4/1) and reddish brown (5YR 5/3) mottles; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; friable, sticky, plastic; common very fine and fine roots; 10 percent subangular quartz pebbles; strongly acid; clear smooth boundary.

IIC—30 to 50 inches; very dark grayish brown (10YR 3/2) gravelly sand; single grain; loose; 45 percent quartz pebbles; medium acid.

Solum thickness and depth to stratified sand and gravel range from 20 to 40 inches. Depth to bedrock is more than 60 inches. Content of water-rounded pebbles and cobblestones ranges from 0 to 10 percent in the solum and 0 to 70 percent in the substratum. Reaction is strongly acid through slightly acid, unless the soil has been limed.

The A horizon has hue of 7.5YR or 10YR, value of 3 through 5, and chroma of 1 through 4. It is loam, fine sandy loam, or sandy loam. The B2 horizon has hue of 7.5YR or 10YR, value of 3 through 5, and chroma of 3 through 8, and it has few to many mottles. It is loam, sandy loam, fine sandy loam, sandy clay loam, or clay loam. The IIC horizon is neutral with value of 3 through 8 or has hue of 7.5YR through 2.5Y, value of 3 through 8, and chroma of 1 through 8. It has common to many mottles in shades of gray, brown, and red. It is stratified sandy loam, sand, loamy sand, or loam in the fine earth fraction.

Glenelg series

Soils of the Glenelg series are deep and well drained. They formed in residuum of granite, gneiss, and schist on uplands. Slopes range from 2 to 50 percent.

Glenelg soils are commonly near French, Guernsey, Hayter, and Parker soils. Glenelg soils are better drained than the French and Guernsey soils, have a lower base saturation than the Hayter soils, and have fewer coarse fragments than the Parker soils.

Typical pedon of Glenelg loam, 7 to 15 percent slopes, about 0.9 mile east-southeast of the intersection of State Highways 610 and 717 and about 3 miles east-northeast of Pilot.

Ap—0 to 6 inches; dark brown (10YR 4/3) loam; many medium and coarse distinct brown (7.5YR 5/4) mottles; moderate fine granular structure; very friable, slightly sticky, slightly plastic; many very fine roots; 2 percent angular quartz gravel; neutral; clear smooth boundary.

B2t—6 to 19 inches; strong brown (7.5R 5/6) silty clay loam; few medium distinct dark brown (10YR 4/3) mottles; moderate fine and medium subangular blocky structure; friable, sticky, plastic; common very fine roots; continuous medium clay films on faces of peds; 2 percent angular quartz gravel; strongly acid; clear smooth boundary.

B3t—19 to 27 inches; strong brown (7.5YR 5/6) loam; common medium distinct brownish yellow (10YR 6/6) mottles; moderate fine and medium subangular blocky structure; friable, sticky, plastic; few very fine roots; many medium patchy clay films on faces of peds; 1 percent angular quartz gravel; strongly acid; abrupt wavy boundary.

C—27 to 72 inches; brownish yellow (10YR 6/6) and brown (10YR 5/3) saprolite that crushes easily to sandy loam; massive; firm, slightly sticky; 10 percent angular quartz gravel; black (10YR 2/1) coatings on coarse fragments; strongly acid.

Solum thickness ranges from 18 to 30 inches. Depth to bedrock is more than 48 inches. Coarse fragments range from 0 to 35 percent in the solum and from 5 to

90 percent in the C horizon. Reaction is very strongly acid or strongly acid, unless the soil has been limed.

The A horizon has hue of 7.5YR or 10YR, value of 3 through 5, and chroma of 1 through 4. Only the thin A1 horizon has value of 3 with chroma of 1 or 2. The A horizon is loam or silt loam and their channery analogs. The Bt horizon has hue of 5YR through 10YR, value of 4 or 5, and chroma of 4 through 8. It is silty clay loam, loam, or silt loam in the fine earth fraction. The C horizon has hue of 2.5YR through 10YR, value of 4 through 6, and chroma of 2 through 8 and is commonly variegated as a result of weathering of bedrock. It is sandy loam or loam in the fine earth fraction.

Groseclose series

Soils of the Groseclose series are deep and well drained. They formed in residuum of limestone, shale, siltstone, and sandstone on uplands. Slopes range from 2 to 60 percent.

Groseclose soils are commonly near Berks, Duffield, Ernest, and Poplimento soils. Groseclose soils are deeper than the Berks soils, have a lower base saturation than the Duffield and Poplimento soils, and are better drained than the Ernest soils.

Typical pedon of Groseclose loam, in an area of Groseclose and Poplimento soils, 2 to 7 percent slopes, about 3,000 feet east (93°) of the junction of State Highways 114 and 663, about 150 feet south of State Highway 114, and about 6 miles northwest of Christiansburg.

Ap—0 to 10 inches; brown (10YR 5/3) loam; moderate fine granular structure; friable, slightly sticky, slightly plastic; common very fine and fine roots; common fine pores; 2 percent chert fragments less than 1/2 inch in length; medium acid; abrupt smooth boundary.

B2t—10 to 28 inches; yellowish brown (10YR 5/6) clay; moderate very fine and fine subangular blocky structure; friable, sticky, plastic; few very fine and fine roots; common very fine pores; thicky continuous dark yellowish brown clay films and few black coatings on faces of peds; 2 percent chert fragments less than 3 inches in length; very strongly acid; clear smooth boundary.

B3t—28 to 39 inches; mottled strong brown (7.5YR 5/8) and yellowish red (5YR 5/8) clay; moderate medium and coarse subangular blocky structure; friable, sticky, plastic; few fine roots; common fine pores; common slickensides; many thick patchy clay films and few black coatings on faces of peds; 15 percent highly weathered brownish yellow and greenish gray shale and siltstone fragments that crush easily to soil material; very strongly acid; clear wavy boundary.

C1—39 to 51 inches; mottled strong brown (7.5YR 5/8) and yellowish red (5YR 5/6) clay; massive; friable, sticky, slightly plastic; few very fine roots; few very fine vesicular pores; common slickensides; thick discontinuous clay flows mainly in relict rock joints; 60 percent brownish yellow (10YR 6/6) and greenish gray (5G 6/1) shale and siltstone saprolite that crushes easily to soil material; 1 percent chert; very strongly acid; clear wavy boundary.

C2—51 to 72 inches; mottled reddish yellow (5YR 6/6) and yellowish red (5YR 5/8) clay loam; massive; friable, sticky, slightly plastic; few very fine and fine vesicular pores; common slickensides; thick discontinuous clay flows in relict rock joints; few black coatings on coarse fragments; 70 percent greenish gray (5G 6/1) shale and siltstone saprolite that crushes easily to soil material; very strongly acid.

Solum thickness ranges from 30 to 60 inches. Depth to bedrock is more than 48 inches. Coarse fragments of chert and sandstone range from 0 to 75 percent in the A horizon and from 0 to 15 percent in the Bt and C horizons. Reaction is extremely acid through strongly acid throughout, unless the soil has been limed.

The A horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 through 8. It is loam, silt loam, or fine sandy loam and their cherty and very cherty analogs. The Bt horizon has hue of 2.5YR through 10YR, value of 4 through 6, and chroma of 4 through 8. It is clay, silty clay loam, clay loam, or sandy clay loam. The C horizon is mottled in shades of red, brown, and yellow. It is silty clay loam, silt loam, clay loam, clay, sandy clay loam, or sandy loam.

Guernsey series

Soils of the Guernsey series are deep and moderately well drained. They formed in alluvium of limestone, shale, sandstone, and crystalline rock on stream terraces. Slopes range from 2 to 7 percent.

Guernsey soils are commonly near Duffield, Ernest, Hayter, and Weaver soils. Guernsey soils are wetter than the Duffield and Hayter soils, do not have the fragipan that is in the Ernest soils, and contain more clay than the Duffield, Ernest, Hayter, and Weaver soils.

Typical pedon of Guernsey silt loam, 2 to 7 percent slopes, adjacent to U.S. Highway 460 about 1.5 miles south of the junction of U.S. Highway 460 and State Highway 631 at Elliston.

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

B1t—10 to 14 inches; yellowish brown (10YR 5/4) silty clay loam; common medium faint dark brown (10YR 4/3) mottles; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; many very fine roots; few thin patchy clay films on faces of peds; strongly acid; clear smooth boundary.

B2t—14 to 20 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; friable, slightly sticky, slightly plastic; few very fine roots; many thin patchy clay films on faces of peds; 4 percent pebbles; strongly acid; gradual smooth boundary.

IIB22t—20 to 53 inches; grayish brown (10YR 5/2) clay; many medium distinct yellowish brown (10YR 5/6) and light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm, sticky, plastic; many medium patchy clay films on faces of peds; few black coatings on faces of peds; 4 percent pebbles; mildly alkaline; gradual smooth boundary.

IIC—53 to 83 inches; light yellowish brown (10YR 6/4) silty clay loam; light brownish gray (10YR 6/2), gray (10YR 5/1), and black (10YR 2/1) mottles; massive; friable, slightly sticky, slightly plastic; many black coatings on faces of peds; 10 percent pebbles; mildly alkaline.

Solum thickness ranges from 36 to 60 inches. Depth to bedrock is more than 50 inches. Coarse fragments range from 0 to 15 percent in the A horizon, from 2 to 20 percent in the B horizon, and from 5 to 35 percent in the IIC horizon. Reaction is very strongly acid to medium acid in the upper part of the solum and strongly acid to mildly alkaline in the lower part of the solum and in the substratum.

The A horizon has hue of 10YR, value of 3 through 5, and chroma of 2 through 4. Only the thin A1 horizon has value of 3 with chroma of 2 or 3. The A horizon is silt loam. The Bt horizon has hue of 7.5YR, value of 4 through 6, and chroma of 3 through 6 and is mottled in chroma of 2 or less within 10 inches of the upper boundary. It is silt loam, silty clay loam, silty clay, or clay. The IIBt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 through 6. It is silty clay loam, silty clay, or clay. The IIC horizon is neutral with value of 4 through 6 or has hue of 10YR or 2.5Y, value of 4 through 6, and chroma of 1 through 4. It is clay, silty clay, or silty loam in the fine earth fraction.

Hayter series

Soils of the Hayter series are deep and well drained. They formed in alluvium and colluvium derived from granite, gneiss, schist, sandstone, quartzite, limestone, and shale. Hayter soils are on alluvial fans and stream terraces. Slopes range from 2 to 15 percent.

Hayter soils are commonly near Glenelg, Guernsey, Jefferson, and Ross soils. Hayter soils have a higher base saturation than the Glenelg and Jefferson soils, are better drained than the Guernsey soils, and have a better developed subsoil than the Ross soils.

Typical pedon of Hayter loam, 2 to 7 percent slopes, about 2.0 miles west-southwest (241°) of the junction of State Highways 652 and 623, and about 700 feet northwest of the New River at Whitethorne.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) loam, light brownish gray (10YR 6/2) dry; moderate fine and medium granular structure; very friable, slightly sticky, slightly plastic; common very fine roots; common mica flakes; 2 percent quartzite cobblestones; slightly acid; abrupt smooth boundary.

B2t—10 to 26 inches; brown (7.5YR 4/4) loam; moderate fine and medium subangular blocky structure; friable, slightly sticky, plastic; common very fine roots; common medium clay films on faces of peds; common mica flakes; 2 percent quartzite cobblestones; strongly acid; gradual smooth boundary.

B22t—26 to 38 inches; brown (7.5YR 4/4) loam; moderate fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; common very fine roots; common medium clay films on faces of peds; common mica flakes; 10 percent quartzite cobblestones; strongly acid; gradual smooth boundary.

IIB23t—38 to 46 inches; brown (7.5YR 4/4) cobbly sandy clay loam; moderate fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; common very fine roots; common thin clay films on faces of peds; common mica flakes; 20 percent quartzite cobblestones; strongly acid; gradual wavy boundary.

IIB3t—46 to 55 inches; brown (7.5YR 4/4) cobbly sandy clay loam; common medium faint yellowish brown (10YR 5/6) and common medium distinct black (10YR 2/1) mottles; weak coarse subangular blocky structure; friable, slightly sticky, slightly plastic; few very fine roots; common medium clay films on faces of peds; common mica flakes; 20 percent quartzite cobblestones; strongly acid; gradual wavy boundary.

IIC—55 to 74 inches; brown (7.5YR 4/4) cobbly loam; massive; friable, slightly sticky, slightly plastic; many mica flakes; 25 percent quartzite cobblestones; strongly acid.

The solum thickness ranges from 40 to 60 inches. Depth to bedrock is more than 48 inches. Rock fragments range from 0 to 40 percent in the solum and from 25 to 90 percent in the substratum. Reaction is

strongly acid through slightly acid, unless the soil has been limed.

The A horizon has hue of 7.5YR or 10YR, value of 3 through 5, and chroma of 2 through 4. It is loam or fine sandy loam and their gravelly, cobbly, and stony analogs. The Bt horizon has hue of 5YR through 10YR, value of 4 or 5, and chroma of 4 through 8. It is loam, clay loam, or sandy clay loam in the fine earth fraction. The IIC horizon has hue of 5YR through 10YR, value of 4 or 5, and chroma of 4 through 8 or is mottled in shades of brown, yellow, red, black, and gray. It is loam, loamy sand, sandy loam, sandy clay loam, and clay loam in the fine earth fraction.

Jefferson series

Soils of the Jefferson series are deep and well drained. They formed in colluvium of acid sandstone, shale, and siltstone along drainageways and on alluvial fans. Slopes range from 7 to 25 percent.

Jefferson soils are commonly near Berks, Hayter, and Weikert soils. Jefferson soils are deeper and contain fewer coarse fragments than the Berks and Weikert soils and have a lower base saturation than the Hayter soils.

Typical pedon of Jefferson gravelly loam, in an area of Jefferson extremely stony soils, 7 to 25 percent slopes, about 300 yards north of the junction of State Highway 621 and U.S. Highway 460 and about 3 miles north-northwest of Blacksburg.

O2—1 inch to 0; undecomposed and partially decomposed leaves and twigs.

A2—0 to 8 inches; light yellowish brown (10YR 6/4) gravelly loam; weak very fine and fine granular structure; very friable; many very fine, fine, and medium roots; 20 percent sandstone fragments; very strongly acid; clear smooth boundary.

B1—8 to 13 inches; yellowish brown (10YR 5/8) gravelly loam; weak medium and coarse subangular blocky structure; friable, slightly sticky, slightly plastic; common very fine, fine, and medium roots; few thin patchy clay films on faces of peds; 20 percent sandstone fragments; very strongly acid; gradual smooth boundary.

B21t—13 to 31 inches; yellowish brown (10YR 5/6) gravelly clay loam; moderate fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few very fine, fine, and medium roots; many medium patchy clay films on faces of peds; 15 percent sandstone fragments; very strongly acid; gradual smooth boundary.

B22t—31 to 41 inches; yellowish brown (10YR 5/8) gravelly sandy clay loam; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few very fine roots; few thin patchy clay films on faces of peds; 25 percent sandstone and shale fragments; very strongly acid; gradual smooth boundary.

B23t—41 to 55 inches; yellowish brown (10YR 5/6) gravelly sandy clay loam; common medium distinct pale yellow (2.5Y 7/4), yellow (10YR 7/6), and reddish brown (5YR 4/4) mottles; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few very fine roots; few thin patchy clay films on faces of peds; 25 percent sandstone and shale fragments; very strongly acid; clear smooth boundary.

IIC—55 to 65 inches; mottled pale yellow (2.5Y 7/4), yellow (10YR 7/6), and reddish brown (5YR 4/4) very shaly clay loam; massive; friable, slightly sticky, slightly plastic; 75 percent shale fragments; very strongly acid.

Solum thickness ranges from 40 to 60 inches. Depth to bedrock is more than 60 inches. Rock fragments of sandstone and shale range from 5 to 35 percent in the upper 3 feet and 20 to 80 percent below 3 feet. Reaction is very strongly acid or strongly acid, unless the soil has been limed.

The A horizon has hue of 10YR, value of 3 through 6, and chroma of 1 through 4. Some pedons have an Ap or A1 horizon. Only the thin A1 horizon has a value of 3 with chroma of 1 or 2. The A horizon is loam or fine sandy loam and their gravelly, cobbly, stony, very stony, and extremely stony analogs. The Bt horizon has hue of 7.5YR or 10YR, value of 5, and chroma of 4 through 8. It is loam, sandy clay loam, or clay loam in the fine earth fraction. The C horizon is mottled in shades of brown, yellow, and red. In some pedons there are gray mottles. The C horizon is fine sandy loam, sandy loam, loam, sandy clay loam, or clay loam in the fine earth fraction.

Lowell series

Soils of the Lowell series are deep and well drained. They formed in residuum of limestone and calcareous shale on side slopes. Slopes range from 15 to 65 percent. The Lowell soils in this survey area are mapped only with Berks and Rayne soils.

Lowell soils are commonly near Berks, Duffield, Ernest, and Rayne soils. Lowell soils are deeper than the Berks soils, have more clay than the Duffield and Rayne soils, and do not have the fragipan that is in the Ernest soils.

Typical pedon of Lowell silt loam, in an area of Berks-Lowell-Rayne complex, 25 to 65 percent slopes, about 2,000 feet east-southeast (112°) of the intersection of

State Highway 609 and the South Fork of the Roanoke River and about 1 mile east-southeast of Shawsville.

O2—1 inch to 0; undecomposed and partially decomposed leaves and twigs.
A1—0 to 2 inches; dark brown (10YR 3/3) silt loam; moderate medium granular structure; friable, slightly sticky, slightly plastic; many very fine, fine, medium, and coarse roots; 5 percent shale fragments less than 3 inches in length; slightly acid; clear smooth boundary.
A2—2 to 7 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium granular structure; friable, slightly sticky, slightly plastic; many very fine, fine, medium, and coarse roots; dark brown (10YR 3/3) in root channels and worm burrows; 5 percent shale fragments less than 3 inches in length; slightly acid; gradual smooth boundary.
B1t—7 to 15 inches; yellowish brown (10YR 5/6) silty clay; weak medium and coarse subangular blocky structure; friable, sticky, plastic; common very fine, fine, medium, and coarse roots; common thin patchy clay films on faces of peds; light yellowish brown (10YR 6/4) coatings on peds and in root channels and worm burrows; 5 percent shale fragments; medium acid; gradual smooth boundary.
B2t—15 to 32 inches; strong brown (7.5YR 4/6) silty clay; moderate medium and coarse subangular blocky structure; firm, sticky, plastic; common fine, medium, and coarse roots; medium continuous brown (7.5YR 5/4) clay films on faces of peds; 5 percent shale fragments; slightly acid; gradual smooth boundary.
C—32 to 50 inches; strong brown (7.5YR 4/6) channery clay; massive; firm, sticky, plastic; common very fine, fine, medium, and coarse roots; thick clay flows along fractures and bedding planes; 45 percent pale yellow (2.5Y 7/4), pale olive (5Y 6/3), and greenish gray (5BG 6/6) shale fragments; mildly alkaline; gradual wavy boundary.
R—50 inches; soft calcareous shale interbedded with limestone.

Solum thickness ranges from 30 to 60 inches. Depth to bedrock is more than 40 inches. Coarse fragments range from 0 to 5 percent in the upper part of the solum and 0 to 15 percent in the lower part. They range from 1 to 50 percent in the C horizon. The soil is very strongly acid through slightly acid above 30 inches, unless limed; strongly acid through mildly alkaline below 30 inches; and medium acid through mildly alkaline immediately above bedrock.

The A horizon has hue of 7.5YR or 10YR, value of 3 through 5, and chroma of 2 through 4. It is silt loam or silty clay loam. The Bt horizon has hue of 7.5YR through 2.5Y, value of 4 through 6, and chroma of 4 through 8. It is silty clay loam, silty clay, or clay. The C horizon has colors similar to the Bt horizon or is mottled in shades of brown, yellow, gray, olive, and greenish gray. It is silty clay or clay in the fine earth fraction.

McGary series

Soils of the McGary series are deep and somewhat poorly drained. They formed in alluvium of limestone, shale, and sandstone on flood plains and stream terraces. Slopes range from 0 to 2 percent.

McGary soils are commonly near Guernsey, Purdy, Ross, and Weaver soils. McGary soils are wetter than the Guernsey, Ross, and Weaver soils and are not as wet as the Purdy soils.

Typical pedon of McGary silt loam, in an area of McGary and Purdy soils, about 0.7 mile west-southwest of the junction of U.S. Highways 11 and 460, Virginian Railroad, and Roanoke-Montgomery County line and 2 miles northeast of Elliston.

Ap—0 to 9 inches; dark gray (10YR 4/1) silt loam; weak fine and medium granular structure; friable, slightly sticky, slightly plastic; many fine roots; medium acid; abrupt smooth boundary.
B21t—9 to 23 inches; yellowish brown (10YR 5/4) silty clay; many medium distinct gray (10YR 5/1) mottles; weak fine and medium angular blocky structure; firm, sticky, plastic; few roots; few thin clay films on faces of peds; strongly acid; gradual smooth boundary.
B22t—23 to 37 inches; mottled gray (10YR 6/1) and light yellowish brown (10YR 6/4) silty clay; weak coarse angular blocky structure; firm, very sticky, very plastic; few thin clay films on faces of peds; 20 percent lime concretions; mildly alkaline; strong effervescence; gradual smooth boundary.
C—37 to 66 inches; gray (10YR 6/1) clay; few medium distinct yellowish brown (10YR 5/4) mottles; massive; firm, sticky, plastic; 20 percent lime concretions; mildly alkaline; strong effervescence.

Solum thickness ranges from 24 to 40 inches. Depth to carbonates ranges from 20 to 40 inches. Depth to bedrock is more than 60 inches. Reaction is strongly acid through moderately alkaline.

