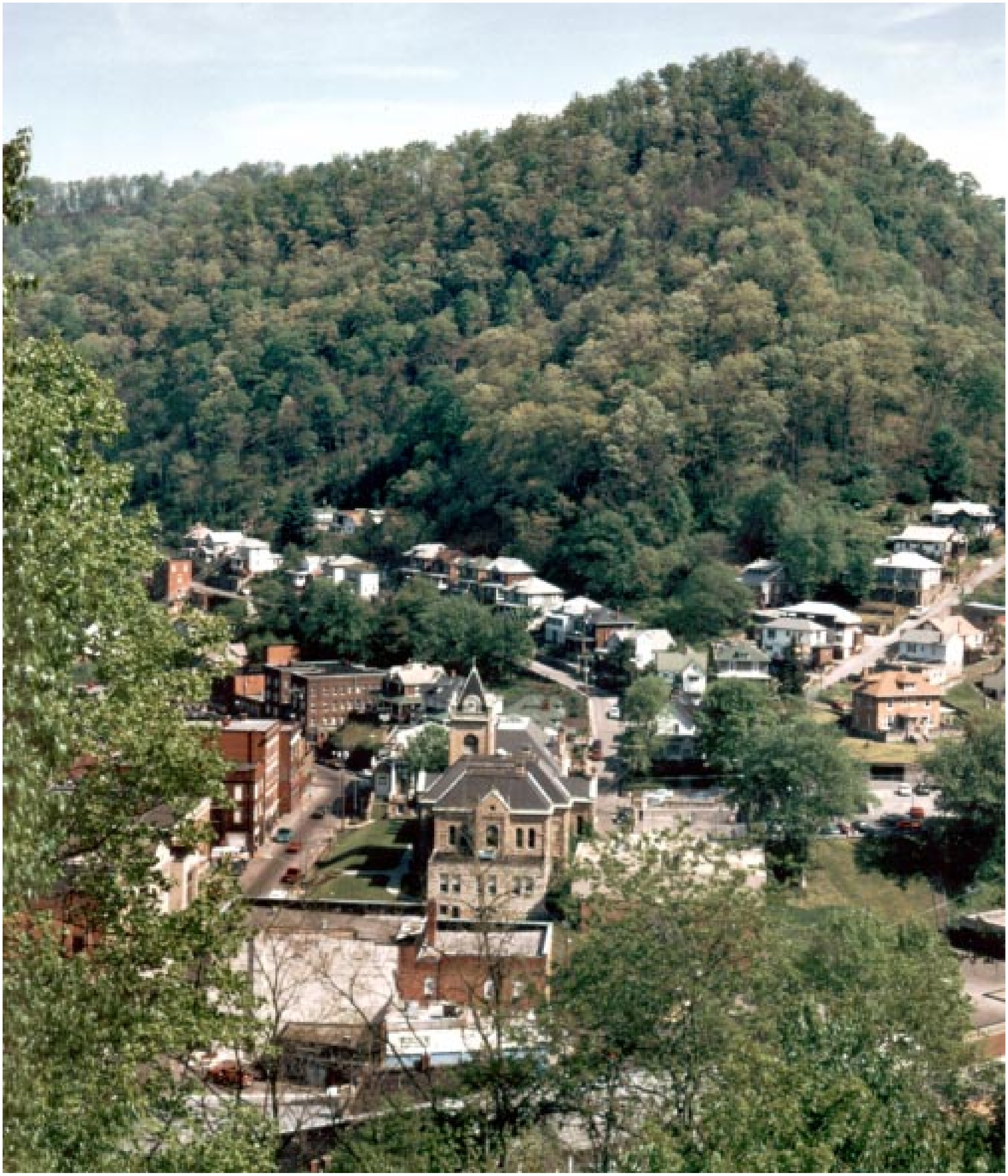
United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with West Virginia Agricultural and Forestry Experiment Station

Soil Survey of McDowell County, West Virginia



How to Use This Soil Survey

General Soil Map

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

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

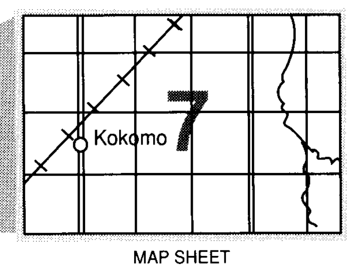
Detailed Soil Maps

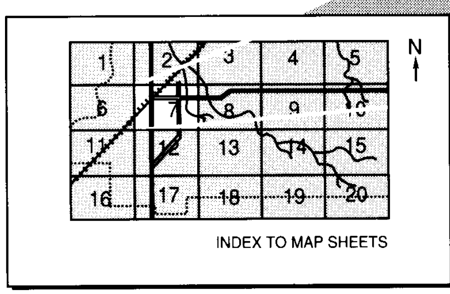
The detailed soil maps can be useful in planning the use and management of small areas.

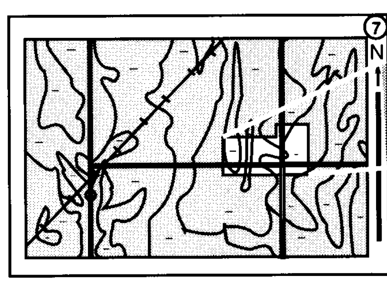
To find information about your area of interest, locate that area on the **Index to Map Sheets**. Note the number of the map sheet and turn to that sheet.

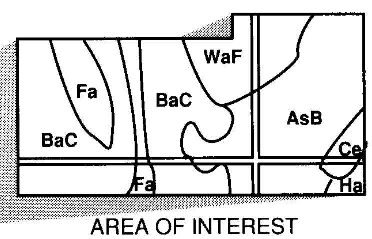
Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Contents**, which lists the map units by symbol and name and shows the page where each map unit is described.

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









This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1993. Soil names and descriptions were approved in 1994. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1993. This soil survey was made cooperatively by the Natural Resources Conservation Service and the West Virginia Agricultural and Forestry Experiment Station. It is part of the technical assistance furnished to the Southern Soil Conservation District.

Cover: A view of the city of Welch, located in an area of Urban land-Chavies complex. Pineville-Berks association, very steep, extremely stony, is on the surrounding slopes.

Additional information about the Nation's natural resources is available on the Natural Resources Conservation Service home page on the World Wide Web. The address is http://www.nrcs.usda.gov (click on "Technical Resources").

Contents

Issued 2004

Foreword

This soil survey contains information that affects land use planning in McDowell County. It contains predictions of soil behavior for selected land uses. The survey also highlights soil limitations, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

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

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

Great differences in soil properties can occur within short distances. Some soils are very steep or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Steep or rapidly permeable soils are poorly suited to use as septic tank absorption fields. Soils subject to flooding are poorly suited for use as homesites.

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

Lillian V. Woods
State Conservationist
Natural Resources Conservation Service

Soil Survey of
McDowell County, West Virginia

By Anthony B. Jenkins, Natural Resources Conservation Service

Fieldwork by Frank A. Doonan, Anthony B. Jenkins, and Barrie L. Wolf,
Natural Resources Conservation Service

United States Department of Agriculture, Natural Resources Conservation Service,
in cooperation with
West Virginia Agricultural and Forestry Experiment Station

McDowell County is located in the south-central part of West Virginia and is the southernmost county in the state (fig. 1). The county has a total area of 535 square miles, or 324,400 acres.

Welch is the county seat. It is located at the confluence of the Tug River and Elkhorn Creek.

McDowell County was created in 1858 from part of Tazewell County, Virginia. It was named in honor of James McDowell, Governor of Virginia in the mid-19th century. In 1990, the population of McDowell County was 35,233 *(5)*.

This soil survey updates information on the county as published in the survey of McDowell and Wyoming Counties in 1914 *(8)*. It provides additional information and has larger maps, which show the soils in greater detail.

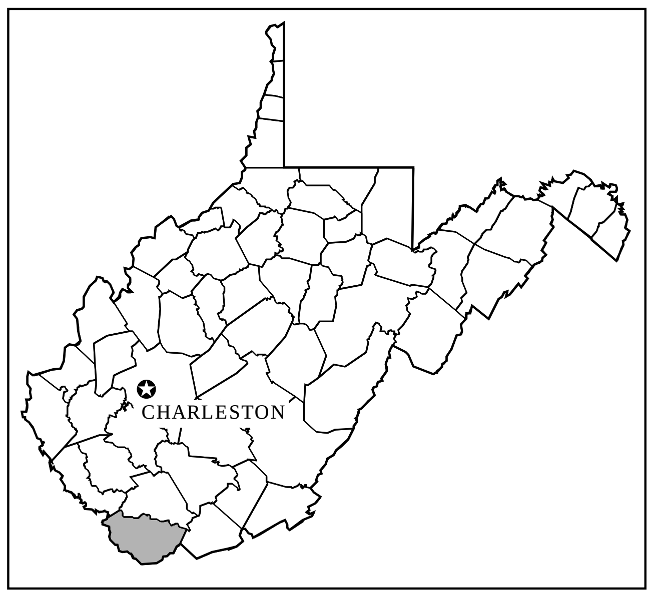


Figure 1.—Location of McDowell County in West Virginia.

General Nature of the County

This section provides general information about McDowell County. It describes farming; transportation and industry; physiography, relief, and drainage; geology; and climate in the survey area.

Farming

According to the 1987 Census of Agriculture, McDowell County has 12 farms and a total of about 912 acres of farmland *(13)*. The average farm size is about 76 acres.

The main farm enterprises in the county are livestock and apple production. Apple orchards in the Bradshaw area are important to the local economy and provide produce to the surrounding area and other states.