The A horizon has hue of 10YR or 2.5Y, value of 4 through 6, and chroma of 1 through 3. It is silt loam or silty clay loam. The Bt horizon has hue of 10YR or 2.5Y, value of 4 through 6, and chroma of 1 through 4. At least one subhorizon within a depth of 30 inches has a matrix chroma of 3 or 4. It is silty clay loam or silty clay. The C horizon has hue of 10YR or 2.5Y, value of 4 through 6, and chroma of 1 through 3 and is mottled. It is stratified clay, silty clay, and silty clay loam. Some pedons contain thin layers of silt or silt loam.

Opequon series

Soils of the Opequon series are shallow and well drained. They formed in residuum of limestone on uplands. Slopes range from 7 to 60 percent. Opequon soils in this survey area are mapped only with Caneyville soil and Rock outcrop.

Opequon soils are commonly near Caneyville, Groseclose, and Wurno soils. Opequon soils are shallower than these soils.

Typical pedon of Opequon silty clay loam, in an area of Caneyville-Opequon-Rock outcrop complex, 25 to 60 percent slopes, about 7,000 feet north-northeast (11°) of the intersection of the Norfolk and Western Railroad and State Highway 641 and about 1.0 mile south-southwest of Fagg.

A1—0 to 4 inches; brown (7.5YR 4/4) silty clay loam; moderate medium granular structure; friable, sticky, plastic; many very fine, fine, medium, and coarse roots; 10 percent limestone fragments larger than 3 inches; slightly acid; clear smooth boundary.

B2—4 to 15 inches; yellowish red (5YR 4/6) clay; strong medium and fine angular blocky structure; friable, very sticky, very plastic; many very fine, fine, medium, and coarse roots; many thick clay films on faces of peds; 5 percent limestone fragments larger than 3 inches; neutral; abrupt wavy boundary.

R—15 inches; hard black limestone.

Solum thickness and depth to bedrock range from 12 to 20 inches. Coarse fragments range from 0 to 35 percent throughout. Reaction is medium acid through mildly alkaline.

The A horizon has hue of 5YR through 10YR, value of 3 through 6, and chroma of 1 through 4. It is silt loam, clay loam, silty clay loam, silty clay, and clay and their cherty, gravelly, channery, cobbly, and flaggy analogs. The Bt horizon has hue of 2.5YR through 7.5YR, value of 4 or 5, and chroma of 4 through 8. It is clay, silty clay, or silty clay loam. Some pedons have a C horizon that is 1 to 3 inches thick and is calcareous.

Parker series

Soils of the Parker series are deep and somewhat excessively drained. They formed in residuum of granite, gneiss, and schist on uplands. Slopes range from 7 to 50 percent.

Parker soils are commonly near French, Glenelg, and Hayter soils. Parker soils are better drained than the French soils and contain more coarse fragments than the Glenelg and Hayter soils.

Typical pedon of Parker gravelly loam, in an area of Parker-Glenelg complex, 25 to 50 percent slopes, 1.2 miles east-northeast of the junction of State Highways 607 and 637 and about 14 miles east of Christiansburg.

O2—2 inches to 0; undecomposed and partially decomposed leaves and twigs.

A1—0 to 4 inches; dark brown (10YR 4/3) gravelly loam; weak fine granular structure; friable, slightly sticky; many very fine, fine, medium, and coarse roots; 35 percent granite pebbles and cobblestones; very strongly acid; clear smooth boundary.

B2—4 to 25 inches; brownish yellow (10YR 6/6) gravelly loam; common medium faint strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure; firm, slightly sticky; many very fine, fine, medium, and coarse roots; few fine patchy clay films on faces of peds; 45 percent granite pebbles and cobblestones; strongly acid; gradual smooth boundary.

C1—25 to 35 inches; strong brown (7.5YR 5/6) very gravelly loam; many medium distinct black (10YR 2/1), white (10YR 8/1), and red (2.5YR 5/8), mottled weathered coarse fragments of granite; massive; firm, slightly sticky; few fine roots; few clay flows; 60 percent granite pebbles and cobblestones; strongly acid; abrupt wavy boundary.

C2—35 to 70 inches; strong brown (7.5YR 5/6) very gravelly sandy loam; many medium distinct black (10YR 2/1), white (10YR 8/1), and red (2.5YR 5/8) mottled weathered coarse fragments of granite; massive; very firm, slightly sticky; 80 percent coarse fragments; strongly acid.

Solum thickness ranges from 20 to 40 inches, and depth to bedrock is more than 48 inches. Rock fragments range from 35 to 70 percent in the A and B horizons and 60 to 90 percent in the C horizon. Reaction is very strongly acid or strongly acid, unless the soil has been limed.

The A horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 1 through 4. It is loam or sandy loam and their gravelly, stony, very stony, and extremely stony analogs. The B horizon has hue of 7.5YR or 10YR, value of 4 through 6, and chroma or 3 through 6. It is loam or sandy loam in the fine earth fraction. The C horizon has hue of 7.YR or 10YR, value of 4 through 6, and chroma of 3 through 6. It is loam or sandy loam in the fine earth fraction.

Poplimento series

Soils of the Poplimento series are deep and well drained. They formed in residuum of limestone, shale, siltstone, and sandstone on uplands. Slopes range from 2 to 60 percent. Poplimento soils in this survey area are mapped only with Groseclose soils.

Poplimento soils are commonly near Berks, Duffield, Ernest, and Groseclose soils. Poplimento soils are deeper than the Berks soils; contain more clay than the Berks, Duffield, and Ernest soils; are better drained than

the Ernest soils; and have a higher base saturation than the Groseclose soils.

Typical pedon of Poplimento soil, 2 to 7 percent slopes, about 1.6 miles west (270°) of control tower at VPI & SU Airport at Blacksburg.

O2—2 inches to 0; undecomposed and partially decomposed leaves and twigs.
A1—0 to 3 inches; dark brown (10YR 3/3) silt loam; strong fine and medium granular structure; very friable, slightly sticky, slightly plastic; many very fine, fine, medium, and coarse roots; common worm burrows; 2 percent angular chert fragments less than 3 inches in length; strongly acid; abrupt smooth boundary.
A2—3 to 12 inches; light yellowish brown (10YR 6/4) silt loam; many medium distinct very dark grayish brown (10YR 3/2) mottles in worm burrows and root channels; moderate fine granular structure; friable, slightly sticky, slightly plastic; many very fine, fine, medium, and coarse roots; common worm burrows; 2 percent angular chert fragments less than 3 inches in length; strongly acid; clear smooth boundary.
B2t—12 to 35 inches; yellowish brown (10YR 5/6) clay; moderate medium subangular blocky structure; friable, sticky, plastic; common fine, medium, and coarse roots; many medium patchy clay films on faces of peds; common worm burrows; 10 percent brownish yellow (10YR 6/6), very pale brown (10YR 7/4), and pale green (5G 6/2) highly weathered shale fragments; strongly acid; gradual smooth boundary.
B3t—35 to 55 inches; yellowish brown (10YR 5/6) clay; moderate fine and medium subangular blocky structure; friable, sticky, plastic; common fine, medium, and coarse roots; many medium patchy clay films on faces of peds; 10 percent shale and chert fragments and 40 percent highly weathered brownish yellow (10YR 6/8) and light greenish gray (5GY 7/1) shale and siltstone fragments; strongly acid; gradual smooth boundary.
C—55 to 72 inches; yellowish brown (10YR 5/6) shaly silty clay loam; massive; friable, slightly sticky, slightly plastic; common fine roots; 30 percent hard shale, sandstone, and chert fragments and 60 percent crushed and mixed brownish yellow (10YR 6/8) and light greenish gray (5GY 7/1) highly weathered fragments of shale, siltstone, and sandstone that crush easily to soil material; strongly acid.

Solum thickness ranges from 40 to 60 inches. Depth to hard bedrock is more than 48 inches. Coarse fragments range from 0 to 50 percent in the A horizon, from 0 to 15 percent in the upper part of the B horizon and from 0 to 50 percent in the lower part of the B horizon and in the C horizon. Reaction is very strongly acid through medium acid in the A horizon and upper part of the B horizon and strongly acid through slightly acid in the lower part of the B horizon and in the C horizon.

The A horizon has hue of 7.5YR or 10YR, value of 3 through 6, and chroma of 2 through 6. It is silt loam, silty clay loam, or loam in the fine earth fraction. The B horizon has hue of 5YR through 10YR, value of 4 through 6, and chroma of 4 through 8. It is clay, silty clay, or silty clay loam in the fine earth fraction. The C horizon has hue of 5YR through 10YR, value of 4 through 6, and chroma of 4 through 8. Some pedons have dusky red mottles. The C horizon is silty clay loam or silty clay in the fine earth fraction.

Purdy series

Soils of the Purdy series are deep and poorly and very poorly drained. They formed in alluvium of limestone, shale, and sandstone on flood plains and stream terraces. Slopes range from 0 to 2 percent. Purdy soils in this survey area are mapped only with McGary soils.

Purdy soils are commonly near Guernsey, Ross, and Weaver soils. Purdy soils are wetter than these soils.

Typical pedon of a Purdy loam in an area of McGary and Purdy soils, about 1.5 miles south of the intersection of U.S. Route 11 and State Highway 605 in Radford.

A1—0 to 2 inches; very dark gray (10YR 3/1) loam; moderate fine granular structure; very friable, slightly sticky, slightly plastic; many very fine and fine roots; strongly acid; abrupt smooth boundary.
A2—2 to 11 inches; grayish brown (10YR 5/2) loam; moderate fine granular structure; very friable, slightly sticky, slightly plastic; many fine and medium roots; strongly acid; clear smooth boundary.
B2tg—11 to 21 inches; grayish brown (10YR 5/2) clay; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm, sticky, plastic; few fine roots; common medium pores; very strongly acid; clear smooth boundary.
B3tg—21 to 34 inches; mottled gray (10YR 5/1) and yellowish brown (10YR 5/6) clay; weak medium subangular blocky strcture; firm, sticky, plastic; common medium pores; very strongly acid; gradual smooth boundary.
Cg—34 to 66 inches; mottled light gray (10YR 6/1) and yellowish brown (10YR 5/6) clay loam; massive; firm, sticky, plastic; very strongly acid.

Solum thickness ranges from 28 to 50 inches. Depth to bedrock is more than 60 inches. Reaction is extremely acid through strongly acid, unless the soil has been limed.

The A horizon is neutral with value of 3 through 5 or has hue of 10YR or 2.5Y, value of 3 through 5, and

chroma of 1 or 2. Only the thin A1 horizon has a value of 3. The A horizon is silt loam, loam, or silty clay loam. The B horizon has hue of 10YR through 5Y or neutral, value of 4 or 5, and chroma of 0 through 2. It is silty clay loam, clay loam, silty clay, or clay. The C horizon is mottled in shades of gray, yellow, red, and brown. It is clay, silty clay, or clay loam with their gravelly or cobbly analogs.

Rayne series

Soils of the Rayne seris are deep and well drained. They formed in residuum of shale, siltstone, and sandstone on uplands. Slopes range from 15 to 65 percent. The Rayne soils in this survey area are mapped only with Berks and Lowell soils.

Rayne soils are commonly near Berks, Ernest, and Lowell soils. Rayne soils are deeper than the Berks soils, do not have the fragipan that is in the Ernest soils, and contain less clay than the Lowell soils.

Typical pedon of Rayne shaly loam, in an area of Berks-Lowell-Rayne complex, 15 to 25 percent slopes, about 1 mile southeast (108°) of the junction of State Highways 606 and 669 and about 2 miles southwest of Riner.

Ap—0 to 7 inches; dark yellowish brown (10YR 4/4) shaly loam; moderate medium granular structure; friable, slightly sticky, slightly plastic; many fine and medium roots; 25 percent hard shale fragments less than 3 inches in length; strongly acid; clear smooth boundary.

B2t—7 to 24 inches; strong brown (7.5YR 5/6) shaly silty clay loam; weak medium subangular blocky structure; friable, sticky, plastic; common very fine and fine roots; many medium patchy clay films; 25 percent hard shale fragments less than 3 inches in length; strongly acid; clear smooth boundary.

B31t—24 to 39 inches; strong brown (7.5YR 5/6) shaly silty clay loam; moderate medium subangular blocky structure; friable, sticky, plastic; few very fine and fine roots; many medium clay films on faces of peds; 35 percent hard and 20 percent highly weathered greenish gray (5GY 5/1), brownish yellow (10YR 6/6), and black (10YR 2/1) shale fragments less than 3 inches in length; strongly acid; clear wavy boundary.

B32t—39 to 53 inches; strong brown (7.5YR 5/6) shaly silty clay loam; moderate medium subangular blocky structure; friable, sticky, plastic; few fine roots; many thick clay films or clay flows on shale fragments and ped faces; strong brown (7.5YR 4/6) ped coatings; 20 percent hard and about 35 percent highly weathered greenish gray (5GY 5/1), brownish yellow (10YR 6/6), and black (10YR 2/1) shale fragments less than 3 inches in length; strongly acid; clear wavy boundary.

C—53 to 65 inches; strong brown (7.5YR 4/6) shaly silty clay loam; massive; friable, sticky, plastic; few fine roots; many very thick clay flows; 40 percent hard and 35 percent highly weathered brownish yellow (10YR 6/6), greenish gray (5GY 5/1), and red (2.5YR 4/6) shale fragments less than 3 inches in length; strongly acid.

Solum thickness ranges from 40 to 60 inches. Depth to soft bedrock is deeper than 40 inches. Rock fragments range from 0 to 40 percent in the A and B2 horizons and from 15 to 90 percent in the B3 and C horizons. Reaction is very strongly acid or strongly acid, unless the soil has been limed.

The A horizon has hue of 10YR, value of 3 through 5, and chroma of 2 through 4. It is silt loam or loam and their shaly, channery, stony, very stony, and extremely stony analogs. The B horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 through 8. It is loam, silt loam, or silty clay loam in the fine earth fraction. The C horizon has hue of 7.5YR through 2.5Y, value of 4 or 5, and chroma of 4 through 8 and has shale fragments in shades of green, gray, and black. It is silt loam, silty clay loam, loam, or sandy loam in the fine earth fraction.

Ross series

Soils of the Ross series are deep and well drained. They formed in alluvium of limestone, shale, sandstone, granite, gneiss, and schist on flood plains. Slopes range from 0 to 2 percent.

Ross soils are commonly near Hayter, McGary, and Weaver soils. Ross soils do not have the argillic horizon that is present in the Hayter and McGary soils and are better drained than the McGary and Weaver soils.

Typical pedon of Ross loam, in an area of Ross soils, 1 mile north of the junction of State Highways 637 and 638 and 1.5 miles south of Shawsville.

Ap—0 to 10 inches; dark brown (10YR 3/3) loam, brown (10YR 5/3) dry; moderate medium granular structure; very friable, slightly sticky, slightly plastic; many very fine and fine roots; moderately alkaline; clear smooth boundary.

B2—10 to 35 inches; dark brown (10YR 3/3) loam, brown (10YR 5/3) dry; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; common fine and medium roots; moderately alkaline; gradual smooth boundary.

C—35 to 70 inches; brown (10YR 4/3) loam; massive; friable, slightly sticky, slightly plastic; few very fine and fine roots; moderately alkaline.

Solum thickness ranges from 24 to 45 inches. Depth to bedrock is more than 60 inches. The mollic epipedon ranges from 24 to 40 inches and can include all or part of the B2 horizon. Coarse fragments range from 0 to 8 percent in the A horizon, from 0 to 10 percent in the B2

horizon, and from 0 to 45 percent in the C horizon. Reaction is slightly acid through moderately alkaline.

The A horizon has hue of 10YR, value of 2 or 3 moist and 4 or 5 dry, and chroma of 1 through 3. It is silt loam, loam, sandy loam, or silty clay loam. The B2 horizon has hue of 10YR, value of 2 through 5 moist and 4 through 6 dry, and chroma of 1 through 4. It is silt loam, loam, sandy loam, or silty clay loam. The C horizon has hue of 7.5YR through 2.5Y, value of 4 through 6, and chroma of 2 through 4. It is loam, silt loam, sandy loam, or sandy clay loam in the fine earth fraction. Some pedons are stratified below 40 inches.

Udorthents

Udorthents in this survey area consist of shallow to deep, well drained to somewhat poorly drained soils. They formed in clayey or loamy residuum or alluvium of limestone, shale, sandstone, or granite and in fill materials excavated from these parent materials. Udorthents are on ridgetops, side slopes, and along drainageways. They are in areas where excavation or filling has destroyed all discernible subsurface diagnostic horizons. Slopes are 0 to 25 percent.

Udorthents are commonly near Berks, Frederick, Groseclose, and Unison soils. Berks, Frederick, Groseclose, and Unison soils have diagnostic subsurface horizons that Udorthents do not have.

Because of the variability of these soils, a typical pedon is not given. Depth to bedrock is generally more than 10 inches and is deeper than 60 inches. Coarse fragments range from 0 to 75 percent throughout the soil. Reaction ranges from extremely acid through moderately alkaline.

The A horizon ranges from 2 to 10 inches and has hue of 10R through 10YR, value of 2 through 6, and chroma of 3 through 8. It is sandy loam, loam, silt loam, clay loam, silty clay loam, silty clay, or clay and their gravelly, very gravelly, shaly, very shaly, cobbly, very cobbly, channery, very channery, cherty, very cherty, flaggy, very flaggy, stony, very stony, and extremely stony analogs. The C horizon has variable colors in shades of red, brown, and yellow. In some pedons gray mottles are below 20 inches. The C horizon ranges from sandy loam through clay in the fine earth fraction.

Unison series

Soils of the Unison series are deep and well drained. They formed in alluvium and colluvium of granite, gneiss, schist, sandstone, quartzite, and shale on stream terraces and alluvial fans. Slopes range from 2 to 25 percent.

Unison soils are commonly near Berks, Braddock, and Guernsey soils. Unison soils are deeper than Berks soils, have a yellower subsoil than Braddock soils, and are better drained than the Guernsey soils.

Typical pedon of Unison loam, in an area of Unison and Braddock soils, 2 to 7 percent slopes, about 4,500 feet west-northwest of the junction of State Highways 696 and 652 and 450 feet north of State Highway 652, west of Longshop.

O2—2 inches to 0; undecomposed and decomposed leaves and twigs.

A1—0 to 2 inches; dark brown (10YR 3/3) loam; weak fine granular structure; very friable; many very fine, fine, and medium roots; 2 percent rounded quartz pebbles; strongly acid; abrupt smooth boundary.

A2—2 to 15 inches; brown (10YR 5/3) loam; weak very fine and fine granular structure; very friable; many very fine, fine, medium, and coarse roots; 2 percent rounded quartz pebbles; strongly acid; gradual smooth boundary.

B21t—15 to 37 inches; yellowish red (5YR 5/8) clay; moderate medium and fine angular blocky structure; firm, sticky, plastic; few very fine and fine roots; many medium patchy clay films on faces of peds; few fine mica flakes; 2 percent rounded quartz pebbles; strongly acid; gradual wavy boundary.

B22t—37 to 58 inches; yellowish red (5YR 4/6) clay; many medium distinct red (2.5YR 4/6) and brownish yellow (10YR 6/8) mottles; moderate medium subangular blocky structure; firm, sticky, plastic; many medium patchy clay films on faces of peds; few fine mica flakes; 2 percent rounded quartz pebbles; strongly acid; gradual smooth boundary.

C—58 to 72 inches; red (2.5YR 4/8) clay loam; massive; friable, slightly sticky, slightly plastic; common fine mica flakes; 2 percent rounded quartz pebbles; strongly acid.

Solum thickness ranges from 30 to 60 inches or more. Depth to bedrock is more than 60 inches. Rock fragments range from 0 to 50 percent in the A horizon, 0 to 35 percent in the B horizon, and 0 to 75 percent in the C horizon. Reaction is strongly acid or medium acid, unless the soil has been limed.

The A horizon has hue of 7.5YR or 10YR, value of 3 through 5, and chroma of 3 through 6. It is loam, silt loam, or fine sandy loam and their stony and very stony analogs. The Bt horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 3 through 8. It is clay loam, silty clay loam, clay, or silty clay in the fine earth fraction. The C horizon is loam, silt loam, clay loam, or silty clay loam in the fine earth fraction.

Vertrees series

Soils of the Vertrees series are deep and well drained. They formed in residuum of limestone, siltstone, and shale on uplands. Slopes range from 2 to 25 percent. Vertrees soils in this survey areas are mapped only with Frederick soils.

Vertrees soils are commonly near Duffield, Ernest, Frederick, and Groseclose soils. Vertrees soils contain more clay than the Duffield soils; have a higher base saturation than the Ernest, Frederick, and Groseclose soils; and have a thicker solum than the Groseclose soils.

Typical pedon of Vertrees silt loam, in an area of Frederick and Vertrees silt loams, 7 to 15 percent slopes, about 6,300 feet east-northeast of the junction of Toms Creek Road and Shadow Lake Road adjacent to Toms Creek Road in Bladensburg.

A1—0 to 2 inches; dark brown (10YR 4/3) silt loam; moderate very fine and fine granular structure; very friable, slightly sticky, slightly plastic; many very fine and fine roots; 2 percent chert fragments; medium acid; clear smooth boundary.

A2—2 to 10 inches; yellowish brown (10YR 5/4) silt loam; moderate very fine and fine granular structure; very friable, slightly sticky, slightly plastic; many very fine and fine roots; 2 percent chert fragments; strongly acid; gradual smooth boundary.

B21t—10 to 25 inches; yellowish red (5YR 5/6) silty clay; moderate medium and fine subangular blocky structure; firm, sticky, plastic; few very fine and fine roots; many medium patchy clay films on faces of peds; 2 percent chert fragments; strongly acid; gradual smooth boundary.

B22t—25 to 50 inches; yellowish red (5YR 4/6) clay; moderate fine and medium angular blocky structure; firm, sticky, plastic; few very fine and fine roots; many medium clay films on faces of peds; 2 percent shale and chert fragments; strongly acid; gradual smooth boundary.