Transportation and Industry

The main roads in McDowell County are U.S. Route 52 and West Virginia Routes 16, 80, 83, 103, 161, and 635. Rail service is provided by the Norfolk and Western Railway.

The major industries of the county are coal mining and the development of forest products.

Physiography, Relief, and Drainage

McDowell County is in the Cumberland Plateau and Mountain physiographic region *(10)*. Its natural landforms are the result of geologic erosion acting over the millennia, dissecting ancient sedimentary rock with a multitude of narrow valleys.

The topography of McDowell County is dominated by very steep mountain side slopes below gently sloping to very steep ridgetops. Narrow, nearly level and gently sloping flood plains occur along many of the streams.

McDowell County is almost entirely drained by the Tug Fork River. A few acres along the Mercer County line are in the Crane Creek Watershed. Crane Creek is a tributary of the Bluestone River.

The lowest elevation in the survey area is about 875 feet above sea level at the confluence of the Tug Fork River and Fourpole Creek in the extreme western part of McDowell County. The highest elevation is about 3,400 feet on Flattop Mountain in the extreme eastern part of the county where it adjoins Mercer and Wyoming Counties *(4)*.

Geology

Gordon B. Bayles, State Geologist, Natural Resources Conservation Service, helped prepare this section.

All of the surface rocks in McDowell County are sedimentary in origin and occur as cyclic deposits of sandstone, siltstone, shale, and coal. Rocks of Pennsylvanian age cover most of the county, but a few small areas of rocks of Mississippian age outcrop at the headwaters of the Tug Fork and Dry Fork Rivers along the southeastern edge of the county. The Mississippian rock consists of red, green, and gray shales of the Mauch Chunk Group.

Most of the exposed rock is part of the Kanawha, New River, and Pocahontas Formations of the Pottsville Group. Small areas of the Bluestone and Princeton Formations of the Mauch Chunk Group outcrop along the southeastern edge of the county. Relatively little local folding occurs in the survey area, and rock strata dip slightly toward the northwest.

The western part of the McDowell County, bordering Wyoming and Mingo Counties, West Virginia, and Buchanan County, Virginia, is dominated by rocks of the Kanawha Formation and includes valleys having some outcropping of the New River Formation. A number of coal seams have been extensively surface mined and deep mined in this part of the county, including the Cambell Creek (No. 2 Gas), Eagle, Lower War Eagle, and Gilbert. The major soils in this area are Berks, Pineville, and Dekalb soils.

The central part of McDowell County bordering Wyoming County to the north and ridges of the eastern and southeastern parts of the county bordering Mercer County and Tazewell County, Virginia, are dominated by rocks of the New River Formation. The Iaeger, Sewell, Beckley, Fire Creek, and Pocahontas No. 9 coal seams in this formation have been mined extensively. The major soils in these areas are Pineville, Berks, Gilpin, and Lily soils.

The eastern and southeastern parts of the county bordering Mercer County and Tazewell County, Virginia, have a predominance of surface rocks from the Pocahontas Formation of the Pottsville Group on the side slopes and have many ridges capped with rock of the New River Formation. The most extensively mined coal seams in the Pocahontas Formation are the Pocahontas No. 6, Pocahontas No. 4, and Pocahontas No. 3. The major soils in these areas are Pineville and Berks soils. Also in this part of the county are small areas of outcropping of the Bluestone Formation of the Mauch Chunk Group, which occur in the headwaters of the Tug Fork and Dry Fork Rivers. Most of this formation is covered with colluvium from Pennsylvanian rocks; however, reddish silty soils derived from the Mauch Chunk geology occur in a few areas.

Climate

In winter the climate of McDowell County is cold and snowy in areas at the higher elevations. In the valleys, it is also frequently cold in winter but snow cover does not last long due to intermittent thaws. In summer the climate is fairly warm on mountain slopes and very warm and occasionally hot in the valleys. Rainfall is evenly distributed throughout the year, but it is significantly heavier on the windward, west-facing slopes than in the valleys. Normal annual precipitation is adequate for all crops. Summer temperatures and length of growing season, however, particularly at the higher elevations, may be inadequate.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Gary, West Virginia, in the period 1951 to 1986. 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 34 degrees F and the average daily minimum temperature is 23 degrees. The lowest temperature on record, which occurred on January 21, 1985, is -26 degrees. In summer, the average temperature is 72 degrees and the average daily maximum temperature is 84 degrees. The highest recorded temperature, which occurred on September 3, 1953, is 100 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 average annual precipitation is about 40.5 inches. Of this, 22 inches, or about 55 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 19 inches. The heaviest 1-day rainfall during the period of record was 4.29 inches on July 21, 1954. Thunderstorms occur on about 45 days each year.

The average seasonal snowfall is about 19 inches. The greatest snow depth at any one time during the period of record was 10 inches. On the average, 11 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 50 percent of the time possible in summer and 35 percent in winter. The prevailing wind is from the southwest. Average windspeed is highest, 12 miles per hour, in spring.

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

How This Survey Was Made

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

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

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

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

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

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

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

General Soil Map Units

The general soil map shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The components of one map unit can occur in another but in a different pattern.

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

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or a 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.

Areas of the general soil map of McDowell County are joined with areas of the general soil maps for Wyoming and Mercer Counties, West Virginia. Differences in map unit names and proportions of component soils are the result of differences in the degree of generalization.

1. Pineville-Berks

Very deep and moderately deep, moderately steep to extremely steep, well drained soils on mountainous uplands

This map unit consists of soils on ridges, on side slopes, on foot slopes, and in mountain coves throughout the county (fig. 2). The landscape is dominated by rough, mountainous topography typical of southern West Virginia. It is a deeply dissected plateau with narrow ridgetops and valleys and long, very steep or extremely steep side slopes. Stones cover 3 to 15 percent of the surface in most areas, and many areas have exposed bedrock.

This map unit makes up about 95 percent of the survey area. It is about 40 percent Pineville soils, 35 percent Berks soils, and 25 percent soils of minor extent and Rock outcrop.

Pineville soils are very deep, well drained, and moderately steep to very steep. They are on mountain side slopes, in coves, and on foot slopes. They formed in mixed colluvial material weathered from sandstone, siltstone, and shale. The surface layer is very dark brown channery loam. The subsoil is yellowish brown channery loam.

Berks soils are moderately deep, well drained, and very steep or extremely steep. They are on mountain ridges and side slopes. They formed in material weathered from sandstone, siltstone, and shale. The surface layer is dark brown channery loam. The subsoil is yellowish brown very channery or extremely channery loam.

Of minor extent in this map unit are the well drained Gilpin, Lily, and Dekalb soils on ridgetops; well drained to somewhat excessively drained soils in surface mined areas; the somewhat excessively drained Itmann soils in mine refuse areas; areas of Rock outcrop along the major streams; and the well drained Chavies and Yeager soils in the narrow flood plain areas.

Most areas of this map unit are wooded. Some areas on ridgetops, foot slopes, and flood plains are cleared and used for urban development, home gardens, orchards, or pasture.

Although most areas of this unit are unsuited to agriculture, some of the less sloping areas on ridgetops and foot slopes and some of the reclaimed surface mined areas have limited suitability for pasture and hay. Areas of the included Chavies and Yeager soils are generally suited to hay, pasture, and row crops. Erosion control is a major management concern. Conservation tillage and good pasture management, such as rotational grazing, help to control erosion.

The soils of this map unit are well suited to timber production, and approximately 90 percent of this unit is forested. The most common tree species are yellow-poplar, red maple, scarlet oak, red oak, chestnut oak, white ash, black oak, blackgum, sugar maple, and hickory. Many stands of trees are poor in quality due to repeated forest fires. Fire control is a major management concern. The slope limits the use of equipment, and the hazard of erosion is very severe