B23t—50 to 66 inches; mottled yellowish red (5yr 5/6), red (2.5YR 5/6), strong brown (7.5YR 5/6), and brownish yellow (10YR 6/6) clay; moderate fine and medium angular blocky structure; firm, sticky, plastic; many medium clay films on faces of peds; 2 percent shale and chert fragments; strongly acid.

Solum thickness and depth to bedrock are more than 60 inches. Coarse fragments range from 0 to 35 percent in the A horizon, from 0 to 20 percent in the horizon to a depth of 50 inches, and from 0 to 35 percent below 50 inches. Reaction is very strongly acid through medium acid to a depth of 60 inches, unless the soil has been limed, and is very strongly acid through neutral below 60 inches.

The A horizon has hue of 7.5YR or 10YR, value of 3 through 6, and chroma of 2 through 4. It is silt loam or loam or is silty clay in eroded areas and the cherty analogs of these textures. The B1 horizon, if there is one, has hue of 5YR through 10YR, value of 4 or 5, and chroma of 4 through 6. It is loam, silt loam, or silty clay loam in the fine earth fraction. The B21t horizon has hue of 2.5YR or 5YR, value of 4 or 5, and chroma of 6 or 8. The B22t and B23t horizons have hue of 2.5YR through 7.5YR, value of 3 through 5, and chroma of 6 or 8. In some pedons the B2t horizon is mottled in shades of brown and red in the upper part and brown, red, yellow, or gray in the lower part. It is clay or silty clay.

Weaver series

Soils of the Weaver series are deep and moderately well drained. They formed in recent calcareous alluvium of limestone, shale, and sandstone on flood plains. Slopes range from 0 to 2 percent.

Weaver soils are commonly near Guernsey, McGary, and Ross soils. Weaver soils have less clay than the Guernsey soils, are better drained than the McGary soils, and are wetter than the Ross soils.

Typical pedon of Weaver silt loam, in an area of Weaver soils, about 4,500 feet east (116°) of the westernmost intersection of State Highway 604 and U.S. Route 11, about 4 miles west of Christiansburg.

Ap—0 to 10 inches; dark brown (10YR 4/3) silt loam; weak fine granular structure; very friable, slightly sticky, slightly plastic; many very fine, fine, and medium roots; moderately alkaline; clear smooth boundary.

B21—10 to 18 inches; brown (10YR 5/3) silt loam; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; common very fine and fine roots; moderately alkaline; clear smooth boundary.

B22—18 to 26 inches; brown (10YR 5/3) silt loam; common medium distinct grayish brown (10YR 5/2) and black (10YR 2/1) mottles; weak fine and medium subangular blocky structure; friable, slighly sticky, slightly plastic; common very fine and fine roots; moderately alkaline; abrupt smooth boundary.

B23—26 to 30 inches; dark yellowish brown (10YR 4/6) silt loam; few fine distinct grayish brown mottles; weak medium subangular blocky structure; friable; moderately alkaline; abrupt smooth boundary.

B24—30 to 49 inches; dark grayish brown (10YR 4/2) silt loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; common partially decomposed leaves and twigs; moderately alkaline; abrupt smooth boundary.

IIC—49 to 60 inches; dark grayish brown (10YR 4/2) gravelly silty clay loam; massive; friable, slightly sticky, slightly plastic; 20 percent sandstone, shale, and chert fragments; 20 percent soft lime accumulations; moderately alkaline.

Solum thickness and depth to bedrock range from 40 to 60 inches. Reaction is neutral to moderately alkaline in the A and B horizons and mildly alkaline or moderately alkaline in the C horizon. The amount of nodules of lime and soft marly material ranges from 0 to about 10

percent in the Ap and B2 horizons and 15 to 50 percent in the C horizon.

The A horizon has hue of 10YR, value of 4, and chroma of 2 through 4. It is silt loam or silty clay loam. The B horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 through 6. It is silt loam or silty clay loam. The C horizon has hue of 10YR through 5Y, value of 4 or 5, and chroma of 0 through 6. It is silt loam or silty clay loam in the fine earth fraction. The lithologic discontinuity below a depth of 4 feet is shale or limestone bedrock or gravelly, loamy, or clayey soil material.

Weikert series

Soils of the Weikert series are shallow and well drained. They formed in residuum of shale, siltstone, and sandstone on uplands. Slopes range from 15 to 65 percent. Weikert soils in this survey area are mapped only with Berks soils.

Weikert soils are commonly near Berks and Jefferson soils. Weikert soils are shallower than these soils.

Typical pedon of Weikert shaly silt loam, in an area of Berks and Weikert soils, 25 to 65 percent slopes about 1.6 miles southwest of the junction of State Highways 785 and 628 and about 1.5 miles north of Ironto.

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) shaly silt loam; moderate fine granular structure; very friable, slightly sticky, slightly plastic; many very fine, fine, medium, and coarse roots; 35 percent shale fragments; very strongly acid; abrupt smooth boundary.

B2—4 to 13 inches; yellowish brown (10YR 5/4) shaly silt loam; weak fine subangular blocky structure; very friable, slightly sticky, slightly plastic; many very fine, fine, medium, and coarse roots; few thin patchy clay films on faces of peds; 45 percent shale fragments; very strongly acid; clear wavy boundary.

R—13 inches; soft shale bedrock.

Solum thickness ranges from 8 to 20 inches. Depth to bedrock ranges from 10 to 20 inches. Coarse fragments range from 20 to 50 percent in the A horizon and from 30 to 65 percent in the B horizon. Reaction is very strongly acid or strongly acid, unless the soil has been limed.

The A horizon has hue of 10YR, value of 3 through 5, and chroma of 2 through 6. It is silt loam or loam and their shaly, channery, stony, and very stony analogs. The B horizon has hue of 7.5YR or 10YR, value of 4 through 6, and chroma of 3 through 6. It is silt loam or loam in the fine earth fraction. In some pedons the C horizon has hue of 7.5YR or 10YR, value of 4 through 6, and chroma of 3 through 6. It is silt loam or loam in the fine earth fraction. Coarse fragments range from 60 to 85 percent.

Wurno series

Soils of the Wurno series are moderately deep and well drained. They formed in residuum of shale, siltstone, and limestone on uplands. Slopes range from 25 to 45 percent.

Wurno soils are commonly near Berks, Caneyville, Chilhowie, and Jefferson soils. Wurno soils have a higher base saturation than the Berks soils, are shallower and contain more coarse fragments than the Jefferson soils, and contain less clay than the Caneyville and Chilhowie soils.

Typical pedon of Wurno shaly silt loam, in an area of Wurno-Caneyville complex, 25 to 45 percent slopes, about 0.4 mile east-southeast of the junction of State Highways 723 and 603 and about 1.4 miles west of Fagg.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) shaly silt loam; moderate fine and medium granular structure; friable, slightly sticky, slightly plastic; many very fine, fine, and medium roots; 25 percent shale fragments; slightly acid; clear smooth boundary.

B2—6 to 19 inches; yellowish brown (10YR 5/6) shaly silt loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; common very fine, fine, and medium roots; few thin clay films; many medium silt coatings; 45 percent shale fragments; slightly acid; gradual wavy boundary.

C19 to 33 inches; light yellowish brown (10YR 6/6) very shaly silt loam; many medium distinct very pale brown (10YR 7/3) and black (10YR 2/1) mottles; massive; friable, slightly sticky, slightly plastic; few very fine, fine, and medium roots; 75 percent shale fragments; neutral; gradual wavy boundary.

Cr—33 to 38 inches; brownish yellow (10YR 6/6) shale that can be dug with a spade; few very fine roots in rock crevices; abrupt wavy boundary.

R—38 inches; soft shale.

Solum thickness ranges from 10 to 20 inches. Depth to bedrock ranges from 20 to 40 inches. Shale fragments range from 5 to 80 percent in individual horizons and increase with depth. Reaction is slightly acid through mildly alkaline.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 through 4. It is silt loam or loam and their shaly and very shaly analogs. The B horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 6 or 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 through 6, and chroma of 6 or 8, and weathered shale commonly has shades of brown, yellow, olive, red, and black. It is silt loam in the fine earth fraction. The Cr horizon has colors similar to those of the C horizon. It consists of highly weathered shale or siltstone.

references

(1) American Association of State Highway [and Transportation] Officials. 1970. Standard specifications for highway materials and methods of sampling and testing. Ed. 10, 2 vol., illus.

(2) American Society for Testing and Materials. 1974. Methods for classification of soils for engineering purposes. ASTM Stand. D 2487-69. *In* 1974 Annual Book of ASTM Standards, Part 19, 464 pp., illus.

(3) Division of State Planning and Community Affairs. 1974. Data summary: Montgomery County and Radford City.

(4) Fenneman, N. M. 1938. Physiography of eastern United States. McGraw-Hill. 691 pp.

(5) Givens, Lula Porterfield. 1975. Highlights of the early history of Montgomery County. B.D. Smith and Bros.

(6) Hack, J.R. 1965. Geomorphology of the Shenandoah Valley, Virginia and West Virginia, and origin of the residual ore deposits.

(7) Johnson, T.W., J. Wyson, and R. Marchany. 1975. Hydrologic information storage and retrieval systems (HISARS). Va. Water Resources Research Center.

(8) Montgomery County Overall Economic Development Committee. 1977. Montgomery County Overall Economic Program.

(9) Sheffield, Raymond M. 1977. Forest statistics for the southern mountain region of Virginia. U.S. Dep. Agric., Forest Serv. Res. Bull. SE-42.

(10) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus. [Supplements replacing pp. 173-188 issued May 1962]

(11) United States Department of Agriculture. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. Soil Conserv. Serv., U.S. Dept. Agric. Handb. 436, 754 pp., ilus.

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—

	Inches
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.

Broad-base terrace. A ridge-type terrace built to control erosion by diverting runoff along the contour at a nonscouring velocity. The terrace is 10 to 20 inches high and 15 to 30 feet wide and has gently sloping sides, a rounded crown, and a dish-shaped channel along the upper side. It may be nearly level or have a grade toward one or both ends.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche. A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds just beneath the solum, or it is exposed at the surface by erosion.

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 fragment.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or arresting grazing 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.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

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.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

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, and 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 37.5 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.

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 7.5 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 (7.5 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 underlying 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.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual.* The major horizons of mineral soil are as follows:
O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.
A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.
B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a

combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

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—

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.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

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.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Lodge. To break, bend, or lie flat on the ground.

Low strength. The soil is not strong enough to support loads.

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.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and 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).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

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.

Open space. A relatively undeveloped green or wooded area provided mainly within an urban area to minimize feelings of congested living.

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.

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 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitting (in tables). Pits caused by melting ground ice. They form on the soil after plant cover is removed.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

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 degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that 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-size particles.

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.

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 runoff water.

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.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

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.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

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, are in soils in extremely small amounts. They are essential to plant growth.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial melt water. In nonglaciated regions, alluvium deposited by heavily loaded 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 soils.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Based on data recorded in the period 1953-78 at Blacksburg, 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[1]	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January	40.3	20.2	30.3	64	-2	30	2.86	1.80	3.99	7	6.9
February	43.7	21.8	32.8	66	2	41	3.10	1.52	4.62	7	5.4
March	52.7	29.3	41.0	75	11	141	3.80	2.62	4.49	8	5.0
April	64.0	38.4	51.2	82	22	348	3.44	2.34	4.64	7	0.6
May	72.1	47.3	59.7	84	30	613	3.71	2.40	4.78	8	.0
June	78.5	54.6	66.6	87	40	795	3.53	1.73	5.19	8	.0
July	82.4	59.1	70.8	91	47	953	3.57	2.23	4.75	7	.0
August	81.5	58.4	70.0	89	46	925	3.51	2.20	4.46	6	.0
September	75.6	51.4	63.5	88	34	703	3.85	1.66	5.22	6	.0
October	65.5	39.5	52.5	80	21	394	3.32	1.46	4.79	5	0.1
November	54.4	30.5	42.5	74	12	155	2.60	1.62	3.51	6	1.9
December	44.0	23.6	33.8	64	4	51	3.10	1.88	4.57	6	8.5
Yearly:											
Average	63.1	39.8	51.5	---	---	---	---	---	---	---	---
Extreme	---	---	---	92	-4	---	---	---	---	---	---
Total	---	---	---	---	---	5,149	40.39	23.46	55.01	81	28.4

[1] A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Based on data recorded in the period 1953-78 at Blacksburg, 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--	April 16	May 3	May 16
2 years in 10 later than--	April 14	April 28	May 15
5 years in 10 later than--	April 5	April 17	April 29
First freezing temperature in fall:			
1 year in 10 earlier than--	October 11	October 6	September 23
2 years in 10 earlier than--	October 15	October 8	September 25
5 years in 10 earlier than--	November 2	October 19	October 10

TABLE 3.--GROWING SEASON

[Based on data recorded in the period 1953-78 at Blacksburg, 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	167	149	117
8 years in 10	179	159	136
5 years in 10	202	178	155
2 years in 10	235	206	176
1 year in 10	242	211	185

TABLE 4.--DISTRIBUTION OF SLOPE CLASSES AND ASPECT[1]

Area and slope class	Degree of aspect								
	45	90	135	180	225	270	315	360	Total
	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct
For a 9 square mile area in Groseclose-Poplimento-Duffield: near Belmont									
A (0-2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
B (3-7)	0.4	2.4	0.3	4.1	0.7	5.2	0.7	5.8	19.6
C (8-15)	5.3	3.8	5.1	7.6	7.1	6.6	6.1	9.0	50.6
D (16-25)	2.1	2.1	2.1	3.4	1.2	1.6	1.7	6.1	20.4
E (26-45)	0.4	1.8	0.6	1.8	0.1	0.7	0.4	2.9	8.8
F (46-70)	0.1	0.3	0.0	0.1	0.0	0.0	0.0	0.1	0.7
Total	8.4	10.4	8.1	17.0	9.1	14.1	8.9	23.9	100.0
For a 9 square mile area in Caneyville-Opequon-Rock outcrop: in the Pedlar Hills[2]									
A (0-2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
B (3-7)	0.0	0.1	0.2	0.4	0.0	0.0	0.0	0.0	0.7
C (8-15)	0.3	0.4	0.7	0.8	0.3	0.1	0.1	0.2	2.9
D (16-25)	1.5	2.0	2.0	3.4	1.6	1.3	1.3	2.1	15.2
E (26-45)	4.6	9.1	6.2	12.2	4.4	7.9	6.3	10.4	61.0
F (46-70)	2.3	3.8	2.0	2.3	0.6	1.3	1.8	5.7	19.7
Total	8.7	15.3	11.1	19.0	6.9	10.6	9.5	18.5	99.6
For a 9 square mile area in Berks-Groseclose-Lowell: near Riner									
A (0-2)	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.8	1.1
B (3-7)	1.2	3.1	1.1	5.3	1.4	4.5	1.5	7.6	25.7
C (8-15)	4.0	4.0	5.4	8.9	3.3	6.0	7.4	9.0	47.9
D (16-25)	1.0	2.0	1.3	4.1	0.5	2.6	3.2	5.0	19.7
E (26-45)	0.2	0.7	0.1	1.6	0.0	0.3	0.4	2.0	5.4
F (46-70)	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Total	6.4	9.8	8.0	19.9	5.2	13.5	12.6	24.4	100.0

See footnotes at end of table.

TABLE 4.--DISTRIBUTION OF SLOPE CLASSES AND ASPECT[1]--Continued

Area and slope class	Degree of aspect								
	45	90	135	180	225	270	315	360	Total
	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct
For a 9 square mile area in Berks-Lowell-Rayne: near Sugar Grove[3]									
A (0-2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B (3-7)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
C (8-15)	0.2	0.2	0.1	0.3	0.2	0.2	0.2	0.1	1.6
D (16-25)	1.3	1.2	1.4	1.7	0.8	1.0	1.4	1.5	10.4
E (26-45)	3.7	5.2	6.2	8.2	2.6	7.3	7.1	9.1	49.4
F (46-70)	3.0	5.7	3.9	5.3	0.9	2.6	4.9	8.7	35.0
Total	8.3	12.3	11.6	15.5	4.5	11.1	13.8	19.4	96.5
For a 1 square mile very steep area in Berks-Weikert: on Poor Mountain[4]									
A-B (0-7)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C (8-15)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D (16-25)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E (26-45)	0.2	0.2	0.2	0.7	0.9	0.7	1.4	1.1	5.5
F (46-60)	1.8	3.2	2.1	1.6	1.6	4.6	1.8	5.5	22.3
F (61-99)	2.5	6.0	2.8	5.9	5.7	16.3	9.2	8.0	54.5
Total	4.6	9.4	5.1	6.2	8.3	21.6	12.4	14.7	82.3
For a 1 square mile moderately steep area in Berks-Weikert: near Ironto[5]									
A (0-2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B (3-7)	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.3
C (8-15)	1.4	1.4	2.2	2.8	1.1	1.9	1.7	3.9	16.3
D (16-25)	2.5	7.8	5.3	8.9	1.4	3.6	5.8	11.4	46.5
E (26-45)	0.3	4.4	1.7	9.4	1.9	2.2	3.9	10.0	33.8
F (46-60)	0.0	0.0	0.0	1.1	0.3	0.0	0.0	1.1	2.5
Total	4.2	13.6	9.1	22.4	4.7	7.8	11.4	26.3	99.4

See footnotes at end of table.

TABLE 4.--DISTRIBUTION OF SLOPE CLASSES AND ASPECT[1]--Continued

Area and slope class	Degree of aspect								
	45	90	135	180	225	270	315	360	Total
	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct
For a 1 square mile steep area in Glenelg-Parker: near Little River									
A (0-2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B (3-7)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C (8-15)	0.9	0.6	2.6	3.1	0.3	0.6	1.1	0.6	9.7
D (16-25)	2.3	4.6	3.1	7.7	6.3	10.5	3.1	4.6	42.2
E (26-45)	4.0	11.4	0.3	5.7	3.1	7.1	2.3	10.8	44.7
F (46-60)	0.0	0.6	0.0	0.0	0.0	0.0	0.9	2.0	3.4
Total	7.1	17.1	6.0	16.5	9.7	18.2	7.4	17.9	100.0
For a 1 square mile sloping area in Glenelg-Parker: near Eckels Branch									
A (0-2)	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.3
B (3-7)	1.1	1.1	0.0	2.2	0.3	3.0	0.6	0.3	8.6
C (8-15)	2.8	5.5	6.4	5.5	3.6	8.6	6.1	6.6	45.2
D (16-25)	3.0	4.4	2.5	3.3	2.2	5.5	3.6	9.1	38.8
E (26-45)	0.0	2.2	0.3	2.2	0.0	0.8	0.6	0.6	6.6
F (46-60)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.6
Total	6.9	13.3	9.1	18.3	6.4	18.0	10.8	17.2	100.0
For a 1 square mile area in Unison-Braddock: near Whitehorne									
A (0-2)	0.3	0.0	0.3	0.0	0.5	0.0	0.0	1.1	2.2
B (3-7)	2.7	4.4	7.7	15.7	4.4	3.6	1.9	7.7	48.1
C (8-15)	1.9	7.7	7.7	14.3	2.7	3.3	2.7	4.4	44.8
D (16-25)	0.3	1.4	0.0	1.6	0.3	0.8	0.0	0.5	4.9
E (26-45)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
F (46-60)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	5.2	13.5	15.7	31.6	8.0	7.7	4.7	13.7	100.0

[1]Grender, G. C., W. J. Edmonds, and W. G. Harris. SLASH - a computer program for relief, slope, aspect and topographic shapes in soil surveys. Unpublished report. Virginia Tech. Blacksburg, Virginia 24060.
[2]In 0.4 percent of the area, slopes were more than 70 percent.
[3]In 3.5 percent of the area, slopes were more than 70 percent.
[4]In 17.7 percent of the area, slopes were more than 99 percent.
[5]In 0.6 percent of the area, slopes were more than 60 percent.