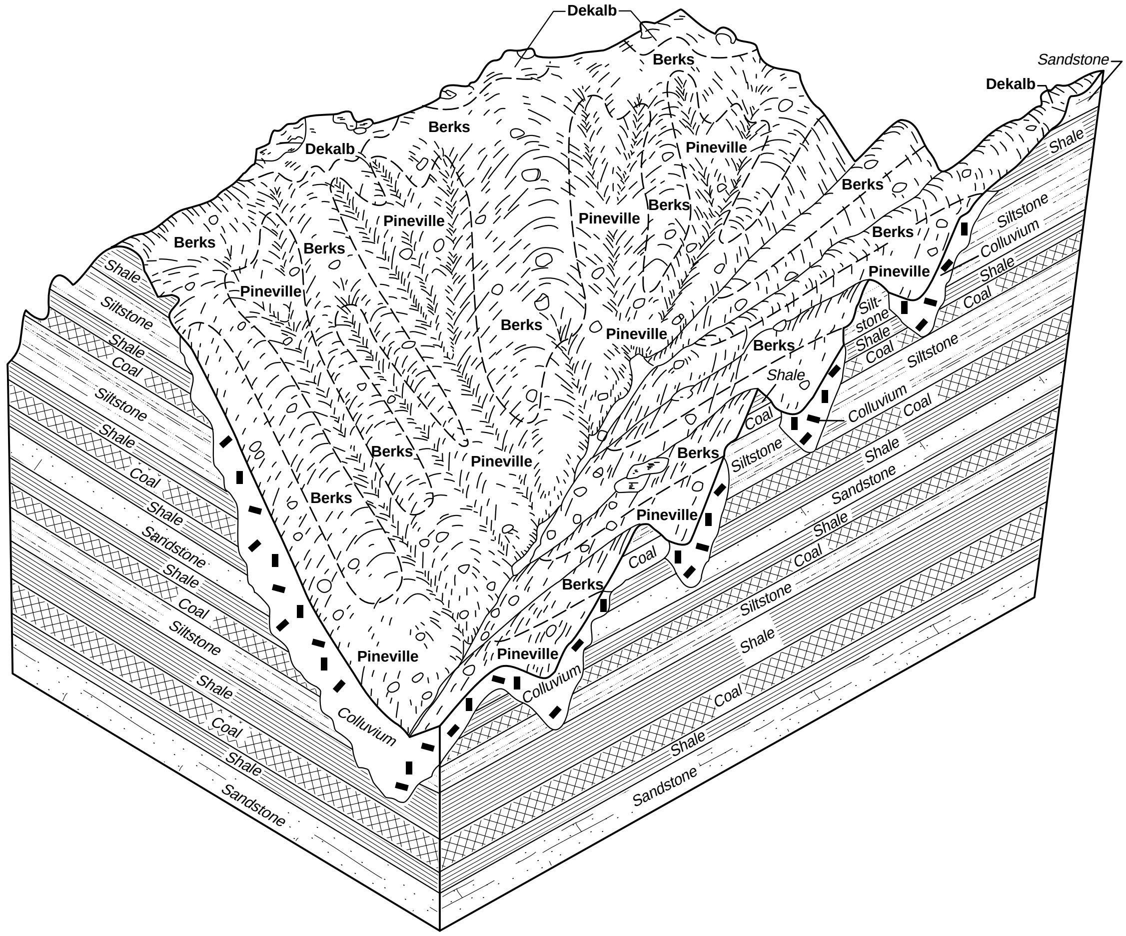


Figure 2.—Typical relationship of the soils and underlying parent material in the Pineville-Berks general soil map unit.

on logging roads and skid trails. Constructing roads and trails on a gentle grade across the slope helps to control erosion.

The major soils are severely limited for community development due to the slope and surface stones. Common limitations of the minor soils are the slope, surface stones, differential settling, depth to bedrock, flooding, and rapid permeability.

2. Kaymine-Cedarcreek-Pineville

Very deep, gently sloping to very steep, well drained soils on uplands

This map unit consists of soils on uplands in the eastern and central parts of the county. In most areas multiple seams of coal have been extensively surface mined. Stones and boulders cover 1 to 15 percent of the surface in most areas, and many areas have highwalls of exposed bedrock.

This map unit makes up about 5 percent of the survey area. It is about 30 percent Kaymine soils, 25 percent Cedarcreek soils, 10 percent Pineville soils, and 35 percent soils of minor extent and Urban land.

Kaymine soils are very deep, well drained, and gently sloping to very steep. They occur in contour surface mined areas of mountain side slopes and on mountaintop surface mines. They formed in mixed sandstone, siltstone, shale, and some coal material and are nonacid. The surface layer is dark brown very channery loam. The substratum is dark grayish brown and brown very channery loam.

Cedarcreek soils are very deep, well drained, and gently sloping to very steep. They occur in contour surface mined areas of mountain side slopes and on mountaintop surface mines. They formed in mixed sandstone, siltstone, shale, and some coal material and are acid. The surface layer is brown very channery loam. The substratum is grayish brown and yellowish brown very channery or extremely channery loam.

Pineville soils are very deep, well drained, and moderately steep to very steep. They occur on mountain side slopes, in coves, and on foot slopes. They formed in mixed colluvial material weathered from sandstone, siltstone, and shale. The surface layer is very dark brown channery loam. The subsoil is brown and yellowish brown channery loam.

Of minor extent in this map unit are the well drained Dekalb and Berks soils on mountain side slopes and narrow ridgetops; the well drained Gilpin and Lily soils on ridgetops; small areas of Urban land and the well drained Chavies soils along streams; the somewhat excessively drained Itmann soils in mine refuse areas; and Sewell soils in surface mined areas.

Most areas of this map unit are wooded. Some of the surface mined areas have been reclaimed and are vegetated with grasses, legumes, and tree seedlings. A few areas are used for urban development.

Although most areas of this map unit are unsuited to agriculture, some of the less sloping areas on ridgetops and some of the reclaimed coal mine areas have limited suitability for pasture and hay. Surface stones limit the suitability of many reclaimed surface mines for hay cutting. Lack of surface water is a limitation in pasture management for most surface mined areas and ridgetop soils. Erosion control is a major management concern. Conservation tillage and good pasture management, such as rotational grazing, help to control erosion.

The soils of this map unit are suited to timber production; however, trees are not of harvestable size in most surface mined areas. The most common tree species are yellow-poplar, red maple, black locust, sycamore, and birch. Plant competition and seedling mortality are major management concerns affecting planted seedlings in surface mined areas. The species that are well suited to these soils are eastern white pine, Virginia pine, black locust, yellow-poplar, and red maple. The slope limits the use of equipment, and the hazard of erosion is very severe on logging roads and skid trails. Constructing roads and trails on a gentle grade across the slope helps to control erosion.

The major soils are severely limited for community development due to the slope, surface stones, and the hazard of differential settling in surface mined areas. Common limitations of the minor soils are the slope, surface stones, differential settling, depth to bedrock, flooding, and rapid permeability.

Detailed Soil Map Units

Dr. John Sencindiver, Professor of Agronomy, West Virginia Agricultural and Forestry Experiment Station, helped prepare this section.

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

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

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

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

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit 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, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Kaymine very channery loam, 3 to 15 percent slopes, very stony, is a phase of the Kaymine series.

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

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Berks-Rock outcrop complex, extremely steep, extremely stony, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Pineville-Berks association, very steep, extremely stony, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Gilpin and Lily soils, 15 to 35 percent slopes, is an undifferentiated group in this survey area.

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

BrF—Berks-Rock outcrop complex, extremely steep, extremely stony

This map unit consists of the moderately deep, well drained Berks soil and outcrops of hard sandstone and mudstone shale on mountainsides along the Tug Fork and Dry Fork Rivers (fig. 3). It is about 50 percent Berks soil, 30 percent Rock outcrop, and 20 percent included soils. Slopes range from 55 to more than 80 percent. The areas of Berks soil and Rock outcrop are so intermingled on the landscape that it was not practical to map them separately. Relief ranges from about 900 to 1,300 feet. The landscape is dissected by numerous small drainageways. Stones cover 3 to 15 percent of the soil surface.

Typically, the surface layer of the Berks soil is dark brown channery loam about 3 inches thick. The subsoil is yellowish brown very channery loam 13 inches thick. The substratum is yellowish brown extremely channery silt loam that extends to bedrock at a depth of about 24 inches. Soft brown fractured, rippable mudstone bedrock extends to a depth of 30 inches or more.

Rock outcrop consists of vertical or nearly vertical exposures of hard sandstone or mudstone shale that are as much as 50 feet or more high.

Included in this unit in mapping are areas of the well drained Dekalb and Pineville soils. Dekalb soils are commonly associated with areas of sandstone rock outcrop near ridgetops and on convex ridge points. Pineville soils typically occur on the lower side slopes and in coves. Also included are a few small areas of soils that have slopes of less than 55 percent or more than 80 percent, areas that have more than 15 percent of the soil surface covered by stones or boulders, and areas of soils that have bedrock at a depth of less than 20 inches.

The available water capacity of the Berks soil is very low or low. Natural fertility is low. Permeability is moderately rapid. Runoff is very rapid. Reaction is extremely acid to slightly acid throughout the profile. Depth to bedrock is 20 to 40 inches.

Most areas of this map unit are wooded. A few areas have been cleared for homesites and roads.

The Berks soil is not suited to cultivated crops or hay and is difficult to manage for pasture. The slope, stoniness, and areas of Rock outcrop restrict the use of farm machinery. The hazard of erosion is very severe.

The potential productivity for trees in areas of the Berks soil is moderate on south-facing slopes and moderately high on north-facing slopes. Timber stands are dominantly scarlet oak, red oak, black oak, chestnut oak, white oak, yellow-poplar, hickory, beech, and red maple. In many areas, especially on south-facing slopes, the trees are poor in quality due to repeated fire damage. Fire control is difficult because of the long, very steep slopes and areas of Rock outcrop, which offer little protection from the wind. Access roads to mining areas and gas wells help in fire control and in providing access to logging areas. Erosion on gas well roads, logging roads, skid trails, and log landings is a major management concern. Building roads and skid trails on a gentle grade across the slope, diverting surface water away from roads, and seeding and mulching roads, skid trails, and log landings after use help to control erosion. Specialized equipment or management techniques, such as cable yarding, that are adapted to very steep slopes should be used in harvesting timber. Poor harvesting methods can cause very severe erosion.

This map unit is suited to habitat for woodland wildlife. Many areas support a moderate population of grouse, turkey, squirrel, and whitetail deer. In many areas, especially on north-facing coves and side slopes, important understory vegetation consists of

Figure 3.—An area of Berks-Rock outcrop complex, extremely steep, extremely stony, near Bradshaw. This map unit has a very severe hazard of erosion if vegetation is disturbed.

cohosh, snakeroot, ginseng, trillium, mayapple, spring beauty, and ferns.

This map unit is severely limited for recreational development because of the extremely steep slopes and areas of Rock outcrop.

Because of the extremely steep slopes and areas of Rock outcrop, this map unit generally is unsuitable for community development or industrial uses. As slope increases, the risk of soil slippage or creep becomes significant and cutting and filling becomes hazardous. The hazard of erosion is very severe in areas cleared for construction. The removal of vegetative cover in construction areas should be kept to a minimum. Establishing plant cover in unprotected areas and providing a proper disposal system for surface water help to control erosion and sedimentation.

The capability subclass is VIIs.

CeB—Cedarcreek very channery loam, 3 to 15 percent slopes, very stony

This unit consists of a very deep, well drained soil in areas that were surface mined for coal. It is on mountaintops and mountain side slopes throughout the county, and it consists of areas of gently sloping hilltops and benches. Stones cover 1 to 3 percent of the surface.

Typically, the surface layer is brown very channery loam about 2 inches thick. The substratum extends to a depth of 65 inches or more. The upper part of the substratum is grayish brown very channery or extremely channery loam 35 inches thick. The lower part is yellowish brown extremely channery loam 28 inches thick. Sandstone and mudstone make up nearly equal portions of the total content of rock fragments.

Included with this soil in mapping are a few small areas of strongly sloping to very steep soils on outslopes, small wet depressions, small areas of rubble land on outslopes and in rock drains, and a few areas of Rock outcrop on highwalls. Also included are a few small areas of the well drained Gilpin and Lily soils on adjacent ridgetops, areas of the well drained, moderately deep Berks and Dekalb soils, and areas of the very deep Kaymine, Itmann, and Sewell soils. Included areas make up about 25 percent of this map unit.

The available water capacity of the Cedarcreek soil is low to high. Natural fertility is low. Permeability is moderately rapid. Runoff is medium or rapid. In unlimed areas, reaction is extremely acid to strongly acid. Depth to bedrock is more than 60 inches.

Most areas of this soil support grasses and legumes. Some of the older reclaimed areas support small trees such as black locust, yellow-poplar, red maple, eastern white pine, pitch pine, and Virginia pine.

Because of the stones and boulders on the surface, this soil generally is unsuitable for cultivated crops. The ridgetop areas have limited suitability for hay and pasture. Cutting hay crops higher than usual allows machinery to clear stones, conserves soil moisture, and reduces stress on plants. The areas used for pasture have a severe hazard of erosion. In pasture management, deferred grazing, rotational grazing, applying lime and fertilizer as needed, and planting desirable species help to maintain good forage and control erosion.

The potential productivity of this soil for trees is moderately high. In most areas the trees are young and are not of harvestable size. The species that are well suited to this soil are eastern white pine, Virginia pine, black locust, yellow-poplar, red maple, hybrid poplar, and paulownia. Seedling mortality and plant competition are major management concerns. Planting healthy seedlings with well developed root systems and timing planting so that seedlings can benefit from spring rains help to reduce seedling mortality rates. Intensive management that prevents undesirable plants from competing with native plants or planted seedlings is necessary for the establishment of a desirable stand. Access to some areas may be difficult because of the surrounding very steep side slopes.

This soil has fair potential for habitat for woodland wildlife. A variety of vegetation provides wildlife food and cover, and the included small wet areas provide water.

This soil has limited suitability for community development because of the large stones and boulders and the potential for differential settling. Onsite investigation and testing are needed to determine the limitations and suitabilities of this map unit for development.

The capability subclass is VIs.

CrF—Cedarcreek-Rock outcrop complex, very steep, extremely stony

This map unit consists of the very deep, well drained Cedarcreek soil and exposures of bedrock in areas that were surface mined for coal. The areas of Cedarcreek soil and Rock outcrop are so intermingled on the landscape that it was not practical to map them separately. This unit is mostly on mountain side slopes and consists of nearly vertical highwalls, gently sloping and strongly sloping benches, and very steep outslopes. The nearly vertical highwalls make up about 15 percent of this unit. The benches are commonly concave and have slopes ranging from 3 to 25 percent. They make up about 25 percent of the unit. In the outslope areas, stones and boulders cover 3 to 15 percent of the surface and slopes range from 35 to 80 percent. The outslopes make up about 60 percent of the unit. This unit is about 65 percent Cedarcreek soil, 15 percent Rock outcrop, and 20 percent included soils.

Typically, the surface layer of the Cedarcreek soil is brown very channery loam about 2 inches thick. The substratum extends to a depth of 65 inches or more. The upper part of the substratum is grayish brown very channery or extremely channery loam 35 inches thick. The lower part is yellowish brown extremely channery loam 28 inches thick. Sandstone and mudstone make up nearly equal portions of the total content of rock fragments.

Rock outcrop consists of bedrock exposures, or highwalls, that have resulted from surface mining. The highwalls are about 25 to 100 feet above the bench floor and are vertical or nearly vertical.

Included in this unit in mapping are areas of soils that have bedrock at a depth of less than 60 inches, small wet depressions in the bench areas, and areas on outslopes that have more than 15 percent of the surface covered by stones and boulders. Also included are areas of Berks and Dekalb soils near highwall edges, areas of Pineville soils in coves, and small areas of Kaymine, Sewell, and Itmann soils on benches and outslopes.

The available water capacity of the Cedarcreek soil is low to high. Natural fertility is low. Permeability is moderately rapid. Runoff is medium or rapid on benches and very rapid on outslopes. In unlimed areas, reaction is extremely acid to strongly acid. Depth to bedrock is more than 60 inches.

Many areas of the Cedarcreek soil are in woodland. Many reclaimed areas support grasses and legumes. Areas of Rock outcrop are generally barren.

Because of the slope, stones and boulders on the surface, and the erosion hazard, the Cedarcreek soil is unsuitable for cultivated crops and hay. The less sloping bench areas have limited suitability for pasture. Areas used for pasture have a severe hazard of erosion. In pasture management, deferred grazing, rotational grazing, applying lime and fertilizer as needed, and planting desirable species help to maintain good forage and control erosion.

The potential productivity for trees in areas of the Cedarcreek soil is moderately high. In most areas the trees are young and are not of harvestable size. The species that are well suited to this soil are eastern white pine, Virginia pine, black locust, yellow-poplar, red maple, hybrid poplar, and paulownia. The very steep slopes and areas of Rock outcrop severely limit the use of equipment. A very severe hazard of erosion and seedling mortality are major management concerns. Planting healthy seedlings with well developed root systems and timing planting so that seedlings can benefit from spring rains help to reduce seedling mortality rates and plant competition. Intensive management that prevents undesirable plants from competing with native plants or planted seedlings is necessary for the establishment of a desirable stand. Building roads and skid trails on a gentle grade across the slope or in the less sloping bench areas, diverting surface water away from roads, and seeding and mulching roads, skid trails, and log landings after use help to control erosion and sedimentation. Access to some areas may be difficult because of adjacent highwalls and the surrounding very steep side slopes.

The Cedarcreek soil has fair potential for habitat for woodland wildlife. A variety of vegetation provides food and cover for wildlife, and small wet areas on benches provide water. Many areas support good populations of grouse.

Many areas of the Cedarcreek soil are used as locations for underground coal mining. The bench areas are used for access to the coal seam. Erosion on roads and around mine sites is a major management concern. Building roads on a gentle grade across the slope, diverting surface water away from roads, using sediment basins to collect runoff, and seeding and mulching disturbed areas help to control erosion and sedimentation.

Because of the slope, boulders, areas of Rock outcrop, and the potential for differential settling, this map unit is generally unsuited to community development. Onsite investigation and testing are needed to determine the limitations and potentials of this unit for most uses.

The capability subclass is VIIs.

Cv—Chavies loam

This map unit consists of a nearly level, well drained soil. It occurs on high flood plains and terraces of streams throughout the county and is subject to rare flooding. Slopes range from 0 to 3 percent.

Typically, the surface layer is very dark grayish brown loam about 4 inches thick. The subsoil extends to a depth of 40 inches. The upper part of the subsoil is dark brown fine sandy loam 5 inches thick. The lower part is dark yellowish brown fine sandy loam and sandy loam 31 inches thick. The substratum extends to a depth of 65 inches or more and is dark yellowish brown to yellowish brown loamy fine sand and fine sandy loam.

Included with this soil in mapping are a few small areas of the well drained, occasionally flooded Yeager soils, which occur on the lower flood plains; areas of the well drained Pineville soils, which occur on foot slopes; areas of soils that have more than 35 percent rock fragments in the solum; and areas of soils that have slopes of more than 3 percent. Also included are a few small areas of soils that have a high water table within a depth of 2.5 feet. Included soils make up about 20 percent of this map unit.

The available water capacity of the Chavies soil is moderate or high. Natural fertility is medium. Permeability is moderately rapid. Runoff is slow or medium. The soil ranges from strongly acid to neutral in the topsoil and the upper part of the subsoil and from very strongly acid to moderately acid in the lower part of the subsoil and in the substratum. Depth to bedrock is more than 60 inches.

Many areas of this soil are cleared and used for homesites, gardens, cultivated crops, or hay and pasture. Some areas are wooded.

This soil is well suited to cultivated crops, hay, and pasture. It can produce a variety of early and late season garden crops. Late spring frosts are a management concern because of poor air drainage in the narrow mountain valleys. Growing cover crops, delaying tillage until the soil is relatively dry, and mixing crop residue into the soil helps to maintain fertility and tilth. Proper stocking rates, rotational grazing, and deferment of grazing until the soil is relatively firm are major needs in pasture management.

This soil has high potential productivity for trees. Common tree species include yellow-poplar, sycamore, river birch, red maple, sugar maple, white ash, American beech, red oak, and black oak. Plant competition is a management concern. Intensive management that prevents undesirable plants from competing with native plants or planted seedlings is necessary for the establishment of a desirable stand. Areas of this soil used for haul roads, skid trails, and log landings are subject to rutting unless they are strengthened with gravel. Establishing wide filter strips next to streams and seeding and mulching haul roads, skid trails, and log landings after use help to control erosion and sedimentation.