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
1C	Berks-Clymer complex, 7 to 15 percent slopes	7,310	2.9
2B	Berks-Groseclose complex, 2 to 7 percent slopes	1,649	0.6
2C	Berks-Groseclose complex, 7 to 15 percent slopes	8,023	3.1
3D	Berks-Lowell-Rayne complex, 15 to 25 percent slopes	7,973	3.1
3E	Berks-Lowell-Rayne complex, 25 to 65 percent slopes	31,501	12.2
4E	Berks-Rock outcrop complex, 25 to 70 percent slopes	8,488	3.3
5D	Berks-Weikert complex, 15 to 25 percent slopes	3,716	1.5
6E	Berks and Weikert soils, 25 to 65 percent slopes	44,140	17.1
7D	Berks and Weikert very stony soils, 15 to 35 percent slopes	6,619	2.6
8D	Caneyville-Opequon-Rock outcrop complex, 7 to 25 percent slopes	5,346	2.1
8E	Caneyville-Opequon-Rock outcrop complex, 25 to 60 percent slopes	24,985	9.7
9C	Carbo and Chilhowie soils, 7 to 15 percent slopes	946	0.4
9D	Carbo and Chilhowie soils, 15 to 25 percent slopes	891	0.3
10	Craigsville soils	3,033	1.2
11B	Duffield-Ernest complex, 2 to 7 percent slopes	6,389	2.5
11C	Duffield-Ernest complex, 7 to 15 percent slopes	5,033	2.0
12B	Frederick and Vertrees silt loams, 2 to 7 percent slopes	647	0.3
12C	Frederick and Vertrees silt loams, 7 to 15 percent slopes	1,490	0.6
13B	Frederick and Vertrees cherty silt loams, 2 to 7 percent slopes	1,293	0.5
13C	Frederick and Vertrees cherty silt loams, 7 to 15 percent slopes	3,414	1.3
13D	Frederick and Vertrees cherty silt loams, 15 to 25 percent slopes	4,589	1.8
14	French soils	402	0.2
15B	Glenelg loam, 2 to 7 percent slopes	795	0.3
15C	Glenelg loam, 7 to 15 percent slopes	2,223	0.9
15D	Glenelg loam, 15 to 25 percent slopes	1,159	0.5
16B	Groseclose and Poplimento soils, 2 to 7 percent slopes	4,883	1.9
16C	Groseclose and Poplimento soils, 7 to 15 percent slopes	7,327	2.9
16D	Groseclose and Poplimento soils, 15 to 25 percent slopes	5,828	2.3
16E	Groseclose and Poplimento soils, 25 to 60 percent slopes	5,785	2.3
17C	Groseclose and Poplimento cherty soils, 7 to 15 percent slopes	1,197	0.5
18B	Groseclose-Urban land complex, 2 to 7 percent slopes	1,486	0.6
18C	Groseclose-Urban land complex, 7 to 15 percent slopes	1,404	0.5
18D	Groseclose-Urban land complex, 15 to 25 percent slopes	661	0.3
19B	Guernsey silt loam, 2 to 7 percent slopes	1,766	0.7
20B	Hayter loam, 2 to 7 percent slopes	1,327	0.5
21C	Hayter soils, 7 to 15 percent slopes	596	0.2
22C	Jefferson soils, 7 to 15 percent slopes	2,837	1.1
23C	Jefferson very stony soils, 7 to 15 percent slopes	1,322	0.5
24D	Jefferson extremely stony soils, 7 to 25 percent slopes	7,640	3.0
25	McGary and Purdy soils	2,505	1.0
26C	Parker-Glenelg complex, 7 to 15 percent slopes	759	0.3
26D	Parker-Glenelg complex, 15 to 25 percent slopes	1,371	0.5
26E	Parker-Glenelg complex, 25 to 50 percent slopes	4,498	1.8
27E	Parker-Rock outcrop complex, 25 to 50 percent slopes	1,027	0.4
28	Ross soils	2,065	0.8
29	Udorthents and Urban land	1,874	0.7
30B	Unison and Braddock soils, 2 to 7 percent slopes	1,183	0.5
30C	Unison and Braddock soils, 7 to 15 percent slopes	1,183	0.5
30D	Unison and Braddock soils, 15 to 25 percent slopes	1,092	0.4
31C	Unison and Braddock cobbly soils, 7 to 15 percent slopes	981	0.4
32B	Unison-Urban land complex, 2 to 7 percent slopes	2,129	0.8
32C	Unison-Urban land complex, 7 to 15 percent slopes	534	0.2
32D	Unison-Urban land complex, 15 to 25 percent slopes	431	0.2
33	Weaver soils	3,841	1.5
34E	Wurno-Caneyville complex, 25 to 45 percent slopes	3,138	1.2
	Water	1,276	0.5
	Total	256,000	100.0

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn	Corn silage	Oats	Wheat	Alfalfa hay	Grass-legume hay	Pasture
	Bu	Ton	Bu	Bu	Ton	Ton	AUM*
1C---- Berks-Clymer	89	17	62	37	3.4	2.7	6.5
2B---- Berks-Groseclose	110	17	65	45	3.8	3.3	7.3
2C---- Berks-Groseclose	100	16	65	40	3.2	2.8	6.4
3D---- Berks-Lowell-Rayne	---	---	---	---	---	---	6.2
3E---- Berks-Lowell-Rayne	---	---	---	---	---	---	4.0
4E---- Berks-Rock outcrop	---	---	---	---	---	---	---
5D---- Berks-Weikert	---	---	---	---	---	---	4.0
6E, 7D---- Berks and Weikert	---	---	---	---	---	---	4.0
8D---- Caneyville-Opequon-Rock outcrop	---	---	---	---	---	---	6.0
8E---- Caneyville-Opequon-Rock outcrop	---	---	---	---	---	---	4.0
9C---- Carbo and Chilhowie	50	7	45	30	2.5	2.0	5.0
9D---- Carbo and Chilhowie	---	---	---	---	---	---	4.0
10---- Craigsville	80	15	45	25	2.0	1.5	4.5
11B---- Duffield-Ernest	117	23	74	46	4.3	3.3	8.2
11C---- Duffield-Ernest	112	21	68	40	4.0	3.0	7.4
12B---- Frederick and Vertrees	130	25	75	50	5.0	4.0	9.5
12C---- Frederick and Vertrees	115	23	75	45	5.0	3.5	8.0
13B---- Frederick and Vertrees	115	23	75	45	4.5	3.5	8.0
13C---- Frederick and Vertrees	100	24	70	37	4.5	3.0	8.0
13D---- Frederick and Vertrees	90	22	60	35	4.0	3.0	7.7
14---- French	130	26	---	---	---	4.8	8.0

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Corn silage	Oats	Wheat	Alfalfa hay	Grass-legume hay	Pasture
	Bu	Ton	Bu	Bu	Ton	Ton	AUM*
15B---- Glenelg	135	27	80	50	5.5	3.5	10.5
15C---- Glenelg	125	25	75	45	5.0	3.5	9.5
15D---- Glenelg	110	22	65	40	4.5	3.0	8.5
16B---- Groseclose and Poplimento	127	23	80	50	4.2	3.6	8.3
16C---- Groseclose and Poplimento	112	22	75	43	3.9	3.1	7.8
16D---- Groseclose and Poplimento	---	---	---	---	3.5	3.0	7.0
16E---- Groseclose and Poplimento	---	---	---	---	---	---	4.0
17C---- Groseclose and Poplimento	107	23	70	40	4.1	3.0	8.0
18B---- Groseclose-Urban land	---	---	---	---	---	---	---
18C---- Groseclose-Urban land	---	---	---	---	---	---	---
18D---- Groseclose-Urban land	---	---	---	---	---	---	---
19B---- Guernsey	100	22	65	40	---	4.0	7.0
20B---- Hayter	120	25	80	50	5.5	3.5	10.0
21C---- Hayter	110	20	70	40	5.0	3.0	9.0
22C---- Jefferson	85	17	65	35	4.0	3.0	6.0
23C---- Jefferson	---	---	---	---	---	---	6.0
24D---- Jefferson	---	---	---	---	---	---	---
25---- McGary and Purdy	91	18	---	---	---	2.4	7.0
26C---- Parker-Glenelg	97	19	67	40	3.6	2.5	7.5
26D---- Parker-Glenelg	---	---	---	---	3.0	2.0	7.0
26E---- Parker-Glenelg	---	---	---	---	---	---	4.0
27E---- Parker-Rock outcrop	---	---	---	---	---	---	---
28---- Ross	130	26	70	40	---	5.0	7.0

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Corn silage	Oats	Wheat	Alfalfa hay	Grass-legume hay	Pasture
	Bu	Ton	Bu	Bu	Ton	Ton	AUM*
29---------- Udorthents and Urban land	---	---	---	---	---	---	---
30B---------- Unison and Braddock	120	25	85	50	5.0	5.0	9.3
30C---------- Unison and Braddock	115	23	80	45	4.5	4.6	9.1
30D---------- Unison and Braddock	100	20	70	40	4.0	4.3	8.8
31C---------- Unison and Braddock	90	20	60	40	3.5	3.5	6.6
32B---------- Unison-Urban land	---	---	---	---	---	---	---
32C---------- Unison-Urban land	---	---	---	---	---	---	---
32D---------- Unison-Urban land	---	---	---	---	---	---	---
33---------- Weaver	100	22	65	40	---	6.0	7.0
34E---------- Wurno-Caneyville	---	---	---	---	---	---	---

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
1C*:								
Berks	3f	Slight	Slight	Moderate	Slight	Northern red oak Black oak Virginia pine	70 70 70	Virginia pine, eastern white pine, Japanese larch, Norway spruce, red pine.
Clymer	2o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar Eastern white pine	77 90 90	Eastern white pine, black cherry, yellow-poplar.
2B*, 2C*:								
Berks	3f	Slight	Slight	Moderate	Slight	Northern red oak Black oak Virginia pine	70 70 70	Virginia pine, eastern white pine, Japanese larch, Norway spruce, red pine.
Groseclose	2r	Severe	Severe	Slight	Slight	White oak Northern red oak Eastern white pine Yellow-poplar	85 85 90 86	Eastern white pine, yellow-poplar.
3D*:								
Berks (north aspect)	3f	Slight	Moderate	Moderate	Slight	Northern red oak Black oak Virginia pine	70 70 70	Virginia pine, eastern white pine, Japanese larch, Norway spruce, red pine.
Lowell (north aspect)	2c	Moderate	Moderate	Slight	Slight	Northern red oak Yellow-poplar Shortleaf pine Virginia pine	70 90 80 80	Yellow-poplar, eastern white pine, shortleaf pine.
Rayne (north aspect)	2r	Slight	Moderate	Slight	Slight	Northern red oak Yellow-poplar Eastern white pine Virginia pine Shortleaf pine	80 90 90 76 76	Eastern white pine, yellow-poplar, black cherry, Norway spruce.
3D*:								
Berks (south aspect)	4f	Slight	Moderate	Moderate	Slight	Northern red oak Black oak Virginia pine	60 60 60	Virginia pine, eastern white pine, Japanese larch, Norway spruce, red pine.
Lowell (south aspect)	2c	Moderate	Moderate	Slight	Slight	Northern red oak Yellow-poplar Shortleaf pine Virginia pine	76 90 80 80	Yellow-poplar, eastern white pine, shortleaf pine, loblolly pine.
Rayne (south aspect)	2r	Slight	Moderate	Slight	Slight	Northern red oak Yellow-poplar Eastern white pine Virginia pine Shortleaf pine	80 90 90 76 76	Eastern white pine, yellow-poplar, black cherry, Norway spruce.
3E*:								
Berks (north aspect)	3f	Moderate	Severe	Moderate	Slight	Northern red oak Black oak Virginia pine	70 70 70	Virginia pine, eastern white pine, Japanese larch, Norway spruce, red pine.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
3E*:								
Lowell (north aspect)	2c	Severe	Severe	Slight	Slight	Northern red oak Yellow-poplar Shortleaf pine Virginia pine	76 90 80 80	Yellow-poplar, eastern white pine, shortleaf pine.
Rayne (north aspect)	2r	Moderate	Severe	Slight	Slight	Northern red oak Yellow-poplar Eastern white pine Virginia pine Shortleaf pine	80 90 90 76 76	Eastern white pine, yellow-poplar, black cherry, Norway spruce.
3E*:								
Berks (south aspect)	4f	Moderate	Severe	Moderate	Slight	Northern red oak Black oak Virginia pine	60 60 60	Virginia pine, eastern white pine, Japanese larch, Norway spruce, red pine.
Lowell (south aspect)	2c	Severe	Severe	Slight	Slight	Northern red oak Yellow-poplar Shortleaf pine Virginia pine	76 90 80 80	Yellow-poplar, eastern white pine, shortleaf pine.
Rayne (south aspect)	2r	Moderate	Severe	Slight	Slight	Northern red oak Yellow-poplar Eastern white pine Virginia pine Shortleaf pine	80 90 90 76 76	Eastern white pine, yellow-poplar, black cherry, Norway spruce.
4E*:								
Berks (north aspect)	3f	Moderate	Severe	Moderate	Slight	Northern red oak Black oak Virginia pine	70 70 70	Virginia pine, eastern white pine, Japanese larch, Norway spruce, red pine.
Rock outcrop.								
4E*:								
Berks (south aspect)	4f	Moderate	Severe	Moderate	Slight	Northern red oak Black oak Virginia pine	60 60 60	Virginia pine, eastern white pine, Japanese larch, Norway spruce, red pine.
Rock outcrop.								
5D*:								
Berks (north aspect)	3f	Slight	Moderate	Moderate	Slight	Northern red oak Black oak Virginia pine	70 70 70	Virginia pine, eastern white pine, Japanese larch, Norway spruce, red pine.
Weikert (north aspect)	4d	Slight	Moderate	Severe	Moderate	Northern red oak Virginia pine	64 60	Eastern white pine, shortleaf pine, Virginia pine.
5D*:								
Berks (south aspect)	4f	Slight	Moderate	Moderate	Slight	Northern red oak Black oak Virginia pine	60 60 60	Virginia pine, eastern white pine, Japanese larch, Norway spruce, red pine.
Weikert (south aspect)	5d	Slight	Moderate	Severe	Moderate	Northern red oak Virginia pine	55 52	Virginia pine, shortleaf pine.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
6E*:								
Berks (north aspect)	3f	Moderate	Severe	Moderate	Slight	Northern red oak Black oak Virginia pine	70 70 70	Virginia pine, eastern white pine, Japanese larch, Norway spruce, red pine.
Weikert (north aspect)	4d	Moderate	Severe	Severe	Moderate	Northern red oak Virginia pine	64 60	Eastern white pine, shortleaf pine, Virginia pine.
6E*:								
Berks (south aspect)	4f	Moderate	Severe	Moderate	Slight	Northern red oak Black oak Virginia pine	60 60 60	Virginia pine, eastern white pine, Japanese larch, Norway spruce, red pine.
Weikert (south aspect)	5d	Moderate	Severe	Severe	Moderate	Northern red oak Virginia pine	55 52	Virginia pine, shortleaf pine.
7D*:								
Berks (north aspect)	3f	Slight	Moderate	Moderate	Slight	Northern red oak Black oak Virginia pine	70 70 70	Virginia pine, eastern white pine, Japanese larch, Norway spruce, red pine.
Weikert (north aspect)	4D	Slight	Moderate	Severe	Moderate	Northern red oak Virginia pine	64 60	Eastern white pine, shortleaf pine, Virginia pine.
7D*:								
Berks (south aspect)	4f	Slight	Moderate	Severe	Slight	Northern red oak Black oak Virginia pine	60 60 60	Virginia pine, eastern white pine, Japanese larch, Norway spruce, red pine.
Weikert (south aspect)	5D	Slight	Moderate	Severe	Moderate	Northern red oak Virginia pine	55 52	Virginia pine, shortleaf pine.
8D*:								
Caneyville (north aspect)	2c	Severe	Severe	Slight	Slight	Yellow-poplar Black oak	90 80	Yellow-poplar, black walnut.
Opequon (north aspect)	3c	Severe	Severe	Severe	Moderate	Northern red oak Yellow-poplar	70 80	Virginia pine, eastern white pine, Japanese larch.
Rock outcrop.								
8D*:								
Caneyville (south aspect)	3c	Severe	Severe	Moderate	Slight	Scarlet oak Eastern redcedar	69 45	Eastern redcedar, Virginia pine, eastern white pine, shortleaf pine.
Opequon (south aspect)	3c	Severe	Severe	Severe	Moderate	Northern red oak Yellow-poplar	70 80	Virginia pine, eastern white pine, Japanese larch.
Rock outcrop.								

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
8E*:								
Caneyville (north aspect)	2c	Severe	Severe	Slight	Slight	Yellow-poplar Black oak	90 80	Yellow-poplar, black walnut.
Opequon (north aspect)	3c	Severe	Severe	Severe	Moderate	Northern red oak Yellow-poplar	70 80	Virginia pine, eastern white pine, Japanese larch.
Rock outcrop.								
8E*:								
Caneyville (south aspect)	3c	Severe	Severe	Moderate	Slight	Scarlet oak Eastern redcedar	69 45	Eastern redcedar, Virginia pine, eastern white pine, shortleaf pine.
Opequon (south aspect)	3c	Severe	Severe	Severe	Moderate	Northern red oak Yellow-poplar	70 80	Virginia pine, eastern white pine, Japanese larch.
Rock outcrop.								
9C*:								
Carbo	3c	Slight	Moderate	Moderate	Slight	Northern red oak Yellow-poplar Eastern white pine	70 80 80	Eastern white pine, yellow-poplar, black walnut.
Chilhowie	4c	Slight	Moderate	Moderate	Moderate	Northern red oak Virginia pine Shortleaf pine	60 60 60	Eastern white pine, black walnut.
9D*:								
Carbo	3r	Moderate	Severe	Moderate	Slight	Northern red oak Yellow-poplar Eastern white pine	70 80 80	Eastern white pine, yellow-poplar, black walnut.
Chilhowie	4r	Moderate	Severe	Moderate	Moderate	Northern red oak Virginia pine Shortleaf pine	60 60 60	Virginia pine, eastern white pine, black walnut.
10* Craigsville	2o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar Eastern white pine Virginia pine	80 95 90 80	Eastern white pine, yellow-poplar.
11B*:								
Duffield	1o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar	86 96	Yellow-poplar, black walnut, Norway spruce, Japanese larch, eastern white pine.
Ernest	3w	Slight	Moderate	Slight	Slight	Northern red oak White oak Yellow-poplar White ash Sugar maple Black cherry	70 70 80 70 70 70	Eastern white pine, Norway spruce, Japanese larch.
11C*:								
Duffield	1o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar	86 96	Yellow-poplar, black walnut, Norway spruce, Japanese larch, eastern white pine.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
11C*:								
Ernest	3w	Moderate	Moderate	Slight	Slight	Northern red oak	70	Eastern white pine, Virginia pine, Norway spruce, Japanese larch.
						White oak	70	
						Yellow-poplar	80	
						White ash	70	
						Sugar maple	70	
						Black cherry	70	
12B*:								
Frederick	2c	Slight	Moderate	Slight	Slight	Northern red oak	76	Eastern white pine, yellow-poplar.
						Yellow-poplar	86	
						Black locust	---	
						White oak	---	
						Black walnut	---	
Vertrees	2c	Slight	Moderate	Slight	Slight	Yellow-poplar	90	Yellow-poplar, black walnut, white ash, northern red oak.
						White oak	80	
						Black oak	80	
						Northern red oak	80	
12C*:								
Frederick	2c	Slight	Moderate	Slight	Slight	Northern red oak	76	Eastern white pine, yellow-poplar.
						Yellow-poplar	86	
						Black locust	---	
						White oak	---	
						Black walnut	---	
Vertrees	2c	Slight	Moderate	Slight	Slight	Yellow-poplar	90	Yellow-poplar, black walnut, white ash, northern red oak.
						White oak	80	
						Black oak	80	
						Northern red oak	80	
13B*:								
Frederick	2c	Slight	Moderate	Slight	Slight	Northern red oak	76	Eastern white pine, yellow-poplar, white oak, black walnut, Scotch pine.
						Yellow-poplar	86	
						Black locust	---	
Vertrees	2c	Slight	Moderate	Slight	Slight	Yellow-poplar	90	Yellow-poplar, black walnut, white ash, northern red oak.
						White oak	80	
						Black oak	80	
						Northern red oak	80	
13C*:								
Frederick	2c	Slight	Moderate	Slight	Slight	Northern red oak	76	Eastern white pine, yellow-poplar, white oak, black walnut, Scotch pine.
						Yellow-poplar	86	
						Black locust	---	
Vertrees	2c	Slight	Moderate	Slight	Slight	Yellow-poplar	90	Yellow-poplar, black walnut, white ash, northern red oak.
						White oak	80	
						Black oak	80	
						Northern red oak	80	
13D*:								
Frederick	2r	Moderate	Moderate	Slight	Slight	Northern red oak	76	Eastern white pine, yellow-poplar, white oak, black walnut, Scotch pine.
						Yellow-poplar	86	
						Black locust	---	
Vertrees	2c	Moderate	Moderate	Slight	Slight	Yellow-poplar	90	Yellow-poplar, black walnut, white ash, northern red oak.
						White oak	80	
						Black oak	80	
						Northern red oak	80	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
14*---------- French	1w	Slight	Moderate	Slight	Moderate	Yellow-poplar------- Northern red oak---- American sycamore--- Eastern white pine-- Shortleaf pine------ Black walnut-------- Black willow--------	100 90 90 100 80 --- ---	Yellow-poplar, eastern white pine, black walnut, white ash, Scotch pine, Norway spruce, American sycamore.
15B, 15C---------- Glenelg	2o	Slight	Slight	Slight	Slight	Black oak---------- Yellow-poplar------- Virginia pine------- Shortleaf pine------	78 87 70 70	Eastern white pine, black walnut, yellow-poplar, Japanese larch.
15D---------- Glenelg	2r	Moderate	Moderate	Slight	Slight	Black oak---------- Yellow-poplar------- Virginia pine------- Shortleaf pine------	78 87 70 70	Eastern white pine, black walnut, yellow-poplar, Japanese larch.
16B*, 16C*: Groseclose-------- Poplimento--------	2r 2c	Severe Slight	Severe Moderate	Slight Slight	Slight Slight	White oak---------- Northern red oak---- Eastern white pine-- Yellow-poplar------- Northern red oak---- Yellow-poplar-------	85 85 90 86 80 90	Eastern white pine, yellow-poplar. Eastern white pine, yellow-poplar, black walnut.
16D*: Groseclose-------- Poplimento--------	2r 2r	Severe Moderate	Severe Severe	Slight Slight	Slight Slight	White oak---------- Northern red oak---- Eastern white pine-- Yellow-poplar------- Northern red oak---- Yellow-poplar-------	85 85 90 86 80 90	Eastern white pine, yellow-poplar. Eastern white pine, yellow-poplar, black walnut.
16E*: Groseclose-------- Poplimento--------	2r 2r	Severe Severe	Severe Severe	Slight Slight	Slight Slight	White oak---------- Northern red oak---- Eastern white pine-- Yellow-poplar------- Northern red oak---- Yellow-poplar-------	85 85 90 86 80 90	Eastern white pine, yellow-poplar. Eastern white pine, yellow-poplar, black walnut.
17C*: Groseclose-------- Poplimento--------	2o 2c	Slight Slight	Slight Moderate	Slight Slight	Slight Slight	White oak---------- Northern red oak---- Eastern white pine-- Yellow-poplar------- Northern red oak---- Yellow-poplar-------	85 85 90 86 80 90	Eastern white pine, yellow-poplar. Eastern white pine, yellow-poplar, black walnut.
18B*, 18C*, 18D*: Groseclose-------- Urban land.	2r	Severe	Severe	Slight	Slight	White oak---------- Northern red oak---- Eastern white pine-- Yellow-poplar-------	85 85 90 86	Eastern white pine, yellow-poplar.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
19B---------- Guernsey	2o	Slight	Slight	Slight	Slight	Northern red oak----	78	Eastern white pine, yellow-poplar, black walnut, white ash, white oak.
						Yellow-poplar-------	95	
						Sugar maple---------	---	
						Black walnut--------	---	
						White oak-----------	---	
						Black cherry--------	---	
						White ash-----------	---	
20B, 21C*---------- Hayter	1o	Slight	Slight	Slight	Slight	Northern red oak----	86	Yellow-poplar, eastern white pine, black walnut.
22C*, 23C*--------- Jefferson	3o	Slight	Slight	Slight	Slight	Northern red oak----	70	Eastern white pine, yellow-poplar, shortleaf pine.
						Yellow-poplar-------	85	
						Shortleaf pine------	68	
						Virginia pine-------	70	
24D---------- Jefferson	3x	Slight	Moderate	Slight	Slight	Northern red oak----	70	Eastern white pine, yellow-poplar, shortleaf pine.
						Yellow-poplar-------	85	
						Shortleaf pine------	68	
						Virginia pine-------	70	
25*:								
McGary----------	2c	Slight	Slight	Moderate	Severe	Sweetgum------------	90	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
						White oak-----------	75	
						White ash-----------	---	
						Red maple-----------	---	
Purdy----------	2w	Slight	Severe	Severe	Severe	Shortleaf pine------	75	Eastern white pine.
						Virginia pine-------	75	
						Yellow-poplar-------	90	
						Sweetgum------------	85	
26C*:								
Parker----------	3f	Slight	Slight	Moderate	Slight	Black oak-----------	---	Eastern white pine, European larch, Austrian pine, Norway spruce.
						White oak-----------	---	
						Scarlet oak---------	---	
						Chestnut oak--------	---	
						Yellow-poplar-------	---	
Glenelg----------	2o	Slight	Slight	Slight	Slight	Black oak-----------	78	Eastern white pine, black walnut, yellow-poplar, Japanese larch.
						Yellow-poplar-------	87	
						Virginia pine-------	76	
						Shortleaf pine------	76	
26D*:								
Parker----------	3x	Moderate	Moderate	Moderate	Slight	Black oak-----------	---	Eastern white pine, European larch, Austrian pine, Norway spruce.
						White oak-----------	---	
						Scarlet oak---------	---	
						Chestnut oak--------	---	
						Yellow-poplar-------	---	
Glenelg----------	2r	Moderate	Moderate	Slight	Slight	Black oak-----------	78	Eastern white pine, black walnut, yellow-poplar, Japanese larch.
						Yellow-poplar-------	87	
						Virginia pine-------	76	
						Shortleaf pine------	76	
26E*:								
Parker----------	3x	Moderate	Moderate	Moderate	Slight	Black oak-----------	---	Eastern white pine, European larch, Austrian pine, Norway spruce.
						White oak-----------	---	
						Scarlet oak---------	---	
						Chestnut oak--------	---	
						Yellow-poplar-------	---	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
26E*:								
Glenelg	2r	Severe	Severe	Slight	Slight	Black oak	78	Eastern white pine, black walnut, yellow-poplar, Japanese larch.
						Yellow-poplar	87	
						Virginia pine	76	
						Shortleaf pine	76	
27E*:								
Parker	3x	Moderate	Moderate	Moderate	Slight	Black oak	---	Eastern white pine, European larch, Austrian pine, Norway spruce.
						White oak	---	
						Scarlet oak	---	
						Chestnut oak	---	
						Yellow-poplar	---	
Rock outcrop.								
28*	1o	Slight	Slight	Slight	Slight	Northern red oak	86	Eastern white pine, black walnut, white ash, Norway spruce, yellow-poplar.
Ross						Yellow-poplar	96	
						Sugar maple	86	
						White oak	---	
						Black walnut	---	
						Black cherry	---	
						White ash	---	
30B*, 30C*:								
Unison	1o	Slight	Slight	Slight	Slight	Northern red oak	86	Yellow-poplar, black walnut, eastern white pine.
						Yellow-poplar	96	
						Virginia pine	86	
Braddock	2c	Slight	Moderate	Slight	Slight	Northern red oak	80	Yellow-poplar, eastern white pine.
						Yellow-poplar	90	
						Eastern white pine	95	
						Virginia pine	76	
						Shortleaf pine	76	
30D*:								
Unison	1r	Slight	Moderate	Slight	Slight	Northern red oak	85	Yellow-poplar, black walnut, eastern white pine.
						Yellow-poplar	95	
						Virginia pine	80	
Braddock	2r	Moderate	Severe	Slight	Slight	Northern red oak	80	Yellow-poplar, eastern white pine.
						Yellow-poplar	90	
						Eastern white pine	95	
						Virginia pine	76	
						Shortleaf pine	76	
31C*:								
Unison	1o	Slight	Slight	Slight	Slight	Northern red oak	86	Yellow-poplar, black walnut, eastern white pine.
						Yellow-poplar	96	
						Virginia pine	86	
Braddock	2c	Slight	Moderate	Slight	Slight	Northern red oak	80	Yellow-poplar, eastern white pine.
						Yellow-poplar	90	
						Eastern white pine	95	
						Virginia pine	76	
						Shortleaf pine	76	
32B*, 32C*:								
Unison	1o	Slight	Slight	Slight	Slight	Northern red oak	86	Yellow-poplar, black walnut, eastern white pine.
						Yellow-poplar	96	
						Virginia pine	86	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
32B*, 32C*: Urban land.								
32D*: Unison	1r	Slight	Moderate	Slight	Slight	Northern red oak Yellow-poplar Virginia pine	86 96 86	Yellow-poplar, black walnut, eastern white pine.
Urban land.								
33* Weaver	2w	Slight	Moderate	Slight	Slight	Yellow-poplar Northern red oak Sweetgum Eastern white pine Black walnut	95 80 90 90 ---	Yellow-poplar, black walnut.
34E*: Wurno (north aspect)	3f	Moderate	Severe	Slight	Slight	Virginia pine Scarlet oak	70 70	Virginia pine, shortleaf pine, eastern white pine.
Caneyville (north aspect)	2c	Severe	Severe	Slight	Slight	Yellow-poplar Black oak	90 80	Yellow-poplar, black walnut.
34E*: Wurno (south aspect)	4f	Moderate	Severe	Slight	Slight	Virginia pine Scarlet oak	60 60	
Caneyville (south aspect)	3c	Severe	Severe	Moderate	Slight	Scarlet oak Eastern redcedar	69 45	Eastern redcedar, Virginia pine, eastern white pine, shortleaf pine.