Recreational development for camp areas is limited on this soil due to the hazard of flooding. Selecting sites in included areas above the flood plain helps to overcome this limitation. This soil is well suited to picnic areas, paths, and playgrounds.

The hazard of flooding is the main limitation affecting community development on this soil. Establishing a plant cover in unprotected areas and providing a proper disposal system for surface water help to control stream scouring and sedimentation.

The capability class is I.

GlE—Gilpin and Lily soils, 15 to 35 percent slopes

This map unit consists of moderately steep and steep, well drained soils on ridgetops. Some areas of this unit are predominantly Gilpin soil, some are predominantly Lily soil, and some contain both soils. These soils were mapped together because they are similar in use and management and have similar interpretive properties. This unit is about 40 percent Gilpin soil, 40 percent Lily soil, and 20 percent included soils.

Typically, the surface layer of the Gilpin soil is dark brown silt loam about 3 inches thick. The subsoil extends to a depth of 31 inches. The upper part of the subsoil is dark yellowish brown silt loam 3 inches thick. The lower part is strong brown and yellowish brown silt loam and channery silt loam 25 inches thick. The substratum is strong brown and yellowish brown very channery silt loam that extends to a depth of 37 inches. Soft yellowish and light olive brown siltstone bedrock occurs at a depth of about 37 inches.

Typically, the surface layer of the Lily soil is very dark grayish brown loam about 4 inches thick. The subsoil extends to a depth of 32 inches. The upper part of the subsoil is yellowish brown loam 7 inches thick. The lower part is yellowish brown channery loam 21 inches thick. The substratum is yellowish brown very channery loam. Moderately hard, fractured brown sandstone bedrock is at a depth of about 38 inches.

Included in this unit in mapping are small areas of the well drained Berks and Dekalb soils, a few areas of the very deep, well drained Pineville soils, and a few small areas of soils that have bedrock at a depth of less than 20 inches. Also included are small areas of soils that have surface stones and soils that have slopes of less than 15 percent or more than 35 percent.

The available water capacity of the Gilpin soil is moderate. Natural fertility is low or medium. Permeability is moderate. Runoff is rapid or very rapid. In unlimed areas this soil typically ranges from extremely acid to strongly acid. In many areas it ranges from moderately acid to neutral in the surface layer due to repeated burning. Depth to bedrock is 20 to 40 inches.

The available water capacity of the Lily soil is moderate or high. Natural fertility is low. Permeability is moderately rapid. Runoff is rapid or very rapid. In unlimed areas this soil ranges from extremely acid to strongly acid throughout. In many areas it ranges from moderately acid to neutral in the surface layer due to repeated burning. Depth to sandstone bedrock is 20 to 40 inches.

Most areas of the Gilpin and Lily soils are wooded. Some areas are cleared and used for homesites, gardens, orchards, or hay and pasture (fig. 4).

These soils are not suited to cultivated crops and have limited suitability for hay and pasture. The slope restricts the use of farm machinery in most areas. Proper stocking rates, rotational grazing, and deferment of grazing until the soils are relatively firm are major needs in pasture management. The hazard of erosion is very severe in unprotected areas and on farm access roads. Establishing a plant cover in areas disturbed for orchard access helps to control erosion and sedimentation.

These soils have moderately high potential productivity for trees. Most areas have stands of oaks, hickory, yellow-poplar, black locust, and red maple.

Figure 4.—Pasture and hayland in an area of Gilpin and Lily soils, 15 to 35 percent slopes. Careful management is required in this map unit to prevent overgrazing and maintain productivity. The erosion hazard is very severe if the soils are disturbed.

During wet periods, haul roads, skid trails, and log landings may be subject to severe rutting unless they are strengthened with gravel surfacing. Erosion on gas well roads, logging roads, skid trails, and log landings is a major management concern. Using the included less sloping areas may help to overcome this limitation. Building roads and skid trails on a gentle grade across the slope, diverting surface water away from roads, and seeding roads, skid trails, and log landings after use help to control erosion.

Recreational development is limited on these soils because of the slope.

The slope and depth to bedrock are the main limitations affecting community development on these soils. Selecting sites on included less sloping soils may help to overcome this limitation. Depth to bedrock may be a management concern where cutting and filling are required. Removal of vegetative cover on construction sites should be kept to a minimum. Establishing plant cover in unprotected areas and providing a proper disposal system for surface water help control erosion and sedimentation.

The capability subclass is VIe.

ItF—Itmann extremely channery sandy loam, very steep

This map unit consists of a very deep, somewhat excessively drained soil that formed mostly in coal and high-carbon shale from coal mining. It is mostly on mountainsides and on valley fills close to abandoned and active coal mines. A few areas consist of valley fills which impound water and coal slurry. Slopes range from 20 to 80 percent but dominantly range from 35 to 80 percent. The top slopes are moderately steep, are commonly narrow, and make up about 15 percent of the unit. The outslopes are steep or very steep and make up about 85 percent of the unit.

Typically, the surface layer is black extremely channery sandy loam about 2 inches thick. The substratum is black extremely channery loam or sandy loam that extends to a depth of 65 inches or more. Coal and other high-carbon fragments dominate the total content of rock fragments.

Included with this soil in mapping are a few small areas of the well drained Berks, Cedarcreek, Dekalb, Kaymine, and Pineville soils. In some areas of this map unit, the surface has been covered with topsoil material and the surface layer has fewer rock fragments than is typical for the Itmann soil. Also included are areas of mine waste that are less acid than the Itmann soil and areas that have burned or that are burning. Included areas make up about 30 percent of this map unit.

The available water capacity of the Itmann soil is very low to moderate. Natural fertility is low or medium. Permeability is moderately rapid or rapid. Runoff is very rapid. In unlimed areas, the soil ranges from extremely acid to strongly acid. Depth to bedrock is more than 60 inches.

Most areas of this map unit are barren. A few small areas are vegetated with red maple, birch, broomsedge, and weeds. The included areas of burned or “reddog” material are used as a local source of road subgrade and fill material.

Because of the slope, the low natural fertility, and a very severe hazard of erosion, the Itmann soil is unsuitable for cultivated crops, hay, and pasture. The hazard of rill and gully erosion is extremely high. Steep and very steep areas are very difficult to revegetate because of excessive runoff, very low fertility, a very low to moderate available water capacity, high soil acidity, and high soil temperatures in the surface layer. Using diversions for surface water control, seeding acid-tolerant species, liming, fertilizing, timing planting so that crops can benefit from spring rains, and heavy mulching or topsoiling help to establish vegetation and control erosion.

This soil has low potential productivity for trees. It has very poor potential for habitat for woodland wildlife.

Onsite investigation and testing are needed to determine the limitations and potentials of this soil for most uses.

The capability subclass is VIIs.

KaB—Kaymine very channery loam, 3 to 15 percent slopes, very stony

This map unit consists of a very deep, well drained soil in areas that were surface mined for coal. It is on mountaintops and includes gently sloping hilltops and benches. Stones and boulders cover 1 to 3 percent of the surface in most areas.

Typically, the surface layer is dark grayish brown very channery loam about 4 inches thick. The substratum extends to a depth of more than 65 inches. The upper part of the substratum is dark grayish brown very channery loam 6 inches thick. The lower part is dark grayish brown extremely channery loam 59 inches thick. The content of rock fragments consists of about equal portions of sandstone and mudstone and includes about 5 percent or less coal fragments.

Included with this soil in mapping are a few small areas of strongly sloping to very steep soils on outslopes, small areas of soils that have a seasonal high water table, small areas that have more than 3 percent of the soil surface covered by stones and boulders, and small areas of Rock outcrop on highwalls. Also included are small areas of the very deep Cedarcreek, Itmann, and Sewell soils; small areas of the moderately deep Gilpin and Lily soils on ridgetops; and areas of the moderately deep Berks soils on the upper mountain side slopes. Included areas make up about 20 percent of this map unit.

The available water capacity of the Kaymine soil is low to high. Natural fertility is medium. Permeability is moderate or moderately rapid in the substratum. Runoff is medium or rapid. Reaction ranges from moderately acid to mildly alkaline. Depth to bedrock is more than 60 inches.

Most areas of this soil support grasses and legumes. Some of the older reclaimed areas support small trees such as black locust, yellow-poplar, red maple, and eastern white pine.

Because of the stones and boulders on the surface, this soil generally is unsuitable for cultivated crops. The ridgetop areas have limited suitability for hay and pasture. Cutting hay crops higher that usual allows machinery to clear stones, conserves soil moisture, and reduces stress on plants. The areas used for pasture have a severe hazard of erosion. In pasture management, deferred grazing, rotational grazing, applying lime and fertilizer as needed, and planting desirable species help to maintain good forage and control erosion.

The potential productivity of this soil for trees is moderately high. In most areas the trees are young and are not of harvestable size. The species that are well suited to this soil are eastern white pine, Virginia pine, black locust, yellow-poplar, red maple, hybrid poplar, and paulownia. Seedling mortality and plant competition are major management concerns. Planting healthy seedlings with well developed root systems and timing planting so that seedlings can benefit from spring rains help to reduce seedling mortality rates. Intensive management that prevents undesirable plants from competing with native plants or planted seedlings is necessary for the establishment of a desirable stand. Access to some areas may be difficult because of the surrounding very steep side slopes.

This soil has fair potential for habitat for woodland wildlife. A variety of vegetation provides wildlife food and cover, and the included small wet areas provide water.

This soil has limited suitability for community development because of the large stones and boulders and the potential for differential settling. Onsite investigation and testing are needed to determine the limitations and potentials of this unit for most uses.