* 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
1C*:					
Berks	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: small stones, slope.	Slight	Severe: small stones.
Clymer	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
2B*:					
Berks	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Severe: small stones.
Groseclose	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
2C*:					
Berks	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: small stones, slope.	Slight	Severe: small stones.
Groseclose	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
3D*:					
Berks	Severe: slope.	Severe: slope.	Severe: small stones, slope.	Moderate: slope.	Severe: slope, small stones.
Lowell	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Rayne	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
3E*:					
Berks	Severe: slope.	Severe: slope.	Severe: small stones, slope.	Severe: slope.	Severe: slope, small stones.
Lowell	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Rayne	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
4E*:					
Berks	Severe: slope.	Severe: slope.	Severe: small stones, slope.	Severe: slope.	Severe: slope, small stones.
Rock outcrop.					
5D*, 6E*:					
Berks	Severe: slope.	Severe: slope.	Severe: small stones, slope.	Severe: slope.	Severe: 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
5D*, 6E*:					
Weikert	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, depth to rock, small stones.	Severe: slope.	Severe: slope, thin layer, small stones.
7D*:					
Berks	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones, slope.	Severe: slope.	Severe: slope, small stones.
Weikert	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, depth to rock, small stones.	Severe: slope.	Severe: slope, small stones, thin layer.
8D*:					
Caneyville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Opequon	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.	Severe: slope, thin layer.
Rock outcrop.					
8E*:					
Caneyville	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, thin layer.
Rock outcrop.					
9C*:					
Carbo	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope, thin layer.
Chilhowie	Severe: too clayey.	Severe: too clayey.	Severe: slope, too clayey.	Severe: too clayey.	Severe: too clayey.
9D*:					
Carbo	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Chilhowie	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: too clayey.	Severe: slope, too clayey.
10* Craigsville	Severe: flooding.	Moderate: flooding, large stones.	Severe: flooding.	Moderate: large stones, flooding.	Severe: flooding.
11B*:					
Duffield	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Ernest	Moderate: percs slowly, wetness.	Moderate: wetness, percs slowly.	Moderate: slope, small stones.	Severe: erodes easily.	Moderate: 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
11C*:					
Duffield	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Ernest	Moderate: slope, wetness.	Moderate: slope, wetness.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, small stones, slope.
12B*:					
Frederick	Slight	Slight	Moderate: slope.	Slight	Slight.
Vertrees	Moderate: percs slowly.	Moderate percs slowly.	Severe: slope.	Severe: erodes easily.	Slight.
12C*:					
Frederick	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Vertrees	Moderate: percs slowly, slope.	Moderate: percs slowly, slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
13B*:					
Frederick	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.	Moderate: small stones.
Vertrees	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope, small stones.	Slight	Slight.
13C*:					
Frederick	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Moderate: small stones.	Moderate: slope, small stones.
Vertrees	Moderate: percs slowly, slope.	Moderate: percs slowly, slope.	Severe: slope, small stones.	Slight	Moderate: small stones, slope.
13D*:					
Frederick	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.
Vertrees	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
14*: French	Severe: flooding, wetness.	Moderate: wetness, flooding.	Severe: wetness, flooding.	Moderate: wetness, flooding.	Moderate: flooding, wetness.
15B: Glenelg	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
15C: Glenelg	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
15D: Glenelg	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
16B*:					
Groseclose	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.

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
16B*:					
Poplimento	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Slight	Slight.
16C*:					
Groseclose	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Poplimento	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
16D*:					
Groseclose	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Poplimento	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
16E*:					
Groseclose	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Poplimento	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
17C*:					
Groseclose	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: small stones, slope.
Poplimento	Severe: small stones.	Severe: small stones.	Severe: small stones, slope.	Slight	Severe: small stones.
18B*:					
Groseclose	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
Urban land.					
18C*:					
Groseclose	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Urban land.					
18D*:					
Groseclose	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Urban land.					
19B---------- Guernsey	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, small stones, wetness.	Moderate: wetness.	Slight.
20B---------- Hayter	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: 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
21C* Hayter	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: large stones, slope.	Moderate: large stones.	Severe: large stones.
22C* Jefferson	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: small stones, slope.
23C* Jefferson	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: large stones, small stones, slope.	Slight	Moderate: small stones, large stones, slope.
24D* Jefferson	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, small stones, slope.	Moderate: slope.	Severe: slope.
25*: McGary	Severe: flooding, wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness, flooding.
Purdy	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, erodes easily.	Severe: wetness.
26C*: Parker	Severe: small stones.	Severe: small stones.	Severe: large stones, slope, small stones.	Severe: small stones.	Severe: small stones.
Glenelg	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
26D*: Parker	Severe: slope, small stones.	Severe: slope, small stones.	Severe: large stones, slope, small stones.	Severe: small stones.	Severe: small stones, slope.
Glenelg	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
26E*: Parker	Severe: slope, small stones.	Severe: slope, small stones.	Severe: large stones, slope, small stones.	Severe: slope, small stones.	Severe: small stones, slope.
Glenelg	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
27E*: Parker	Severe: slope, small stones.	Severe: slope, small stones.	Severe: large stones, slope, small stones.	Severe: slope, small stones.	Severe: small stones, slope.
Rock outcrop.					
28* Ross	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
29*: Udorthents.					

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
29*: Urban land.					
30B*: Unison	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones.
Braddock	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
30C*: Unison	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, slope.
Braddock	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
30D*: Unison	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Braddock	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
31C*: Unison	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: large stones, slope.	Moderate: large stones.	Moderate: large stones, slope.
Braddock	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: large stones, slope.	Moderate: large stones.	Moderate: slope, large stones.
32B*: Unison	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones.
Urban land.					
32C*: Unison	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, slope.
Urban land.					
32D*: Unison	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Urban land.					
33* Weaver	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Moderate: wetness.	Moderate: wetness, flooding.
34E*: Wurno	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope, droughty.
Caneyville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.

* 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
1C*:										
Berks	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
Clymer	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
2B* Berks	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Fair	Poor	Very poor.
Groseclose	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
2C*:										
Berks	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
Groseclose	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
3D*:										
Berks	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
Lowell	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Rayne	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
3E*:										
Berks	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Lowell	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Rayne	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
4E*:										
Berks	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Rock outcrop.										
5D*:										
Berks	Very poor.	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Weikert	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
6E*, 7D*:										
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.

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
8D*:										
Caneyville	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Opequon	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Rock outcrop.										
8E*:										
Caneyville	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Opequon	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Rock outcrop.										
9C*:										
Carbo	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Chilhowie	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
9D*:										
Carbo	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Chilhowie	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
10*---------- Craigsville	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
11B*:										
Duffield	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ernest	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
11C*:										
Duffield	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Ernest	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
12B*:										
Frederick	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Vertrees	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
12C*:										
Frederick	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Vertrees	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
13B*:										
Frederick	Good	Good	Good	Good	Good	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
13B*:										
Vertrees	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
13C*:										
Frederick	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Vertrees	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
13D*:										
Frederick	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Vertrees	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
14* French	Poor	Fair	Fair	Good	Good	Poor	Poor	Fair	Good	Poor.
15B Glenelg	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
15C Glenelg	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
15D Glenelg	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
16B*:										
Groseclose	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Poplimento	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
16C*:										
Groseclose	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Poplimento	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
16D*:										
Groseclose	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Poplimento	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
16E*:										
Groseclose	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Poplimento	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
17C*:										
Groseclose	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Poplimento	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
18B*:										
Groseclose	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Urban land.										
18C*:										
Groseclose	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Urban land.										
18D*:										
Groseclose	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Urban land.										
19B Guernsey	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
20B Hayter	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
21C* Hayter	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
22C* Jefferson	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
23C* Jefferson	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
24D* Jefferson	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
25*:										
McGary	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
Purdy	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
26C*:										
Parker	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Glenelg	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
26D*:										
Parker	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Glenelg	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
26E*:										
Parker	Very poor.	Very poor.	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Glenelg	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
27E*:										
Parker	Very poor.	Very poor.	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Rock outcrop.										

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
28*---------- Ross	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
29*: Udorthents.										
Urban land.										
30B*: Unison----------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Braddock----------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
30C*: Unison----------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Braddock----------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
30D*: Unison----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Braddock----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
31C*: Unison----------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Braddock----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
32B*: Unison----------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Urban land.										
32C*: Unison----------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Urban land.										
32D*: Unison----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Urban land.										
33*---------- Weaver	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
34E*: Wurno----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Caneyville--------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.

* 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 means that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1C*:						
Berks	Moderate: slope, depth to rock.	Moderate: slope.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope.	Severe: small stones.
Clymer	Moderate: depth to rock, slope.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
2B*:						
Berks	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Moderate: slope.	Slight	Severe: small stones.
Groseclose	Moderate: depth to rock, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
2C*:						
Berks	Moderate: slope, depth to rock.	Moderate: slope.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope.	Severe: small stones.
Groseclose	Moderate: depth to rock, too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: slope, shrink-swell.	Severe: low strength, shrink-swell.	Moderate: slope.
3D*, 3E*:						
Berks	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, small stones.
Lowell	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Rayne	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
4E*:						
Berks	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, small stones.
Rock outcrop.						
5D*, 6E*:						
Berks	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, small stones.
Weikert	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.	Severe: slope, thin layer, small stones.
7D*:						
Berks	Severe: slope.	Severe: slope.	Severe	Severe: slope.	Severe: slope.	Severe: slope, small stones.
Weikert	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.	Severe: slope, small stones, thin layer.

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
8D*, 8E*:						
Caneyville	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.	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, thin layer.
Rock outcrop.						
9C*:						
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, thin layer.
Chilhowie	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Severe: too clayey.
9D*:						
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.
Chilhowie	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope, too clayey.
10* Craigsville	Severe: cutbanks cave, large stones.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
11B*:						
Duffield	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Ernest	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength.	Moderate: large stones, small stones.
11C*:						
Duffield	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
Ernest	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: wetness.	Severe: slope.	Severe: low strength.	Moderate: large stones, small stones, slope.
12B*:						
Frederick	Moderate: too clayey.	Moderate: shrink-swell.	Severe: shrink-swell.	Moderate: slope, shrink-swell.	Severe: low strength.	Slight.
Vertrees	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: low strength.	Slight.
12C*:						
Frederick	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Severe: shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: 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
12C*:						
Vertrees	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
13B*:						
Frederick	Moderate: too clayey.	Moderate: shrink-swell.	Severe: shrink-swell.	Moderate: slope, shrink-swell.	Severe: low strength, shrink-swell.	Moderate: small stones.
Vertrees	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: low strength.	Moderate: small stones.
13C*:						
Frederick	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: slope.	Severe: low strength, shrink-swell.	Moderate: slope, small stones.
Vertrees	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: small stones, slope.
13D*:						
Frederick	Severe: slope.	Severe: slope.	Severe: slope, shrink-swell.	Severe: slope.	Severe: low strength, slope, shrink-swell.	Severe: slope, small stones.
Vertrees	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
14*---------- French	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding.	Moderate: flooding, wetness.
15B---------- Glenelg	Slight----------	Slight----------	Slight----------	Moderate: slope.	Moderate: frost action.	Slight.
15C---------- Glenelg	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
15D---------- Glenelg	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
16B*:						
Groseclose	Moderate: depth to rock, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
Poplimento	Moderate: depth to rock, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
16C*:						
Groseclose	Moderate: depth to rock, too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: slope, shrink-swell.	Severe: low strength, shrink-swell.	Moderate: slope.
Poplimento	Moderate: depth to rock, too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: 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
16D*, 16E*:						
Groseclose	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: low strength, slope, shrink-swell.	Severe: slope.
Poplimento	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
17C*:						
Groseclose	Moderate: depth to rock, too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: slope, shrink-swell.	Severe: low strength, shrink-swell.	Moderate: small stones, slope.
Poplimento	Moderate: depth to rock, too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Severe: small stones.
18B*:						
Groseclose	Moderate: depth to rock, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
Urban land.						
18C*:						
Groseclose	Moderate: depth to rock, too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: slope, shrink-swell.	Severe: low strength, shrink-swell.	Moderate: slope.
Urban land.						
18D*:						
Groseclose	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: low strength, slope, shrink-swell.	Severe: slope.
Urban land.						
19B---- Guernsey	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength.	Slight.
20B---- Hayter	Moderate: depth to rock, large stones.	Moderate: shrink-swell, large stones.	Moderate: shrink-swell, depth to rock.	Moderate: shrink-swell, slope, large stones.	Moderate: frost action, shrink-swell.	Moderate: large stones.
21C*---- Hayter	Moderate: depth to rock, large stones, slope.	Moderate: shrink-swell, slope, large stones.	Moderate: shrink-swell, slope, depth to rock.	Severe: slope.	Moderate: slope, frost action, shrink-swell.	Severe: large stones.
22C*---- Jefferson	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: small stones, slope.
23C*---- Jefferson	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: 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
24D* Jefferson	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
25*: McGary	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, flooding, shrink-swell.	Moderate: wetness, flooding.
Purdy	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, low strength, frost action.	Severe: wetness.
26C*: Parker	Moderate: depth to rock, slope.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Moderate: slope, frost action.	Severe: small stones.
Glenelg	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
26D*, 26E*: Parker	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
Glenelg	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
27E*: Parker	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
Rock outcrop.						
28* Ross	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
29*: Udorthents.						
Urban land.						
30B*: Unison	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: low strength.	Moderate: large stones.
Braddock	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, frost action.	Slight.
30C*: Unison	Moderate: too clayey, slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: large stones, slope.
Braddock	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, slope.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: 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
30D*:						
Unison	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Braddock	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
31C*:						
Unison	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: large stones, slope.
Braddock	Moderate: too clayey, large stones, slope.	Moderate: shrink-swell, slope, large stones.	Moderate: wetness, slope, shrink-swell.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope, large stones.
32B*:						
Unison	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: low strength.	Moderate: large stones.
Urban land.						
32C*:						
Unison	Moderate: too clayey, slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: large stones, slope.
Urban land.						
32D*:						
Unison	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Urban land.						
33*---------- Weaver	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Moderate: wetness, flooding.
34E*:						
Wurno	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, droughty.
Caneyville	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1C*:					
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.
Clymer	Moderate: depth to rock, percs slowly, slope.	Severe: slope.	Severe: depth to rock.	Moderate: depth to rock, slope.	Poor: small stones.
2B*:					
Berks	Severe: depth to rock.	Severe: seepage, depth to rock.	Severe: depth to rock, seepage.	Severe: seepage, depth to rock.	Poor: small stones, area reclaim.
Groseclose	Severe: percs slowly.	Moderate: depth to rock, slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock.	Poor: too clayey, hard to pack.
2C*:					
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.
Groseclose	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
3D*, 3E*:					
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.
Lowell	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Rayne	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
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.
Rock outcrop.					
5D*, 6E*:					
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: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage, depth to rock.	Poor: slope, area reclaim, seepage.

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*:					
Berks	Severe: depth to rock, slope.	Severe: slope, depth to rock, seepage.	Severe: slope, depth to rock, seepage.	Severe: seepage, slope, depth to rock.	Poor: small stones, slope, area reclaim.
Weikert	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage, depth to rock.	Poor: slope, area reclaim, seepage.
8D*, 8E*:					
Caneyville	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
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.					
9C*:					
Carbo	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.
Chilhowie	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
9D*:					
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: area reclaim, too clayey, hard to pack.
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: area reclaim, too clayey, hard to pack.
10* Craigsville	Severe: flooding, poor filter.	Severe: seepage, flooding, large stones.	Severe: flooding, seepage, large stones.	Severe: flooding, seepage.	Poor: large stones, seepage.
11B*:					
Duffield	Moderate: depth to rock.	Moderate: seepage, depth to rock, slope.	Severe: depth to rock.	Moderate: depth to rock.	Poor: hard to pack.
Ernest	Severe: percs slowly, wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Poor: small stones.
11C*:					
Duffield	Moderate: depth to rock, slope.	Severe: slope.	Severe: depth to rock.	Moderate: depth to rock, slope.	Poor: 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
11C*:					
Ernest	Severe: percs slowly, wetness.	Severe: slope, wetness.	Moderate: slope, wetness.	Moderate: slope, wetness.	Poor: small stones.
12B*:					
Frederick	Moderate: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Vertrees	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
12C*:					
Frederick	Moderate: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
Vertrees	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
13B*:					
Frederick	Moderate: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: too clayey.
Vertrees	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
13C*:					
Frederick	Moderate: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey.
Vertrees	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
13D*:					
Frederick	Severe: slope.	Severe: slope.	Severe: too clayey.	Severe: slope.	Poor: slope, too clayey.
Vertrees	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
14*: French	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness, thin layer.
15B: Glenelg	Moderate: depth to rock, percs slowly.	Moderate: seepage, depth to rock, slope.	Severe: depth to rock.	Moderate: depth to rock.	Poor: small stones.
15C: Glenelg	Moderate: depth to rock, percs slowly, slope.	Severe: slope.	Severe: depth to rock.	Moderate: depth to rock, slope.	Poor: small stones.

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
15D---------- Glenelg	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: small stones, slope.
16B*:					
Groseclose----------	Severe: percs slowly.	Moderate: depth to rock, slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock.	Poor: too clayey, hard to pack.
Poplimento----------	Severe: percs slowly.	Moderate: depth to rock, slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock.	Poor: too clayey, hard to pack.
16C*:					
Groseclose----------	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
Poplimento----------	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
16D*, 16E*:					
Groseclose----------	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Poplimento----------	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
17C*:					
Groseclose----------	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
Poplimento----------	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
18B*:					
Groseclose----------	Severe: percs slowly.	Moderate: depth to rock, slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock.	Poor: too clayey, hard to pack.
Urban land.					
18C*:					
Groseclose----------	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
Urban land.					
18D*:					
Groseclose----------	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Urban land.					
19B---------- Guernsey	Severe: wetness, percs slowly.	Severe: wetness.	Severe: depth to rock, too clayey.	Moderate: depth to rock, wetness.	Poor: 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 Hayter	Moderate: depth to rock, large stones.	Severe: seepage.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: large stones.
21C* Hayter	Moderate: depth to rock, slope, large stones.	Severe: seepage, slope, large stones.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: large stones.
22C*, 23C* Jefferson	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: too clayey, small stones, slope.
24D* Jefferson	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
25*: McGary	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
Purdy	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: wetness, too clayey, hard to pack.
26C*: Parker	Severe: poor filter.	Severe: seepage, slope.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: seepage, small stones.
Glenelg	Moderate: depth to rock, percs slowly, slope.	Severe: slope.	Severe: depth to rock.	Moderate: depth to rock, slope.	Poor: small stones.
26D*, 26E*: Parker	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: seepage, small stones, slope.
Glenelg	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: small stones, slope.
27E*: Parker	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: seepage, small stones, slope.
Rock outcrop.					
28* Ross	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage.	Good.
29*: Udorthents.					
Urban land.					

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
30B*:					
Unison	Moderate: percs slowly.	Severe: seepage.	Severe: too clayey, seepage.	Slight	Poor: too clayey, hard to pack.
Braddock	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Slight	Poor: too clayey, hard to pack, thin layer.
30C*:					
Unison	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: too clayey, seepage.	Moderate: slope.	Poor: too clayey, hard to pack.
Braddock	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Poor: too clayey, hard to pack, thin layer.
30D*:					
Unison	Severe: slope.	Severe: seepage, slope.	Severe: slope, too clayey, seepage.	Severe: slope.	Poor: slope, too clayey, hard to pack.
Braddock	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: too clayey, hard to pack, thin layer.
31C*:					
Unison	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: too clayey, seepage.	Moderate: slope.	Poor: too clayey, hard to pack.
Braddock	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage, wetness.	Moderate: wetness, slope.	Poor: too clayey, hard to pack, small stones.
32B*:					
Unison	Moderate: percs slowly.	Severe: seepage.	Severe: too clayey, seepage.	Slight	Poor: too clayey, hard to pack.
Urban land.					
32C*:					
Unison	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: too clayey, seepage.	Moderate: slope.	Poor: too clayey, hard to pack.
Urban land.					
32D*:					
Unison	Severe: slope.	Severe: seepage, slope.	Severe: slope, too clayey, seepage.	Severe: slope.	Poor: slope, too clayey, hard to pack.
Urban land.					
33* Weaver	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, depth to rock, wetness.	Severe: flooding, wetness.	Fair: area reclaim, too clayey.

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
34E*:					
Wurno	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: area reclaim, slope, thin layer.
Caneyville	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
1C*:				
Berks	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Clymer	Fair: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
2B*, 2C*:				
Berks	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Groseclose	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
3D*:				
Berks	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Lowell	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
Rayne	Fair: area reclaim, thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
3E*:				
Berks	Poor: slope, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Lowell	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
Rayne	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
4E*:				
Berks	Poor: slope, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Rock outcrop.				
5D*, 6E*:				
Berks	Poor: slope, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Weikert	Poor: slope, area reclaim.	Improbable: small stones.	Improbable: thin layer.	Poor: slope, small stones, area reclaim.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
7D*:				
Berks	Poor: slope, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Weikert	Poor: slope, area reclaim.	Improbable: small stones.	Improbable: thin layer.	Poor: slope, small stones, area reclaim.
8D*:				
Caneyville	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
Opequon	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Rock outcrop.				
8E*:				
Caneyville	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
Opequon	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Rock outcrop.				
9C*:				
Carbo	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too clayey, large stones.
Chilhowie	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.
9D*:				
Carbo	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too clayey, large stones.
Chilhowie	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
10* Craigsville	Fair: large stones.	Improbable: large stones.	Improbable: large stones.	Poor: large stones, area reclaim.
11B*:				
Duffield	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
11B*:				
Ernest	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
11C*:				
Duffield	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim, slope.
Ernest	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
12B*:				
Frederick	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, thin layer.
Vertrees	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
12C*:				
Frederick	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, thin layer.
Vertrees	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
13B*:				
Frederick	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Vertrees	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
13C*:				
Frederick	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Vertrees	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
13D*:				
Frederick	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Vertrees	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
14* French	Fair: wetness, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
15B, 15C Glenelg	Fair: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
15D Glenelg	Fair: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
16B*, 16C*:				
Groseclose	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Poplimento	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
16D*:				
Groseclose	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
Poplimento	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
16E*:				
Groseclose	Poor: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
Poplimento	Poor: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
17C*:				
Groseclose	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.
Poplimento	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.
18B*, 18C*:				
Groseclose	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Urban land.				
18D*:				
Groseclose	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
Urban land.				
19B---------- Guernsey	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, too clayey.
20B, 21C*---------- Hayter	Fair: area reclaim, large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim.
22C*---------- Jefferson	Good----------	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
23C*---------- Jefferson	Good----------	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
24D* Jefferson	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
25*: McGary	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Purdy	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, too clayey.
26C*: Parker	Fair: area reclaim.	Improbable: small stones.	Probable	Poor: small stones, area reclaim.
Glenelg	Fair: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
26D*: Parker	Fair: area reclaim, slope.	Improbable: small stones.	Probable	Poor: small stones, area reclaim, slope.
Glenelg	Fair: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
26E*: Parker	Poor: slope.	Improbable: small stones.	Probable	Poor: small stones, area reclaim, slope.
Glenelg	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
27E*: Parker	Poor: slope.	Improbable: small stones.	Probable	Poor: small stones, area reclaim, slope.
Rock outcrop.				
28* Ross	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
29*: Udorthents.				
Urban land.				
30B*, 30C*: Unison	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Braddock	Fair: 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
30D*:				
Unison	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
Braddock	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
31C*:				
Unison	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, thin layer.
Braddock	Fair: low strength, large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.
32B*, 32C*:				
Unison	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Urban land.				
32D*:				
Unison	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
Urban land.				
33* Weaver	Fair: area reclaim, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
34E*:				
Wurno	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones, thin layer.
Caneyville	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.

* 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]

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
1C*:						
Berks	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Depth to rock, slope, large stones.	Droughty, depth to rock, slope.
Clymer	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, large stones.	Large stones, slope.
2B*:						
Berks	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Depth to rock, large stones.	Droughty, depth to rock, large stones.
Groseclose	Moderate: depth to rock, slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Erodes easily, percs slowly.	Erodes easily, percs slowly.
2C*:						
Berks	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Depth to rock, slope, large stones.	Droughty, depth to rock, slope.
Groseclose	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
3D*, 3E*:						
Berks	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Depth to rock, slope, large stones.	Droughty, depth to rock, slope.
Lowell	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Rayne	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope.
4E*:						
Berks	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Depth to rock, slope, large stones.	Droughty, depth to rock, slope.
Rock outcrop.						
5D*, 6E*:						
Berks	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Depth to rock, slope, large stones.	Droughty, depth to rock, slope.
Weikert	Severe: depth to rock, slope, seepage.	Severe: seepage, thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, droughty.
7D*:						
Berks	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, depth to rock, large stones.	Depth to rock, large stones, slope.
Weikert	Severe: depth to rock, slope, seepage.	Severe: seepage, thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, droughty, depth to rock.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
8D*:						
Caneyville	Moderate: depth to rock.	Severe: thin layer, hard to pack.	Severe: no water.	Deep to water	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, erodes easily.	Slope, erodes easily, depth to rock.
Rock outcrop.						
8E*:						
Caneyville	Severe: slope.	Severe: thin layer, hard to pack.	Severe: no water.	Deep to water	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, erodes easily.	Slope, erodes easily, depth to rock.
Rock outcrop.						
9C*, 9D*:						
Carbo	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Chilhowie	Severe: slope.	Severe: seepage, hard to pack.	Severe: no water.	Deep to water	Slope, large stones, depth to rock.	Large stones, slope, droughty.
10* Craigsville	Severe: seepage.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Large stones, too sandy.	Large stones, droughty.
11B*:						
Duffield	Moderate: seepage, depth to rock, slope.	Severe: piping, hard to pack.	Severe: no water.	Deep to water	Favorable	Favorable.
Ernest	Moderate: slope.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Erodes easily, rooting depth, percs slowly.	Erodes easily, rooting depth.
11C*:						
Duffield	Severe: slope.	Severe: piping, hard to pack.	Severe: no water.	Deep to water	Slope	Slope.
Ernest	Severe: slope.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Slope, erodes easily, rooting depth.	Rooting depth, slope, erodes easily.
12B*:						
Frederick	Moderate: seepage, slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Favorable	Favorable.
Vertrees	Moderate: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
12C*:						
Frederick	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope	Slope.
Vertrees	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
13B*:						
Frederick	Moderate: seepage, slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Favorable	Favorable.
Vertrees	Moderate: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Favorable	Favorable.
13C*:						
Frederick	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope	Slope.
Vertrees	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope	Slope.
13D*:						
Frederick	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope	Slope.
Vertrees	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope	Slope.
14* French	Severe: seepage.	Severe: seepage, wetness.	Moderate: deep to water, cutbanks cave.	Flooding	Wetness	Wetness.
15B Glenelg	Moderate: seepage, depth to rock, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Favorable	Favorable.
15C, 15D Glenelg	Severe: slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope	Slope.
16B*:						
Groseclose	Moderate: depth to rock, slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Poplimento	Moderate: depth to rock, slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Favorable	Favorable.
16C*, 16D*, 16E*:						
Groseclose	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
Poplimento	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope	Slope.
17C*:						
Groseclose	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly.	Slope, percs slowly.
Poplimento	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope	Slope.
18B*:						
Groseclose	Moderate: depth to rock, slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Urban land.						
18C*, 18D*:						
Groseclose	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
18C*, 18D*: Urban land.						
19B---- Guernsey	Moderate: seepage, depth to rock, slope.	Severe: hard to pack.	Severe: no water.	Percs slowly, slope.	Erodes easily, wetness.	Erodes easily, percs slowly.
20B---- Hayter	Severe: seepage.	Severe: large stones.	Severe: no water.	Deep to water	Large stones---	Large stones.
21C*---- Hayter	Severe: seepage, slope.	Severe: large stones.	Severe: no water.	Deep to water	Slope, large stones.	Large stones, slope.
22C*---- Jefferson	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Slope----------	Slope.
23C*, 24D*-------- Jefferson	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Slope, large stones.	Slope, large stones.
25*: McGary----------	Slight---------	Severe: wetness.	Severe: slow refill.	Percs slowly, flooding.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily.
Purdy----------	Slight---------	Severe: piping, hard to pack, wetness.	Severe: slow refill.	Percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
26C*, 26D*, 26E*: Parker----------	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope----------	Slope, droughty.
Glenelg----------	Severe: slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope----------	Slope.
27E*: Parker----------	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope----------	Slope, droughty.
Rock outcrop.						
28*---------- Ross	Severe: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Favorable------	Favorable.
29*: Udorthents.						
Urban land.						
30B*: Unison----------	Moderate: seepage, slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Favorable------	Favorable.
Braddock---------	Moderate: seepage, slope.	Severe: hard to pack.	Moderate: deep to water, slow refill.	Deep to water	Favorable------	Favorable.
30C*, 30D*: Unison----------	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope----------	Slope.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
30C*, 30D*:						
Braddock	Severe: slope.	Severe: hard to pack.	Moderate: deep to water, slow refill.	Deep to water	Slope	Slope.
31C*:						
Unison	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Large stones, slope.	Large stones, slope.
Braddock	Severe: slope.	Severe: hard to pack.	Moderate: deep to water, slow refill, large stones.	Deep to water	Slope, large stones.	Large stones, slope.
32B*:						
Unison	Moderate: seepage, slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Favorable	Favorable.
Urban land.						
32C*, 32D*:						
Unison	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope	Slope.
Urban land.						
33*---------- Weaver	Moderate: seepage, depth to rock.	Severe: piping, wetness.	Moderate: slow refill, depth to rock.	Flooding	Wetness	Favorable.
34E*:						
Wurno	Severe: slope, seepage.	Severe: thin layer, piping.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock, droughty.
Caneyville	Severe: slope.	Severe: thin layer, hard to pack.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
1C*:											
Berks	0-5	Shaly silt loam	GM, ML, GC, SC	A-2, A-4	0-20	50-80	45-70	40-60	30-55	25-36	5-10
	5-22	Shaly loam, very shaly loam, shaly silt 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
	22-27	Shaly loam, very shaly loam, shaly silt loam.	GM, SM	A-1, A-2	0-40	35-65	25-55	20-40	15-35	24-38	2-10
	27	Weathered bedrock	---	---	---	---	---	---	---	---	---
Clymer	0-9	Loam	ML, SM	A-4	0-5	85-100	75-95	60-90	35-85	10-30	NP-9
	9-32	Sandy loam, channery loam, channery clay loam.	GM, SM, GC, ML	A-2, A-4	0-20	60-95	50-95	45-85	30-60	14-32	NP-9
	32-49	Channery loam, very channery loam, channery sandy loam.	GM, GP-GM, GC, SM	A-1, A-2, A-3, A-4	10-30	30-75	25-70	20-60	5-40	14-32	NP-9
	49	Weathered bedrock	---	---	---	---	---	---	---	---	---
2B*, 2C*:											
Berks	0-5	Shaly silt loam	GM, ML, GC, SC	A-2, A-4	0-20	50-80	45-70	40-60	30-55	25-36	5-10
	5-22	Shaly loam, very shaly loam, shaly silt 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
	22-29	Shaly loam, very shaly loam, shaly silt loam.	GM, SM	A-1, A-2	0-40	35-65	25-55	20-40	15-35	24-38	2-10
	29	Weathered bedrock	---	---	---	---	---	---	---	---	---
Groseclose	0-6	Silt loam	SM-SC, SC, CL-ML, CL	A-2, A-4, A-6	0	80-100	75-100	50-100	30-90	25-40	5-15
	6-72	Clay, silty clay loam, clay loam.	CH	A-7	0	80-100	75-100	70-100	50-95	50-95	30-60
3D*, 3E*:											
Berks	0-7	Shaly silt loam	GM, ML, GC, SC	A-2, A-4	0-20	50-80	45-70	40-60	30-55	25-36	5-10
	7-23	Shaly loam, very shaly loam, shaly silt 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
	23-33	Shaly loam, very shaly loam, shaly silt loam.	GM, SM	A-1, A-2	0-40	35-65	25-55	20-40	15-35	24-38	2-10
	33	Weathered bedrock	---	---	---	---	---	---	---	---	---
Lowell	0-7	Silt loam	ML, CL, CL-ML	A-4	0	100	95-100	90-100	85-100	22-32	4-10
	7-32	Silty clay, clay, silty clay loam.	CL, CH, MH	A-7, A-6	0	100	95-100	90-100	85-100	35-65	15-32
	32-50	Clay, silty clay	CH, MH, CL	A-7	0-20	95-100	90-100	85-100	75-100	45-75	20-40
	50	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rayne	0-7	Shaly loam	GM, ML, SM, CL	A-4	0-10	60-85	55-80	50-80	45-65	---	---
	7-24	Loam, shaly silty clay loam, channery clay loam.	GM, ML, GC, CL	A-4, A-6, A-2	0-15	60-95	55-85	40-85	30-60	20-40	2-15
	24-65	Channery sandy loam, shaly silt loam, very shaly silty clay loam.	SM, ML, GM, GP-GM	A-4, A-2, A-1	0-35	40-90	15-80	15-75	10-60	20-35	NP-10

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
4E*:											
Berks	0-5	Shaly silt loam	GM, ML, GC, SC	A-2, A-4	0-20	50-80	45-70	40-60	30-55	25-36	5-10
	5-22	Shaly loam, very shaly loam, shaly silt 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
	22-27	Shaly loam, very shaly loam, shaly silt loam.	GM, SM	A-1, A-2	0-40	35-65	25-55	20-40	15-35	24-38	2-10
	27	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rock outcrop.											
5D*, 6E*:											
Berks	0-5	Shaly silt loam	GM, ML, GC, SC	A-2, A-4	0-20	50-80	45-70	40-60	30-55	25-36	5-10
	5-22	Shaly loam, very shaly loam, shaly silt 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
	22-27	Shaly loam, very shaly loam, shaly silt loam.	GM, SM	A-1, A-2	0-40	35-65	25-55	20-40	15-35	24-38	2-10
	27	Weathered bedrock	---	---	---	---	---	---	---	---	---
Weikert	0-4	Shaly 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
	4-13	Weathered bedrock	GM, GP-GM	A-1, A-2	0-20	15-60	10-55	5-45	5-35	28-36	3-9
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
7D*:											
Berks	0-5	Very stony silt loam.	GM, SM, GC, SC	A-2, A-4	15-30	40-80	35-70	30-60	25-45	25-36	5-10
	5-22	Shaly loam, very shaly loam, shaly silt 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
	22-27	Shaly loam, very shaly loam, shaly silt loam.	GM, SM	A-1, A-2	0-40	35-65	25-55	20-40	15-35	24-38	2-10
	27	Weathered bedrock	---	---	---	---	---	---	---	---	---
Weikert	0-4	Very stony silt loam.	GM, ML, SM	A-1, A-2, A-4	3-15	35-70	35-70	25-65	20-55	30-40	4-10
	4-13	Shaly loam, very shaly silt loam, cherty loam.	GM, GP-GM	A-1, A-2	0-20	15-60	10-55	5-45	5-35	28-36	3-9
	13	Weathered bedrock	---	---	---	---	---	---	---	---	---
8D*, 8E*:											
Caneyville	0-8	Silt loam	ML, CL, CL-ML	A-4, A-6	0-3	90-100	85-100	75-100	60-95	20-35	2-12
	8-32	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-3	90-100	85-100	75-100	65-100	42-70	20-45
	32	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Opequon	0-4	Silt loam	ML, CL	A-4, A-6, A-7	0-5	85-100	80-100	75-100	60-90	25-50	5-20
	4-15	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
	15	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		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
9C*, 9D*:											
Carbo	0-7	Silty clay loam	CL, ML	A-6, A-7	0-2	95-100	90-100	85-95	75-85	30-50	10-15
	7-30	Clay	CH	A-7	0-5	95-100	85-100	80-95	70-90	60-80	35-55
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Chilhowie	0-2	Silty clay	CL, CH	A-7	0-10	90-100	85-100	80-100	70-95	40-60	20-40
	2-15	Clay, silty clay	CH	A-7	0-10	90-100	85-100	80-100	75-95	50-65	30-45
	15-30	Very 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
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
10*: Craigsville	0-8	Cobbly sandy loam	ML, SM, CL-ML, SC	A-2, A-4	25-50	80-95	75-95	50-80	25-60	<25	NP-10
	8-30	Gravelly sandy loam, cobbly loam, very gravelly sandy loam.	SM, GM, GC, SC	A-1, A-2, A-4	25-60	50-80	30-65	25-60	15-40	<25	NP-10
	30-60	Very gravelly loamy sand, very gravelly sandy loam, very cobbly sandy loam.	GC, GM, GP-GM, GM-GC	A-1, A-2	35-75	35-55	30-50	20-45	10-25	<25	NP-8
11B*, 11C*:											
Duffield	0-7	Silt loam	ML, CL, CL-ML	A-4, A-6, A-7	0	85-100	85-100	80-100	70-95	20-50	5-20
	7-37	Silty clay loam, silty clay, shaly loam.	ML, CL, MH	A-4, A-6, A-7	0-10	65-100	60-100	55-100	55-95	30-55	8-22
	37-64	Shaly silt loam, loam, clay.	MH, GM, SM, ML	A-7, A-5	0-20	65-100	50-95	45-90	40-90	40-60	9-29
Ernest	0-6	Silt loam	ML, CL, CL-ML	A-4, A-6	0-10	85-100	80-100	70-95	60-95	20-40	4-15
	6-26	Silty clay loam, silt loam, channery silt loam.	ML, CL, CL-ML	A-4, A-6, A-7	0-15	75-95	70-95	65-90	55-90	25-50	6-22
	26-50	Channery silt 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
	50-72	Channery silt loam, silt loam, silty clay loam.	ML, CL, GM, SC	A-4, A-6, A-7	0-20	70-95	45-95	45-90	40-90	25-50	6-22
12B*, 12C*:											
Frederick	0-10	Silt loam	ML, CL, CL-ML	A-4, A-6	0-5	80-100	75-100	75-95	75-90	<35	NP-15
	10-18	Silt loam, silty clay loam, cherty silty clay loam.	CL, CL-ML	A-6, A-7	0-5	80-100	60-100	55-100	50-95	20-45	5-25
	18-74	Silty clay, clay, cherty clay.	CH, MH-CH	A-7	0-5	80-100	65-100	65-100	65-100	50-70	25-40
Vertrees	0-10	Silt loam	ML, CL, CL-ML	A-4, A-6	0	85-100	80-100	70-95	55-90	20-40	3-20
	10-50	Clay, silty clay	CH, CL	A-7	0	85-100	75-100	70-95	65-95	41-70	25-45
	50-66	Clay, cherty clay	CH, GC, SC	A-7	0-10	60-100	60-100	55-90	45-80	50-70	25-45