The capability subclass is VIs.

KcF—Kaymine-Cedarcreek-Dekalb complex, very steep, extremely stony

This map unit consists of well drained soils on mountain side slopes. The Cedarcreek and Kaymine soils formed in materials from the surface mining of coal. The Dekalb soil is in the unmined areas. The areas of Kaymine, Cedarcreek, and Dekalb soils are so intermingled on the landscape that it was not practical to map them separately. The Kaymine and Cedarcreek soils are on gently sloping or strongly sloping benches and steep or very steep outslopes. They are adjacent to nearly vertical highwalls. The Dekalb soil is very steep and on the undisturbed ridgetops, points, and side slopes. Slopes range from 3 to 35 percent in areas of the benches and from 35 to 80 percent in areas of the outslopes and side slopes. Stones and boulders cover 3 to 15 percent of the surface in most areas. Highwalls make up about 15 percent, benches 25 percent, and outslopes 60 percent of the surface mined areas. This unit is about 35 percent very deep Kaymine and similar soils, 25 percent very deep Cedarcreek and similar soils, 20 percent moderately deep Dekalb and similar soils, and 20 percent included soils and Rock outcrop.

Typically, the surface layer of the Kaymine soil is dark brown very channery loam about 4 inches thick. The substratum extends to a depth of more than 65 inches. In sequence downward it is dark grayish brown very channery loam 6 inches thick, brown very channery loam 21 inches thick, dark grayish brown very channery loam 18 inches thick, and brown very channery loam 11 inches thick. The content of rock fragments consists of about equal portions of sandstone and mudstone and includes about 5 percent or less coal fragments.

Typically, the surface layer of the Cedarcreek soil is brown very channery loam about 2 inches thick. The substratum extends to a depth of 65 inches or more. The upper part of the substratum is grayish brown very channery or extremely channery loam 35 inches thick. The lower part is yellowish brown extremely channery loam 28 inches thick. Sandstone and mudstone make up nearly equal portions of the total content of rock fragments.

Typically, the surface layer of the Dekalb soil is very dark gray channery sandy loam about 3 inches thick. The subsoil extends to a depth of 22 inches. The upper part of the subsoil is dark yellowish brown channery sandy loam 2 inches thick. The lower part is light yellowish brown very channery loam 17 inches thick. The substratum is yellowish brown very channery sandy loam that extends to sandstone bedrock at a depth of about 28 inches.

Included in this unit in mapping are areas of Rock outcrop on vertical highwalls and small areas of the well drained Berks, Gilpin, Lily, Sewell, and Pineville soils and the somewhat excessively drained Itmann soils. Also included are soils that have bedrock at a depth of less than 20 inches, a few small areas of soils that have a seasonal high water table, and soils that have more than 15 percent of the surface covered by stones.

The available water capacity of the Kaymine soil is low to high. Natural fertility is medium. Permeability is moderate or moderately rapid. Runoff is medium on benches and very rapid on outslopes. Reaction ranges from moderately acid to mildly alkaline. Depth to bedrock is more than 60 inches.

The available water capacity of the Cedarcreek soil is low to high. Natural fertility is low. Permeability is moderately rapid. Runoff is medium or rapid on benches and very rapid on outslopes. In unlimed areas, reaction ranges from extremely acid to strongly acid. Depth to bedrock is more than 60 inches.

The available water capacity of the Dekalb soil is very low to moderate. Natural fertility is low. Permeability is rapid. Runoff is very rapid. Reaction is extremely acid to strongly acid in the subsoil and substratum. In some areas the soil is slightly acid in the surface layer due to repeated burning. Depth to sandstone bedrock is 20 to 40 inches.

Most areas of this map unit are in woodland. Some areas support grasses and legumes.

Because of the slope, stones and boulders on the surface, and the erosion hazard, this map unit is unsuitable for cultivated crops and hay. The less sloping bench areas of the Kaymine and Cedarcreek soils have limited suitability for pasture. Areas used for pasture have a severe hazard of erosion. In pasture management, deferred grazing, rotational grazing, applying lime and fertilizer as needed, and planting desirable species help to maintain good forage and control erosion.

The potential productivity of this map unit for trees is moderate or moderately high. The unit is suited to both coniferous and deciduous trees. In most areas the trees are relatively young and are not of harvestable size. The species that are well suited to the soils in this unit are eastern white pine, Virginia pine, black locust, yellow-poplar, red maple, hybrid poplar, and paulownia. The very steep slopes and areas of Rock outcrop severely limit the use of equipment. A very severe hazard of erosion and seedling mortality are major management concerns. Planting healthy seedlings with well developed root systems and timing planting so that seedlings can benefit from spring rains help to reduce seedling mortality rates and plant competition. Intensive management that prevents undesirable plants from competing with native plants or planted seedlings is necessary for the establishment of a desirable stand. Building roads and skid trails on a gentle grade across the slope or in the less sloping bench areas, diverting surface water away from roads, and seeding and mulching roads, skid trails, and log landings after use help to control erosion and sedimentation. Access to some areas may be difficult because of adjacent highwalls and very steep side slopes.

The vegetation on the Kaymine and Cedarcreek soils is variable but commonly consists of black locust, yellow-poplar, American sycamore, white pine, and Virginia pine. The understory vegetation consists of black birch, red maple, sourwood, sassafras, blackberry, and multiflora rose. The vegetation on the Dekalb soil commonly consists of chestnut oak, scarlet oak, red maple, and black locust. Open areas may be covered with grasses, legumes, and autumn-olive.

This map unit has fair potential for habitat for woodland wildlife. A variety of vegetation provides excellent food and cover for wildlife, and the small wet depressions on benches provide water. Many areas support good populations of grouse.

Many areas of this map unit are used as locations or access for underground coal mining. Erosion on roads and around mine sites is a major management concern. Building roads on a gentle grade across the slope, using sediment basins to collect runoff, and seeding and mulching disturbed areas help to control erosion.

Because of the slope, boulders, and areas of Rock outcrop, this map unit is generally unsuited to community development. Due to the potential for differential settling in bench areas, onsite investigation and testing are needed to determine the limitations and potentials of this unit for most uses.

The capability subclass is VIIs.

KrF—Kaymine-Rock outcrop complex, very steep, extremely stony

This map unit consists of the very deep, well drained Kaymine soil and exposures of bedrock in areas that were surface mined for coal. The areas of Kaymine soil and Rock outcrop are so intermingled on the landscape that it was not practical to map them separately. This unit is mostly on mountain side slopes and consists of nearly vertical highwalls, gently sloping or strongly sloping benches, and very steep outslopes. The highwalls make up about 15 percent of the unit. In the bench areas slopes are commonly concave and range from 3 to 15 percent. The benches make up about 25 percent of the unit. In the outslope areas slopes are commonly convex and range from 35 to 80 percent. The outslopes make up about 60 percent of the unit. Some areas of this map unit occur in areas of mountaintop removal surface mines and have little or no Rock outcrop. Stones and boulders cover 3 to 15 percent of the soil surface in most areas. This unit is about 65 percent Kaymine soil, 15 percent Rock outcrop, and 20 percent included soils.

Typically, the surface layer of the Kaymine soil is dark brown very channery loam about 4 inches thick.

The substratum extends to a depth of more than 65 inches. In sequence downward it is dark grayish brown very channery loam 6 inches thick, brown very channery loam 21 inches thick, dark grayish brown very channery loam 18 inches thick, and brown very channery loam 11 inches thick. The content of rock fragments consists of about equal portions of sandstone and mudstone and includes about 5 percent or less coal fragments.

Rock outcrop consists of bedrock exposures, or highwalls, that have resulted from surface mining. The highwalls are about 25 to 100 feet above the bench floor and are vertical or nearly vertical.

Included in this unit in mapping are areas of soils that have bedrock at a depth of less than 60 inches, small wet depressions in the bench areas, and areas on outslopes that have more than 15 percent of the surface covered by stones and boulders. Also included are a few small areas of the Berks and Dekalb soils near highwall edges, areas of Pineville soils in coves, and small areas of Cedarcreek, Sewell, and Itmann soils on benches and outslopes.

The available water capacity of the Kaymine soil is low to high. Natural fertility is medium. Permeability is moderate or moderately rapid in the substratum. Runoff is medium or rapid on benches and very rapid on outslopes. Reaction ranges from moderately acid to mildly alkaline. Depth to bedrock is more than 60 inches.

Most areas of the Kaymine soil are in woodland. Some of the reclaimed areas support grasses and legumes. Areas of Rock outcrop are generally barren.

Because of the slope, stones and boulders on the surface, and areas of Rock outcrop, the Kaymine soil generally is unsuitable for cultivated crops and hay. The less sloping bench areas have limited suitability for pasture. Areas used for pasture have a very severe hazard of erosion. In pasture management, deferred grazing, rotational grazing, applying lime and fertilizer as needed, and planting desirable species help to maintain good forage and control erosion.

The potential productivity for trees in areas of the Kaymine soil is moderately high. In most areas the trees are young and are not of harvestable size. The species that are well suited to this soil are eastern white pine, Virginia pine, black locust, yellow-poplar, red maple, hybrid poplar, and paulownia. The very steep slopes and areas of Rock outcrop severely limit the use of equipment. A very severe hazard of erosion and seedling mortality are major management concerns. Planting healthy seedlings with well developed root systems and timing planting so that seedlings can benefit from spring rains help to reduce seedling mortality rates and plant competition. Intensive management that prevents undesirable plants from competing with native plants or planted seedlings is necessary for the establishment of a desirable stand. Building roads and skid trails on a gentle grade across the slope or in the less sloping bench areas, diverting surface water away from roads, and seeding and mulching roads, skid trails, and log landings after use help to control erosion and sedimentation.