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
13B*, 13C*, 13D*:											
Frederick-------	0-10	Cherty silt loam	GM, GC, ML	A-4, A-6	0-10	50-80	45-75	40-75	35-70	<35	NP-15
	10-22	Silty clay, clay, cherty clay.	CH, MH-CH	A-7	0-5	80-100	65-100	65-100	65-100	50-70	25-40
	22-74	Clay, silty clay	CH, MH	A-7	0-5	90-100	85-100	70-100	60-95	60-85	25-55
Vertrees--------	0-9	Cherty silt loam	ML, CL, GM, SM	A-4, A-6	0-10	60-85	50-75	45-75	36-65	20-40	3-20
	9-21	Clay, silty clay	CH, CL	A-7	0	85-100	75-100	70-95	65-95	41-70	25-45
	21-65	Clay, cherty clay	CH, GC, SC	A-7	0-10	60-100	60-100	55-90	45-80	50-70	25-45
14*-------------- French	0-4	Loam----------	CL-ML, SM-SC, CL	A-4, A-6	0-5	95-100	90-100	70-100	40-80	18-35	4-18
	4-30	Loam, clay loam	CL	A-4, A-7, A-6	0-8	95-100	90-100	65-100	50-90	20-45	7-25
	30-50	Sand and gravel	---	---	---	---	---	---	---	---	---
15B, 15C, 15D---- Glenelg	0-6	Loam----------	ML	A-4, A-6	0	90-100	85-100	75-95	50-80	32-40	7-12
	6-27	Channery silt loam, silty clay loam, loam.	GM, ML, SM	A-4, A-6, A-7	0-10	60-100	55-90	50-90	35-85	34-46	9-15
	27-72	Loam, sandy loam, channery loam.	GM, SM, ML	A-1, A-2, A-4	0-50	60-100	15-95	15-90	10-70	<40	NP-6
16B*, 16C*, 16D*, 16E*:											
Groseclose-----	0-10	Loam----------	SM-SC, SC, CL-ML, CL	A-2, A-4, A-6	0	80-100	75-100	50-100	30-90	25-40	5-15
	10-72	Clay, silty clay loam, clay loam.	CH	A-7	0	80-100	75-100	70-100	50-95	50-95	30-60
Poplimento-----	0-12	Silt loam--------	CL, CL-ML	A-4, A-6	0-5	80-100	75-100	65-100	50-90	25-40	5-15
	12-35	Silty clay loam, silty clay, clay.	CL, CH	A-7	0-5	80-100	75-100	65-95	60-90	45-65	30-60
	35-55	Shaly silty clay loam, shaly silty clay, clay.	CL, CH, GC	A-6, A-7	0-10	45-90	40-85	35-80	30-75	35-55	15-30
	55-72	Shaly silty clay, very shaly silty clay loam.	CL, CH, GC	A-2, A-6, A-7	0-15	30-80	20-70	20-65	15-60	35-55	15-30
17C*:											
Groseclose------	0-10	Cherty loam------	GM, GC, ML	A-4, A-6	0-10	50-80	45-75	40-75	35-70	<35	NP-15
	10-72	Clay, silty clay loam, clay loam.	CH	A-7	0	80-100	75-100	70-100	50-95	50-95	30-60
Poplimento------	0-12	Cherty loam------	GM, GC, SM, SC	A-2, A-4, A-6	0-10	50-85	40-75	35-60	30-50	<30	NP-15
	12-35	Silty clay loam, silty clay, clay.	CL, CH	A-7	0-5	80-100	75-100	65-95	60-90	45-65	30-60
	35-55	Shaly silty clay loam, shaly silty clay, clay.	CL, CH, GC	A-6, A-7	0-10	45-90	40-85	35-80	30-75	35-55	15-30
	55-72	Shaly silty clay, very shaly silty clay loam.	CL, CH, GC	A-2, A-6, A-7	0-15	30-80	20-70	20-65	15-60	35-55	15-30
18B*, 18C*, 18D*:											
Groseclose------	0-10	Loam----------	SM-SC, SC, CL-ML, CL	A-2, A-4, A-6	0	80-100	75-100	50-100	30-90	25-40	5-15
	10-72	Clay, silty clay loam, clay loam.	CH	A-7	0	80-100	75-100	70-100	50-95	50-95	30-60
Urban land.											

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
19B---------- Guernsey	0-10	Silt loam--------	ML, CL-ML, CL	A-4, A-6	0-2	90-100	80-100	75-95	70-90	25-40	4-14
	10-20	Silt loam, silty clay loam.	CL, CH, ML, MH	A-6, A-7	0-2	80-100	70-100	65-100	60-95	35-54	11-26
	20-53	Silty clay, clay, silty clay loam.	CH, CL, ML, MH	A-7	0-10	75-100	65-100	60-100	55-95	45-65	18-35
	53-83	Clay, silty clay, shaly silty clay loam.	CH, MH, ML, CL	A-7	2-20	70-100	60-90	55-85	55-80	40-70	15-35
20B---------- Hayter	0-14	Loam----------	SM, SC, ML, CL	A-4, A-6	0-20	90-100	75-100	55-85	36-70	<40	NP-15
	14-55	Clay loam, sandy clay loam, cobbly clay loam.	CL, SC	A-6, A-7, A-2	0-40	85-100	70-100	60-95	30-70	30-45	11-20
	55-74	Cobbly loam, very cobbly loam, very cobbly fine sandy loam.	SM, SC, ML, CL	A-4, A-6, A-2	25-80	75-100	55-95	45-90	30-60	<40	NP-15
21C*---------- Hayter	0-14	Cobbly loam------	SM, SC, ML, CL	A-4, A-6	20-40	85-100	70-95	55-85	36-70	<40	NP-15
	14-55	Clay loam, sandy clay loam, cobbly clay loam.	CL, SC	A-6, A-7, A-2	0-40	85-100	70-100	60-95	30-70	30-45	11-20
	55-74	Cobbly loam, very cobbly loam, very cobbly fine sandy loam.	SM, SC, ML, CL	A-4, A-6, A-2	25-80	75-100	55-95	45-90	30-60	<40	NP-15
22C*---------- Jefferson	0-8	Gravelly loam----	SM, SC, ML, CL	A-2, A-4	0-5	75-90	50-90	50-80	30-65	20-35	2-10
	8-31	Gravelly loam, gravelly clay loam, gravelly sandy clay loam.	SM, SC, ML, CL	A-4, A-2, A-6	0-5	75-90	50-90	50-80	30-70	15-35	2-15
	31-65	Gravelly loam, gravelly clay loam, gravelly sandy clay loam.	GM, SM, ML, GM-GC	A-2, A-4, A-1	0-5	55-75	25-75	20-70	10-60	20-35	2-10
23C*---------- Jefferson	0-8	Very stony loam	SM, GM, ML, CL	A-2, A-4	5-20	65-90	60-90	50-80	30-60	20-35	2-10
	8-31	Channery loam, gravelly clay loam, gravelly sandy clay loam.	SM, SC, ML, CL	A-2, A-4, A-6	5-20	75-90	70-90	50-80	30-70	15-35	2-15
	31-65	Very channery loam, gravelly clay loam, gravelly sandy clay loam.	GM, SM, ML, GM-GC	A-1, A-2, A-4	5-25	55-75	50-75	35-70	20-60	20-35	2-10
24D*---------- Jefferson	0-8	Extremely stony loam.	SM, GM, ML, CL	A-2, A-4	5-20	65-90	60-90	50-80	30-60	20-35	2-10
	8-31	Channery loam, gravelly clay loam, gravelly sandy clay loam.	SM, SC, ML, CL	A-2, A-4, A-6	5-20	75-90	70-90	50-80	30-70	15-35	2-15
	31-65	Very channery loam, gravelly clay loam, gravelly sandy clay loam.	GM, SM, ML, GM-GC	A-1, A-2, A-4	5-25	55-75	50-75	35-70	20-60	20-35	2-10

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
25*:											
McGary	0-9	Silt loam	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-90	25-36	5-15
	9-37	Silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-100	46-58	24-32
	37-66	Stratified silty clay loam to clay.	CL, CH	A-6, A-7	0	95-100	95-100	95-100	85-100	38-54	20-32
Purdy	0-11	Loam	ML, CL	A-4, A-6, A-7	0	95-100	90-100	90-100	90-100	25-50	4-20
	11-34	Silty clay, clay, clay loam.	CL, CH, MH	A-6, A-7	0	95-100	90-100	85-100	75-85	30-65	11-30
	34-66	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
26C*, 26D*, 26E*:											
Parker	0-4	Gravelly loam	GM, GP-GM, GC	A-1, A-2	0-5	40-60	25-50	15-45	10-30	15-25	3-10
	4-25	Very gravelly loam, cobbly sandy loam, gravelly sandy loam.	GM, GP-GM, GC	A-1, A-2	5-10	40-60	30-55	20-50	10-35	15-25	3-10
	25-70	Very gravelly sandy loam, very gravelly loam.	GP, GM, GC	A-1, A-2	5-15	20-40	5-30	3-25	2-20	15-25	3-10
Glenelg	0-6	Loam	ML	A-4, A-6	0	90-100	85-100	75-95	50-80	32-40	7-12
	6-27	Channery silt loam, silty clay loam, loam.	GM, ML, SM	A-4, A-6, A-7	0-10	60-100	55-90	50-90	35-85	34-46	9-15
	27-60	Loam, sandy loam, channery loam.	GM, SM, ML	A-1, A-2, A-4	0-50	60-100	15-95	15-90	10-70	<40	NP-6
	60	Weathered bedrock	---	---	---	---	---	---	---	---	---
27E*:											
Parker	0-4	Very stony sandy loam.	GM, GP-GM	A-1, A-2	5-10	40-60	25-50	15-45	10-30	10-20	2-7
	4-25	Very gravelly loam, cobbly sandy loam, very gravelly sandy loam.	GM, GP-GM, GC	A-1, A-2	5-10	40-60	30-55	20-50	10-35	15-25	2-10
	25-70	Very gravelly sandy loam, very gravelly loam.	GM, GP, GC	A-1, A-2	5-15	20-40	5-30	3-25	2-20	15-25	2-10
Rock outcrop.											
28*----- Ross	0-10	Loam	ML, CL-ML, CL	A-4, A-6	0	90-100	90-100	80-100	65-95	20-35	NP-12
	10-35	Loam, silt loam, silty clay loam.	ML, CL, CL-ML	A-6, A-4, A-7	0	90-100	85-100	70-100	55-95	22-45	3-20
	35-70	Stratified gravelly sandy loam to silt loam.	CL, ML, SM, GM	A-6, A-4, A-2, A-1	0-5	65-100	55-100	35-100	20-80	<30	NP-12
29*:											
Udorthents.											
Urban land.											

See footnotes at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
30B*, 30C*, 30D*:											
Unison	0-15	Loam	CL, ML, CL-ML	A-4, A-6	0-25	75-100	75-100	60-95	50-90	20-38	2-15
	15-58	Clay loam, clay, gravelly silty clay.	CL, CH	A-6, A-7	0-25	75-100	65-100	60-100	55-95	35-65	15-35
	58-72	Cobbly clay loam, silty clay loam, very gravelly loam.	CL-ML, CL, ML, GM-GC	A-1, A-2, A-6, A-7	10-45	30-90	25-85	20-85	15-80	20-50	5-20
Braddock	0-17	Loam	CL, SM, ML, SC	A-2, A-4	0-5	85-100	75-95	50-85	25-65	<30	NP-10
	17-59	Clay loam, gravelly sandy clay, clay.	MH, CH, CL, SC	A-7, A-2	0-15	70-95	70-90	45-90	20-80	42-60	15-33
	59-78	Loam, sandy clay loam, very cobbly clay.	SM, SC, ML, CL	A-2, A-4, A-6	0-75	75-95	60-90	55-85	30-70	25-50	8-28
31C*:											
Unison	0-15	Cobbly loam	ML, CL, CL-ML	A-4, A-6	25-45	80-90	75-90	60-85	55-80	20-35	2-15
	15-58	Clay, clay loam, gravelly silty clay.	CL, CH	A-6, A-7	0-25	75-100	65-100	60-100	55-95	35-65	15-35
	58-72	Cobbly clay loam, silty clay loam, very gravelly loam.	CL-ML, CL, ML, GM-GC	A-1, A-2, A-6, A-7	10-45	30-90	25-85	20-85	15-80	20-50	5-20
Braddock	0-17	Cobbly sandy loam	SM, SC, SM-SC	A-1, A-2	5-30	60-85	50-75	30-60	15-35	<30	NP-10
	17-59	Clay loam, gravelly sandy clay, cobbly clay.	MH, CH, CL, SC	A-7, A-2	0-30	60-95	50-90	40-90	35-80	42-60	15-30
	59-78	Loam, sandy clay loam, very cobbly clay.	SM, SC, ML, CL	A-2, A-4, A-6	0-25	75-95	60-90	55-85	30-70	25-50	8-30
32B*, 32C*, 32D*:											
Unison	0-15	Loam	CL, ML, CL-ML	A-4, A-6	0-25	75-100	75-100	60-95	50-90	20-38	2-15
	15-58	Clay loam, clay, gravelly silty clay.	CL, CH	A-6, A-7	0-25	75-100	65-100	60-100	55-95	35-65	15-35
	58-72	Cobbly clay loam, silty clay loam, very gravelly loam.	CL-ML, CL, ML, GM-GC	A-1, A-2, A-6, A-7	10-45	30-90	25-85	20-85	15-80	20-50	5-20
Urban land.											
33*----- Weaver	0-10	Silt loam	ML, CL, CL-ML	A-4, A-6	0	95-100	90-100	85-95	75-90	20-40	4-15
	10-60	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	75-100	70-100	55-95	51-90	25-40	6-15