The vegetation on the Kaymine soil is variable but commonly consists of black locust, yellow-poplar, red maple, American sycamore, and eastern white pine. The understory vegetation commonly consists of red maple, redbud, blackberry, jewelweed, and multiflora rose. Open areas may be covered with grasses, legumes, and autumn-olive.

The Kaymine soil has fair potential for habitat for woodland wildlife. A variety of vegetation provides excellent food and cover for wildlife, and the small wet areas on benches provide water. Many areas support good populations of grouse.

Many areas of the Kaymine soil are used as locations for underground coal mining. Erosion on roads and around mine sites is a major management concern. Building roads on a gentle grade across the slope, using sediment basins to collect runoff, and seeding and mulching disturbed areas help to control erosion.

Because of the slope, boulders, areas of Rock outcrop, and the potential for differential settling, this map unit is generally unsuited to community development. Onsite investigation and testing are needed to determine the limitations and potentials of this unit for most uses.

The capability subclass is VIIs.

LlC—Lily loam, 3 to 15 percent slopes

This map unit consists of a gently sloping or strongly sloping, well drained, moderately deep soil on broad ridgetops.

Typically, the surface layer is very dark grayish brown loam about 4 inches thick. The subsoil extends to a depth of 32 inches. The upper part of the subsoil is yellowish brown loam 7 inches thick. The lower part is yellowish brown channery loam 21 inches thick. The substratum is yellowish brown very channery loam. Moderately hard, fractured brown sandstone bedrock is at a depth of about 38 inches.

Included with this soil in mapping are small areas of the moderately deep, well drained Berks, Dekalb, and Gilpin soils; a few small areas of the very deep, well drained Pineville soils; and areas of soils that have

Figure 5.—Pasture and hayland in an area of Lily loam, 3 to 15 percent slopes.

bedrock at a depth of less than 20 inches or more than 40 inches. Also included are small areas of soils that have 1 to 3 percent of their surface covered by stones and a few areas of soils that have slopes of more than 15 percent. Included soils make up about 20 percent of this map unit.

The available water capacity of the Lily soil is moderate or high. Natural fertility is low. Permeability is moderately rapid. Runoff is medium or rapid. In unlimed areas this soil ranges from extremely acid to strongly acid throughout. Depth to sandstone bedrock is 20 to 40 inches.

Some areas of this soil are wooded. Many areas are cleared and used for homesites, gardens, or hay and pasture.

This soil is suited to cultivated crops, hay, and pasture (fig. 5). A severe hazard of erosion in unprotected areas and overgrazing are major management concerns. In cultivated areas, conservation tillage, using a crop sequence that includes hay, and returning crop residue to the soil help to control erosion and maintain fertility and tilth. In pasture management, proper stocking rates, rotational grazing, and deferment of grazing during dry periods help to maintain desirable grasses and legumes and control erosion.

This soil has moderate or moderately high potential productivity for trees. Most areas have stands of oaks, hickory, yellow-poplar, black locust, and red maple. Erosion on gas well roads, logging roads, skid trails, and log landings is a management concern. Building roads and skid trails on a gentle grade across the slope and seeding haul roads, skid trails, and log landings help to control erosion and sedimentation.

Depth to bedrock is the main limitation affecting community development on this soil. The depth to sandstone bedrock may hinder excavations. Building on the bedrock and landscaping with additional fill help to overcome this limitation. Selecting sites in areas of the deepest included soils, installing filter fields on the contour, and planning a filter field that is larger than normal help to overcome the bedrock limitation affecting septic tank absorption fields. Removal of vegetative cover should be kept to a minimum on construction sites. Establishing a plant cover in unprotected areas and providing a proper disposal system for surface water help to control erosion and sedimentation.

The capability subclass is IIIe.

PBF—Pineville-Berks association, very steep, extremely stony

This map unit consists of well drained soils on mountain side slopes and narrow ridgetops. It is about 40 percent Pineville soil, 35 percent Berks soil, and 25 percent included soils and Rock outcrop. Slopes range from 35 to 100 percent but dominantly range from 35 to 80 percent. The Pineville soil is typically on the middle and lower side slopes, on foot slopes, and in coves. The Berks soil is typically on ridgetops and the upper and convex side slopes. Relief ranges from about 900 to more than 2,000 feet. The landscape is dissected by numerous drainageways. Stones cover 3 to 15 percent of the surface in most areas.

Typically, the surface layer of the Pineville soil is very dark brown channery loam about 4 inches thick. The subsoil is brown and yellowish brown channery loam about 40 inches thick. The substratum is dark yellowish brown very channery sandy loam that extends to a depth of 65 inches or more.

Typically, the surface layer of the Berks soil is dark brown channery loam about 3 inches thick. The subsoil is yellowish brown very channery loam 13 inches thick. The substratum is yellowish brown extremely channery silt loam that extends to bedrock at a depth of about 24 inches. Soft brown fractured, rippable mudstone bedrock extends to a depth of 30 inches or more.

Included in this unit in mapping are a few small areas of the well drained Gilpin, Lily, and Dekalb soils. Also included are a few small areas of soils that have slopes of less than 35 or more than 100 percent, areas that have more than 15 percent of the soil surface covered by stones or boulders, areas of very deep soils that have more than 35 percent rock fragments in the solum, areas of Rock outcrop, and areas of soils that have bedrock at a depth of less than 20 inches. There are small areas of Cedarcreek, Kaymine, and Sewell soils where surface mining occurred after soil mapping or is occurring.

The available water capacity of the Pineville soil is moderate or high. Natural fertility is medium. Permeability is moderate. Runoff is very rapid. Reaction ranges from extremely acid to strongly acid. In some areas the soil is slightly acid in the surface layer due to repeated burning. Depth to bedrock is more than 60 inches.

The available water capacity of the Berks soil is very low or low. Natural fertility is low. Permeability is moderately rapid. Runoff is very rapid. Reaction ranges from extremely acid to moderately acid in the subsoil and substratum. In some areas the soil is slightly acid in the surface layer due to repeated burning. Depth to bedrock is 20 to 40 inches.

Most areas of this map unit are in woodland. Some small areas have been cleared and are used for homesites. A few small areas of the Pineville soil on side slopes and foot slopes are used as pasture.

Because of the slope, surface stones, and a very severe hazard of erosion, the Berks and Pineville soils are unsuitable for cultivated crops and hay and are difficult to manage for pasture. The slope and stoniness restrict the use of farm machinery. Areas used for pasture have a very severe hazard of erosion. In pasture management, deferred grazing, rotational grazing, applying lime and fertilizer as needed, and planting desirable species help to maintain good forage and control erosion.

The potential productivity for trees in areas of the Pineville soil is moderately high on both south-facing and north-facing slopes. Timber stands are dominantly white oak, yellow-poplar, red oak, black oak, hickory, American beech, white ash, and cucumbertree. The potential productivity for trees in areas of the Berks soil is moderate on south-facing slopes and moderately high on north-facing slopes. Timber stands are dominantly scarlet oak, black oak, chestnut oak, white oak, hickory, yellow-poplar, and red maple. In many areas the trees, especially those on south-facing slopes, are poor in quality due to repeated fire damage. Fire control is difficult because of the long, very steep slopes, which offer little protection from the wind. The fire hazards are increased by numerous residential developments in the narrow valleys. Access roads to mining areas and gas wells help in fire control and in providing access to logging areas. Erosion on gas well roads, logging roads, and skid trails and in loading areas are major management concerns. Building roads and skid trails on a gentle grade across the slope, diverting surface water away from roads, and seeding and mulching roads, skid trails, and log landings after use help to control erosion. Specialized equipment or management techniques that are adapted to very steep slopes should be used in harvesting timber. Poor harvesting methods can cause very severe erosion in harvested areas.

The Pineville and Berks soils are suited to habitat for woodland wildlife. Many areas support a moderate population of grouse, turkey, squirrel, and whitetail deer. In many areas, especially in areas of north-facing coves and side slopes of the Pineville soil, important understory vegetation consists of trillium, mayapple, spring beauty, ginseng, and ferns.

The slope and stones on the surface severely limit this map unit for recreational development.

Because of the very steep slopes and surface stones, this map unit is generally unsuitable for community development. The hazard of erosion is very severe in areas cleared for construction. Establishing plant cover in unprotected areas and providing a proper disposal system for surface water help to control erosion and sedimentation.

The capability subclass is VIIs.

PlE—Pineville-Lily complex, 15 to 35 percent slopes, very stony

This map unit consists of moderately steep and steep, well drained soils on dissected foot slopes and lower hillside benches. Stones and boulders cover 1 to 3 percent of the soil surface. This unit is about 60 percent Pineville and similar soils, 25 percent Lily and similar soils, and 15 percent included soils and Urban land. The Pineville and Lily soils are so intermingled on the landscape that it was not practical to map them separately.

Typically, the surface layer of the Pineville soil is very dark brown channery loam about 4 inches thick. The subsoil is brown and yellowish brown channery loam about 40 inches thick. The substratum is dark yellowish brown very channery sandy loam that extends to a depth of 65 inches or more.

Typically, the surface layer of the Lily soil is very dark grayish brown loam about 4 inches thick. The subsoil extends to a depth of 32 inches. The upper part of the subsoil is yellowish brown loam 7 inches thick. The lower part is yellowish brown channery loam 21 inches thick. The substratum is yellowish brown very channery loam. Moderately hard, fractured brown sandstone bedrock is at a depth of about 38 inches.