See footnotes at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
34E*:											
Wurno	0-6	Shaly silt loam	GM, GC, ML, CL	A-2, A-4	0-5	60-100	50-95	30-95	20-85	<30	NP-10
	6-19	Silty clay loam, shaly silt loam, very shaly silt loam.	GM, GC, ML, CL	A-1, A-2, A-4, A-6	0-5	40-100	10-85	5-80	5-75	<30	NP-15
	19-33	Shaly silt loam, very shaly silt loam.	GM, GC, ML, CL	A-1, A-2, A-4	0-5	30-100	10-85	5-80	5-75	<30	NP-10
	33-38	Weathered bedrock	---	---	---	---	---	---	---	---	---
	38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Caneyville	0-8	Silt loam	ML, CL, CL-ML	A-4, A-6	0-3	90-100	85-100	75-100	60-95	20-35	2-12
	8-32	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-3	90-100	85-100	75-100	65-100	42-70	20-45
	32	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm³	In/hr	In/in	pH				Pct
1C*:										
Berks	0-5	5-23	1.20-1.50	0.6-6.0	0.08-0.12	3.6-6.5	Low	0.24	3	.5-3
	5-22	5-32	1.20-1.60	0.6-6.0	0.04-0.10	3.6-6.5	Low	0.17		
	22-27	5-20	1.20-1.60	2.0-6.0	0.04-0.10	3.6-6.5	Low	0.17		
	27	---	---	---	---	---				
Clymer	0-9	15-27	1.20-1.40	0.6-2.0	0.10-0.16	3.6-5.5	Low	0.24	4	1-4
	9-32	18-30	1.20-1.50	0.6-2.0	0.08-0.14	3.6-5.5	Low	0.15		
	32-49	15-27	1.20-1.40	0.6-2.0	0.04-0.08	3.6-5.5	Low	0.15		
	49	---	---	---	---	---				
2B*, 2C*:										
Berks	0-5	5-23	1.20-1.50	0.6-6.0	0.08-0.12	3.6-6.5	Low	0.24	3	.5-3
	5-22	5-32	1.20-1.60	0.6-6.0	0.04-0.10	3.6-6.5	Low	0.17		
	22-29	5-20	1.20-1.60	2.0-6.0	0.04-0.10	3.6-6.5	Low	0.17		
	29	---	---	---	---	---				
Groseclose	0-6	7-27	1.25-1.55	2.0-6.0	0.11-0.20	3.6-5.5	Low	0.43	4	1-3
	6-72	35-60	1.35-1.60	0.06-0.2	0.10-0.17	3.6-5.5	High	0.24		
3D*, 3E*:										
Berks	0-7	5-23	1.20-1.50	0.6-6.0	0.08-0.12	3.6-6.5	Low	0.24	3	.5-3
	7-23	5-32	1.20-1.60	0.6-6.0	0.04-0.10	3.6-6.5	Low	0.17		
	23-33	5-20	1.20-1.60	2.0-6.0	0.04-0.10	3.6-6.5	Low	0.17		
	33	---	---	---	---	---				
Lowell	0-7	12-27	1.20-1.40	0.6-2.0	0.18-0.23	4.5-6.5	Low	0.37	3	1-4
	7-32	35-60	1.30-1.60	0.2-2.0	0.13-0.19	4.5-6.5	Moderate	0.28		
	32-50	40-60	1.50-1.70	0.2-0.6	0.12-0.17	5.1-7.8	Moderate	0.28		
	50	---	---	---	---	---				
Rayne	0-7	10-27	1.20-1.40	0.6-2.0	0.12-0.16	4.5-5.5	Low	0.20	3	1-3
	7-24	18-35	1.40-1.60	0.6-2.0	0.12-0.16	4.5-5.5	Low	0.20		
	24-65	10-30	1.40-1.60	0.6-2.0	0.10-0.16	4.5-5.5	Low	0.20		
4E*:										
Berks	0-5	5-23	1.20-1.50	0.6-6.0	0.08-0.12	3.6-6.5	Low	0.24	3	.5-3
	5-22	5-32	1.20-1.60	0.6-6.0	0.04-0.10	3.6-6.5	Low	0.17		
	22-27	5-20	1.20-1.60	2.0-6.0	0.04-0.10	3.6-6.5	Low	0.17		
	27	---	---	---	---	---				
Rock outcrop.										
5D*, 6E*:										
Berks	0-5	5-23	1.20-1.50	0.6-6.0	0.08-0.12	3.6-6.5	Low	0.24	3	.5-3
	5-22	5-32	1.20-1.60	0.6-6.0	0.04-0.10	3.6-6.5	Low	0.17		
	22-27	5-20	1.20-1.60	2.0-6.0	0.04-0.10	3.6-6.5	Low	0.17		
	27	---	---	---	---	---				
5D*, 6E*:										
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
	4-13	15-27	1.20-1.40	2.0-6.0	0.04-0.08	4.5-6.0	Low	0.28		
	13	---	---	---	---	---				
7D*:										
Berks	0-5	5-23	1.20-1.50	0.6-6.0	0.08-0.12	3.6-6.5	Low	0.17	3	5-3
	5-22	5-32	1.20-1.60	0.6-6.0	0.04-0.10	3.6-6.5	Low	0.17		
	22-27	5-20	1.20-1.60	2.0-6.0	0.04-0.10	3.6-6.5	Low	0.17		
	27	---	---	---	---	---				
Weikert	0-4	15-27	1.20-1.40	2.0-6.0	0.08-0.14	4.5-5.5	Low	0.28	2	1-3
	4-13	15-27	1.20-1.40	2.0-6.0	0.04-0.08	4.5-5.5	Low	0.28		
	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		Organic matter
								K	T	
	In	Pct	G/cm^3	In/hr	In/in	pH				Pct
8D*, 8E*:										
Caneyville------	0-8	10-25	1.20-1.40	0.6-2.0	0.15-0.22	4.5-7.3	Low----------	0.43	3	2-4
	8-32	36-60	1.35-1.60	0.2-0.6	0.12-0.18	4.5-7.3	Moderate-----	0.28		
	32	---	---	---	---	---	----------	----		
Opequon---------	0-4	18-27	1.20-1.50	0.6-2.0	0.16-0.21	5.6-7.8	Moderate-----	0.43	2	2-4
	4-15	35-65	1.40-1.70	0.2-2.0	0.12-0.16	5.6-7.8	High---------	0.28		
	15	---	---	---	---	---	----------	----		
Rock outcrop.										
9C*, 9D*:										
Carbo-----------	0-7	20-40	1.20-1.40	0.6-2.0	0.16-0.19	4.5-7.3	Moderate-----	0.37	2	.5-3
	7-30	60-80	1.30-1.50	0.06-0.2	0.10-0.14	5.6-7.8	High---------	0.24		
	30	---	---	---	---	---	----------	----		
Chilhowie-------	0-2	40-55	1.30-1.50	0.2-0.6	0.12-0.15	6.1-7.8	Moderate-----	0.28	2	.5-1
	2-15	60-80	1.30-1.50	0.06-0.2	0.10-0.15	6.1-7.8	High---------	0.24		
	15-30	55-80	1.20-1.50	0.06-0.2	0.02-0.05	6.6-8.4	High---------	0.24		
	30	---	---	---	---	---	----------	----		
10*---------------	0-8	5-15	1.05-1.20	2.0-20	0.07-0.15	4.5-5.5	Low----------	0.17	5	1-5
Craigsville	8-30	5-15	1.30-1.60	2.0-20	0.06-0.15	4.5-5.5	Low----------	0.17		
	30-60	5-10	1.35-1.55	>6.0	0.04-0.09	4.5-5.5	Low----------	0.17		
11B*, 11C*:										
Duffield--------	0-7	15-30	1.10-1.40	0.6-2.0	0.16-0.22	5.1-7.3	Low----------	0.32	4	1-4
	7-37	20-42	1.30-1.60	0.6-2.0	0.14-0.20	5.1-7.3	Moderate-----	0.28		
	37-64	18-41	1.30-1.60	0.6-2.0	0.14-0.20	5.1-6.5	Moderate-----	0.28		
Ernest----------	0-6	15-20	1.20-1.40	0.6-2.0	0.14-0.20	4.5-5.5	Low----------	0.43	3	2-4
	6-26	20-35	1.30-1.50	0.6-2.0	0.12-0.16	4.5-5.5	Moderate-----	0.28		
	26-50	18-30	1.40-1.70	0.06-0.6	0.08-0.12	4.5-5.5	Low----------	0.28		
	50-72	20-35	1.30-1.60	0.06-0.6	0.08-0.12	4.5-5.5	Moderate-----	0.28		
12B*, 12C*:										
Frederick-------	0-10	13-23	1.25-1.50	2.0-6.0	0.15-0.24	4.5-6.0	Low----------	0.32	4	1-3
	10-18	20-40	1.40-1.65	0.6-2.0	0.12-0.18	4.5-6.0	Moderate-----	0.24		
	18-74	40-75	1.40-1.65	0.6-2.0	0.09-0.18	4.5-5.5	High---------	0.24		
Vertrees--------	0-10	15-27	1.20-1.40	0.6-2.0	0.18-0.22	4.5-7.3	Low----------	0.37	4	2-4
	10-50	40-60	1.40-1.65	0.2-0.6	0.14-0.18	4.5-6.0	Moderate-----	0.28		
	50-66	40-60	1.45-1.65	0.2-0.6	0.10-0.16	4.5-7.3	Moderate-----	0.28		
13B*, 13C*, 13D*:										
Frederick-------	0-10	13-35	1.25-1.55	2.0-6.0	0.12-0.20	4.5-6.0	Low----------	0.28	4	1-3
	10-22	40-75	1.40-1.65	0.6-2.0	0.10-0.18	4.5-6.0	Moderate-----	0.24		
	22-74	50-85	1.40-1.65	0.6-2.0	0.10-0.18	4.5-5.5	High---------	0.24		
Vertrees--------	0-9	15-27	1.20-1.40	0.6-2.0	0.15-0.19	4.5-7.3	Low----------	0.32	4	2-4
	9-21	40-60	1.40-1.65	0.2-0.6	0.14-0.18	4.5-6.0	Moderate-----	0.28		
	21-65	40-60	1.45-1.65	0.2-0.6	0.10-0.16	4.5-7.3	Moderate-----	0.28		
14*---------------	0-4	8-27	1.4-1.6	0.6-2.0	0.15-0.20	5.1-6.5	Low----------	0.28	5	1-4
French	4-30	18-35	1.3-1.5	0.6-2.0	0.15-0.20	5.1-6.5	Low----------	0.28		
	30-50	---	---	---	---	---	----------	----		
15B, 15C, 15D----	0-6	15-25	1.20-1.40	0.6-2.0	0.14-0.24	4.5-5.5	Low----------	0.32	3	1-3
Glenelg	6-27	20-32	1.40-1.60	0.6-2.0	0.10-0.20	4.5-5.5	Low----------	0.28		
	27-72	5-20	1.40-1.60	0.6-2.0	0.10-0.19	4.5-5.5	Low----------	0.28		
16B*, 16C*, 16D*, 16E*:										
Groseclose------	0-10	7-27	1.25-1.55	2.0-6.0	0.11-0.20	3.6-5.5	Low----------	0.43	4	1-3
	10-72	35-60	1.35-1.60	0.06-0.2	0.10-0.17	3.6-5.5	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		Organic matter
								K	T	
	In	Pct	G/cm^3	In/hr	In/in	pH				Pct
16B*, 16C*, 16D*, 16E*:										
Poplimento-----	0-12	17-27	1.20-1.35	0.6-2.0	0.15-0.22	4.5-6.0	Low----------	0.32	4	.5-2
	12-35	35-60	1.30-1.60	0.2-0.6	0.10-0.14	4.5-6.0	High----------	0.24		
	35-55	30-55	1.30-1.55	0.2-0.6	0.07-0.14	5.1-6.5	High----------	0.24		
	55-72	27-50	1.25-1.50	0.2-0.6	0.05-0.12	5.1-6.5	Moderate-----	0.24		
17C*:										
Groseclose------	0-10	13-35	1.25-1.55	2.0-6.0	0.12-0.20	3.6-5.5	Low----------	0.28	4	1-3
	10-72	35-60	1.35-1.60	0.06-0.2	0.10-0.17	3.6-5.5	High----------	0.24		
Poplimento------	0-12	10-27	1.20-1.35	0.6-2.0	0.08-0.14	4.5-6.0	Low----------	0.24	4	.5-2
	12-35	35-60	1.30-1.60	0.2-0.6	0.10-0.14	4.5-6.0	High----------	0.24		
	35-55	30-55	1.30-1.55	0.2-0.6	0.07-0.14	5.1-6.5	High----------	0.24		
	55-72	27-50	1.25-1.50	0.2-0.6	0.05-0.12	5.1-6.5	Moderate-----	0.24		
18B*, 18C*, 18D*:										
Groseclose------	0-10	7-27	1.25-1.55	2.0-6.0	0.11-0.20	3.6-5.5	Low----------	0.43	4	1-3
	10-72	35-60	1.35-1.60	0.06-0.2	0.10-0.17	3.6-5.5	High----------	0.24		
Urban land.										
19B----------	0-10	13-27	1.30-1.50	0.6-2.0	0.19-0.24	4.5-6.0	Low----------	0.43	3	1-3
Guernsey	10-20	22-38	1.35-1.55	0.2-2.0	0.15-0.21	4.5-6.0	Moderate-----	0.43		
	20-53	35-60	1.45-1.70	0.06-0.6	0.10-0.15	5.1-7.8	Moderate-----	0.32		
	53-83	35-60	1.50-1.70	0.06-0.6	0.06-0.10	5.1-7.8	Moderate-----	0.32		
20B----------	0-14	10-25	1.25-1.55	2.0-6.0	0.10-0.16	5.1-6.5	Low----------	0.28	4	1-3
Hayter	14-55	20-35	1.30-1.60	2.0-6.0	0.11-0.19	5.1-6.5	Moderate-----	0.28		
	55-74	15-27	1.30-1.60	2.0-6.0	0.06-0.10	5.1-6.5	Low----------	0.17		
21C*----------	0-14	10-25	1.25-1.55	2.0-6.0	0.08-0.14	5.1-6.5	Low----------	0.20	4	1-3
Hayter	14-55	20-35	1.30-1.60	2.0-6.0	0.11-0.19	5.1-6.5	Moderate-----	0.28		
	55-74	15-27	1.30-1.60	2.0-6.0	0.06-0.10	5.1-6.5	Low----------	0.17		
22C*, 23C*, 24D*-	0-8	10-25	1.30-1.50	2.0-6.0	0.10-0.16	4.5-5.5	Low----------	0.28	4	.5-3
Jefferson	8-31	18-34	1.30-1.65	2.0-6.0	0.10-0.16	4.5-5.5	Low----------	0.28		
	31-65	15-30	1.30-1.65	2.0-6.0	0.08-0.14	4.5-5.5	Low----------	0.17		
25*:										
McGary----------	0-9	22-27	1.35-1.50	0.6-2.0	0.22-0.24	6.6-7.3	Low----------	0.43	3	1-4
	9-37	35-50	1.60-1.75	<0.2	0.11-0.13	5.6-7.8	High----------	0.32		
	37-66	35-50	1.60-1.75	<0.2	0.14-0.16	7.9-8.4	High----------	0.32		
Purdy----------	0-11	18-35	1.30-1.50	0.2-0.6	0.18-0.24	3.6-5.5	Moderate-----	0.43	3	2-4
	11-34	35-50	1.30-1.60	<0.2	0.12-0.18	3.6-5.5	Moderate-----	0.28		
	34-66	35-50	1.30-1.60	<0.2	0.10-0.16	3.6-5.5	Moderate-----	0.28		
26C*, 26D*, 26E*:										
Parker----------	0-4	3-10	1.30-1.60	2.0-6.0	0.10-0.14	4.5-5.5	Low----------	0.17	5	.5-2
	4-25	7-20	1.30-1.60	2.0-6.0	0.10-0.14	4.5-5.5	Low----------	0.20		
	25-70	7-20	1.30-1.60	6.0-20	0.04-0.08	4.5-5.5	Low----------	0.20		
Glenelg---------	0-6	15-25	1.20-1.40	0.6-2.0	0.14-0.24	4.5-5.5	Low----------	0.32	3	1-3
	6-27	20-32	1.40-1.60	0.6-2.0	0.10-0.20	4.5-5.5	Low----------	0.28		
	27-60	5-20	1.40-1.60	0.6-2.0	0.10-0.19	4.5-5.5	Low----------	0.28		
	60	---	---	---	---	---	----------	----		
27E*:										
Parker----------	0-4	3-10	1.30-1.60	2.0-6.0	0.06-0.14	4.5-5.5	Low----------	0.17	5	.5-2
	4-25	7-20	1.30-1.60	2.0-6.0	0.10-0.14	4.5-5.5	Low----------	0.20		
	25-70	7-20	1.30-1.60	6.0-20	0.04-0.08	4.5-5.5	Low----------	0.20		
Rock outcrop.										
28*----------	0-10	15-27	1.20-1.45	0.6-2.0	0.19-0.24	6.1-7.8	Low----------	0.32	5	3-5
Ross	10-35	18-32	1.20-1.50	0.6-2.0	0.16-0.22	6.1-8.4	Low----------	0.32		
	35-70	5-25	1.35-1.60	0.6-6.0	0.05-0.18	6.1-8.4	Low----------	0.32		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm³	In/hr	In/in	pH				Pct
29*:										
Udorthents.										
Urban land.										
30B*, 30C*, 30D*:										
Unison----------	0-15	10-25	1.35-1.65	0.6-6.0	0.14-0.20	4.5-6.0	Low----------	0.32	4	1-3
	15-58	30-70	1.30-1.60	0.6-2.0	0.12-0.18	4.5-6.0	Moderate-----	0.24		
	58-72	30-50	1.30-1.60	0.6-6.0	0.08-0.16	4.5-6.0	Moderate-----	0.28		
Braddock--------	0-17	10-25	1.20-1.50	0.6-6.0	0.14-0.19	4.5-5.5	Low----------	0.32	4	1-2
	17-59	35-55	1.20-1.50	0.6-2.0	0.14-0.19	4.5-5.5	Moderate-----	0.24		
	59-78	25-45	1.20-1.50	0.6-6.0	0.06-0.12	4.5-5.5	Low----------	0.24		
31C*:										
Unison----------	0-15	10-25	1.35-1.65	0.6-6.0	0.11-0.17	4.5-6.0	Low----------	0.24	4	1-3
	15-58	30-70	1.30-1.60	0.6-2.0	0.12-0.18	4.5-6.0	Moderate-----	0.24		
	58-72	30-50	1.30-1.60	0.6-6.0	0.08-0.16	4.5-6.0	Moderate-----	0.24		
Braddock--------	0-17	10-25	1.20-1.50	0.6-6.0	0.12-0.18	4.5-5.5	Low----------	0.24	4	.5-3
	17-59	35-55	1.20-1.50	0.6-6.0	0.14-0.19	4.5-5.5	Moderate-----	0.24		
	59-78	25-40	1.20-1.50	0.6-6.0	0.06-0.12	4.5-5.5	Low----------	0.24		
32B*, 32C*, 32D*:										
Unison----------	0-15	10-25	1.35-1.65	0.6-6.0	0.14-0.20	4.5-6.0	Low----------	0.32	4	1-3
	15-58	30-70	1.30-1.60	0.6-2.0	0.12-0.18	4.5-6.0	Moderate-----	0.24		
	58-72	30-50	1.30-1.60	0.6-6.0	0.08-0.16	4.5-6.0	Moderate-----	0.28		
Urban land.										
33*----------	0-10	18-35	1.35-1.50	0.6-2.0	0.15-0.20	6.6-8.4	Low----------	0.32	5	1-3
Weaver	10-60	20-35	1.35-1.50	0.6-2.0	0.15-0.20	7.4-8.4	Low----------	0.32		
34E*:										
Wurno----------	0-6	10-27	1.20-1.50	0.6-2.0	0.07-0.20	6.1-7.8	Low----------	0.28	2	1-2
	6-19	20-35	1.30-1.60	0.6-2.0	0.03-0.20	6.1-7.8	Low----------	0.17		
	19-33	10-27	1.30-1.60	0.6-2.0	0.03-0.14	6.6-7.8	Low----------	0.17		
	33-38	---	---	---	---	---	----------	----		
	38	---	---	---	---	---	----------	----		
Caneyville------	0-8	10-25	1.20-1.40	0.6-2.0	0.15-0.22	4.5-7.3	Low----------	0.43	3	2-4
	8-32	36-60	1.35-1.60	0.2-0.6	0.12-0.18	4.5-7.3	Moderate-----	0.28		
	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 the 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				
1C*:												
Berks	C	None	---	---	>6.0	---	---	20-40	Soft	Low	Low	High.
Clymer	B	None	---	---	>6.0	---	---	40-60	Hard	Moderate	Low	High.
2B*, 2C*:												
Berks	C	None	---	---	>6.0	---	---	20-40	Soft	Low	Low	High.
Groseclose	C	None	---	---	>6.0	---	---	>48	Hard	Moderate	High	High.
3D*, 3E*:												
Berks	C	None	---	---	>6.0	---	---	20-40	Soft	Low	Low	High.
Lowell	C	None	---	---	>6.0	---	---	>40	Hard	Moderate	High	Moderate.
Rayne	B	None	---	---	>6.0	---	---	>40	Soft	Moderate	Low	High.
4E*:												
Berks	C	None	---	---	>6.0	---	---	20-40	Soft	Low	Low	High.
Rock outcrop.												
5D*, 6E*, 7D*:												
Berks	C	None	---	---	>6.0	---	---	20-40	Soft	Low	Low	High.
Weikert	C/D	None	---	---	>6.0	---	---	10-20	Soft	Moderate	Moderate	Moderate.
8D*, 8E*:												
Caneyville	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	High	Moderate.
Opequon	C	None	---	---	>6.0	---	---	12-20	Hard	Moderate	Moderate	Low.
Rock outcrop.												
9C*, 9D*:												
Carbo	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	High	Low.
Chilhowie	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	High	Low.
10* Craigsville	B	Frequent	Very brief	Nov-May	>6.0	---	---	>60	---	Moderate	Low	Moderate.
11B*, 11C*:												
Duffield	B	None	---	---	>6.0	---	---	>48	Soft	Moderate	Moderate	Moderate.
Ernest	C	None	---	---	1.5-3.0	Perched	Dec-Apr	>60	---	Moderate	Moderate	Moderate.
12B*, 12C*, 13B*, 13C*, 13D*:												
Frederick	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	High.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
12B*, 12C*, 13B*, 13C*, 13D*: Vertrees	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
14* French	C	Frequent	Very brief	Dec-Apr	1.0-2.5	Apparent	Dec-May	>60	---	Low	Moderate	Moderate.
15B, 15C, 15D Glenelg	B	None	---	---	>6.0	---	---	>48	Soft	Moderate	Low	High.
16B*, 16C*, 16D*, 16E*: Groseclose	C	None	---	---	>6.0	---	---	>48	Hard	Moderate	High	High.
Poplimento	C	None	---	---	>6.0	---	---	>48	Hard	Moderate	High	Moderate.
17C*: Groseclose	C	None	---	---	6.0	---	---	48	Hard	Moderate	High	High.
Poplimento	C	None	---	---	>6.0	---	---	>48	Hard	Moderate	High	Moderate.
18B*, 18C*, 18D*: Groseclose	C	None	---	---	>6.0	---	---	>48	Hard	Moderate	High	High.
Urban land.												
19B Guernsey	C	None	---	---	2.0-3.5	Perched	Jan-Apr	>50	Soft	Moderate	High	Moderate.
20B, 21C* Hayter	B	None	---	---	>6.0	---	---	>48	Hard	Moderate	Moderate	Moderate.
22C* Jefferson	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	High.
23C*, 24D* Jefferson	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	High.
25*: McGary	C	Occasional	Brief	Jan-May	1.0-3.0	Apparent	Jan-Apr	>60	---	Moderate	High	Low.
Purdy	D	None	---	---	+1-1.0	Apparent	Nov-Jun	>60	---	High	High	High.
26C*, 26D*, 26E*: Parker	B	None	---	---	>6.0	---	---	>48	Hard	Moderate	Low	High.
Glenelg	B	None	---	---	>6.0	---	---	>48	Soft	Moderate	Low	High.
27E*: Parker	B	None	---	---	>6.0	---	---	>48	Hard	Moderate	Low	High.
Rock outcrop.												

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				
28*---------- Ross	B	Occasional	Very brief	Nov-Jun	4.0-6.0	Apparent	Feb-Apr	>60	---	Moderate	Low------	Low.
29*: Udorthents.												
Urban land.												
30B*, 30C*, 30D*, 31C*: Unison----------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
Braddock--------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
32B*, 32C*, 32D*: Unison----------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
Urban land.												
33*---------- Weaver	C	Occasional	Very brief	Dec-Mar	1.5-2.5	Apparent	Dec-Mar	40-60	Hard	Moderate	Moderate	Low.
34E*: Wurno----------	C	None--------	---	---	>6.0	---	---	20-40	Soft	Moderate	Low------	Low.
Caneyville-------	C	None--------	---	---	>6.0	---	---	20-40	Hard	Moderate	High-----	Moderate.

* 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
Berks	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
Braddock	Clayey, mixed, mesic Typic Hapludults
Caneyville	Fine, mixed, mesic Typic Hapludalfs
Carbo	Very-fine, mixed, mesic Typic Hapludalfs
Chilhowie	Very-fine, mixed, mesic Typic Hapludalfs
Clymer	Fine-loamy, mixed, mesic Typic Hapludults
Craigsville	Loamy-skeletal, mixed, mesic Fluventic Dystrochrepts
Duffield	Fine-loamy, mixed, mesic Ultic Hapludalfs
Ernest	Fine-loamy, mixed, mesic Aquic Fragiudults
Frederick	Clayey, mixed, mesic Typic Paleudults
French	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Fluvaquentic Dystrochrepts
Glenelg	Fine-loamy, mixed, mesic Typic Hapludults
Groseclose	Clayey, mixed, mesic Typic Hapludults
Guernsey	Fine, mixed, mesic Aquic Hapludalfs
Hayter	Fine-loamy, mixed, mesic Ultic Hapludalfs
Jefferson	Fine-loamy, siliceous, mesic Typic Hapludults
Lowell	Fine, mixed, mesic Typic Hapludalfs
McGary	Fine, mixed, mesic Aeric Ochraqualfs
Opequon	Clayey, mixed, mesic Lithic Hapludalfs
Parker	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
Poplimento	Fine, mixed, mesic Ultic Hapludalfs
Purdy	Clayey, mixed, mesic Typic Ochraquults
Rayne	Fine-loamy, mixed, mesic Typic Hapludults
Ross	Fine-loamy, mixed, mesic Cumulic Hapludolls
Udorthents	Udorthents
Unison	Clayey, mixed, mesic Typic Hapludults
Vertrees	Fine, mixed, mesic Typic Paleudalfs
Weaver	Fine-loamy, mixed, mesic Fluvaquentic Eutrochrepts
Weikert	Loamy-skeletal, mixed, mesic Lithic Dystrochrepts
Wurno	Loamy-skeletal, mixed, mesic Dystric Eutrochrepts

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If you wish to file a Civil Rights program complaint of discrimination, complete the USDA Program Discrimination Complaint Form, found online at http://www.ascr.usda.gov/complaint_filing_cust.html or at any USDA office, or call (866) 632-9992 to request the form. You may also write a letter containing all of the information requested in the form. Send your completed complaint form or letter by mail to U.S. Department of Agriculture; Director, Office of Adjudication; 1400 Independence Avenue, S.W.; Washington, D.C. 20250-9419; by fax to (202) 690-7442; or by email to program.intake@usda.gov.

Persons with Disabilities

If you are deaf, are hard of hearing, or have speech disabilities and you wish to file either an EEO or program complaint, please contact USDA through the Federal Relay Service at (800) 877-8339 or (800) 845-6136 (in Spanish).

If you have other disabilities and wish to file a program complaint, please see the contact information above. If you require alternative means of communication for

program information (e.g., Braille, large print, audiotape, etc.), please contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

Supplemental Nutrition Assistance Program

For additional information dealing with Supplemental Nutrition Assistance Program (SNAP) issues, call either the USDA SNAP Hotline Number at (800) 221-5689, which is also in Spanish, or the State Information/Hotline Numbers (http://directives.sc.egov.usda.gov/33085.wba).

All Other Inquiries

For information not pertaining to civil rights, please refer to the listing of the USDA Agencies and Offices (http://directives.sc.egov.usda.gov/33086.wba).