Included in this unit in mapping are a few small areas of the well drained Berks and Gilpin soils. Also included are small areas of the very deep, well drained Chavies and Yeager soils on low terraces and flood plains, a few small areas of Urban land, a few areas that have 3 to 15 percent surface stones, and a few areas that have slopes of less than 15 percent or more than 35 percent.

The available water capacity of the Pineville soil is moderate or high. Natural fertility is medium. Permeability is moderate. Runoff is very rapid. Reaction ranges from extremely acid to strongly acid. In some areas the soil is slightly acid in the surface layer due to repeated burning. Depth to bedrock is more than 60 inches.

The available water capacity of the Lily soil is moderate or high. Natural fertility is low. Permeability is moderately rapid. Runoff is medium or rapid. In unlimed areas this soil ranges from extremely acid to strongly acid throughout. Depth to sandstone bedrock is 20 to 40 inches.

Most areas of the Pineville and Lily soils are wooded. Many areas, however, are cleared and used for homesites, gardens, or pasture.

Because of the slope and surface stones, these soils are unsuitable for cultivated crops and hay and are difficult to manage for pasture. The hazard of erosion is severe in unprotected areas and is a major management concern. In pasture management, proper stocking rates, rotational grazing, and deferment of grazing during dry periods and in the spring until the soils are firm help to maintain desirable grasses and legumes and control erosion.

These soils have moderate or moderately high potential productivity for trees. Most areas have stands of yellow-poplar, and some areas have stands of northern red oak, hickory, white oak, black locust, and beech. Erosion on gas well roads, logging roads, skid trails, and log landings is a major management concern. Building roads and skid trails on a gentle grade across the slope and away from streams and seeding haul roads, skid trails, and log landings help to control erosion and sedimentation.

The slope is the main limitation affecting community development on these soils. Selecting sites on the included less sloping soils may help to overcome this limitation. Cutting and filling may be restricted by depth to bedrock in areas of the moderately deep Lily soil. Removal of vegetative cover should be kept to a minimum on construction sites. Establishing a plant cover in unprotected areas and providing a proper disposal system for surface water help to control erosion and sedimentation.

The capability subclass is VIIs.

SeB—Sewell extremely channery sandy loam, 3 to 15 percent slopes, very stony

This map unit consists of a very deep, somewhat excessively drained soil in ridgetop areas that were surface mined for coal. It is mostly on mountaintops in the northern and eastern parts of the county. In the outslope areas, slopes are commonly convex and range from 35 to 80 percent. Stones and boulders cover 0.1 to 3 percent of the surface in most areas.

Typically, the surface layer is yellowish brown extremely channery sandy loam about 7 inches thick. The substratum is yellowish brown and dark yellowish brown extremely channery sandy loam that extends to a depth of 65 inches or more. The total content of rock fragments consists of about 95 percent sandstone and 5 percent mudstone.

Included with this soil in mapping are soils that have bedrock at a depth of less than 60 inches, a few areas of the moderately deep Dekalb and Lily soils near the edges of ridgetops, and a few areas of the very deep Pineville soils in coves. Also included are some small areas of the very deep Cedarcreek and Itmann soils on benches and outslopes, small depressional areas that have a seasonal high water table, small areas of very steep outslopes, areas of soils that are less acid in the control section than the Sewell soil, and areas that have sand textures. Included areas make up about 30 percent of this map unit.

The available water capacity of the Sewell soil is very low to moderate. Natural fertility is low. Permeability is moderately rapid or rapid in the substratum. In some areas compaction during reclamation activities has resulted in slow infiltration and permeability rates in the upper part of the soil. Runoff is medium or rapid. In unlimed areas reaction ranges from extremely acid to strongly acid. Depth to bedrock is more than 60 inches.

Most areas of this soil support grasses and legumes. Some of the older reclaimed areas support small trees such as black locust, red maple, yellow-poplar, and sourwood.

Because of the stones and boulders on the surface and the low natural fertility, this soil generally is unsuitable for cultivated crops. The ridgetop areas have limited suitability for hay and pasture. Cutting hay crops higher than usual allows machinery to clear stones, conserves soil moisture, and reduces stress on plants. Areas used for pasture have a severe hazard of erosion. In pasture management, deferred grazing, rotational grazing, applying lime and fertilizer as needed, and planting desirable species help to maintain good forage and control erosion.

The potential productivity of this soil for trees is moderately high. In most areas the trees are young and are not of harvestable size. The species that are well suited to this soil are eastern white pine, Virginia pine, black locust, yellow-poplar, and red maple. Seedling mortality and plant competition are major management concerns. Planting healthy seedlings with well developed root systems and timing planting so that seedlings can benefit from spring rains help to reduce seedling mortality rates. Intensive management that prevents undesirable plants from competing with native plants or planted seedlings is necessary for the establishment of a desirable stand. Access to some areas may be limited by the surrounding very steep side slopes.

This soil has fair potential for habitat for woodland wildlife. A variety of vegetation provides wildlife food and cover, and the small wet areas provide water.

This soil has limited suitability for community development because of the large stones and boulders and the potential for differential settling. Onsite investigation and testing are needed to determine the limitations and suitabilities of this unit for development.

The capability subclass is VIs.

SrF—Sewell-Rock outcrop complex, very steep, extremely stony

This map unit consists of the very deep, somewhat excessively drained Sewell soil and exposed bedrock in areas that were surface mined for coal. The areas of Sewell soil and Rock outcrop are so intermingled on the landscape that it was not practical to map them separately. This unit is mostly on mountaintops and side slopes in the northern and eastern parts of the county. It consists of nearly vertical highwalls, gently sloping or strongly sloping benches, and very steep outslopes. The nearly vertical highwalls make up about 15 percent of this unit. In the bench areas, slopes are commonly concave and range from 3 to 25 percent. The benches make up about 25 percent of the unit. In the outslope areas, stones and boulders cover 3 to 15 percent of the surface and slopes range from 35 to 80 percent. The outslopes make up about 60 percent of this unit. This unit is about 65 percent Sewell soil, 15 percent Rock outcrop, and 20 percent included soils.

Typically, the surface layer of the Sewell soil is yellowish brown extremely channery sandy loam about 7 inches thick. The substratum is yellowish brown and dark yellowish brown extremely channery sandy loam that extends to a depth of 65 inches or more. The total content of rock fragments consists of about 95 percent sandstone and 5 percent mudstone.

Rock outcrop consists of exposures of brown sandstone bedrock that have resulted from surface mining. The highwalls are about 25 to 75 feet above the bench floor and are vertical or nearly vertical.

Included in this unit in mapping are areas of soils that have bedrock at a depth of less than 60 inches, small wet depressions in the bench areas, and areas on outslopes that have more than 15 percent of the surface covered by stones and boulders. Also included are areas of Berks and Dekalb soils near highwall edges, areas of Pineville soils in coves, and small areas of Cedarcreek, Kaymine, and Itmann soils on benches and outslopes.

The available water capacity of the Sewell soil is very low to moderate. Natural fertility is low. Permeability is moderately rapid or rapid in the substratum. In some areas compaction during reclamation activities has resulted in slow infiltration and permeability rates in the upper part of the soil. Runoff is medium or rapid on benches and very rapid on outslopes. In unlimed areas reaction ranges from extremely acid to strongly acid. Depth to bedrock is more than 60 inches.

Most areas of the Sewell soil support grasses and legumes. Some of the older reclaimed areas support small trees such as black locust, red maple, yellow-poplar, and sourwood.

Because of the slope, stones and boulders on the surface, and the erosion hazard, the Sewell soil is unsuitable for cultivated crops and hay. The less sloping bench areas have limited suitability for pasture. Areas used for pasture have a severe hazard of erosion. In pasture management, deferred grazing, rotational grazing, applying lime and fertilizer as needed, and planting desirable species help to maintain good forage and control erosion.

The potential productivity for trees in areas of the Sewell soil is moderately high. In most areas the trees are young and are not of harvestable size. The species that are well suited to this soil are eastern white pine, Virginia pine, black locust, yellow-poplar, red maple, and hybrid poplar. The very steep slopes and areas of Rock outcrop severely limit the use of equipment. A very severe hazard of erosion and seedling mortality are major management concerns. Planting healthy seedlings with well developed root systems and timing planting so that seedlings can benefit from spring rains help to reduce seedling mortality rates and plant competition. Intensive management that prevents undesirable plants from competing with native plants or planted seedlings is necessary for the establishment of a desirable stand. Building roads and skid trails on a gentle grade across the slope or in the less sloping bench areas, diverting surface water away from roads, and seeding and mulching roads, skid trails, and log landings after use help to control erosion and sedimentation. Access to some areas may be difficult because of adjacent highwalls and the very steep slopes.

The Sewell soil has fair potential for habitat for woodland wildlife. A variety of vegetation provides wildlife food and cover, and the small wet areas on benches provide water. Many areas support good populations of grouse.

Many areas of the Sewell soil are used as locations for underground coal mining. The bench areas are used for access to the coal seam. Erosion on roads and around mine sites is a major management concern. Building roads on a gentle grade across the slope, diverting surface water away from roads, using sediment basins to collect runoff, and seeding and mulching disturbed areas help to control erosion and sedimentation.

Because of the slope, boulders, areas of Rock outcrop, and the potential for differential settling, this map unit is generally unsuited to community development. Onsite investigation and testing are needed to determine the limitations and potentials of this unit for most uses.

The capability subclass is VIIs.

Ud—Udorthents, smoothed

This map unit is nearly level to very steep and consists of mixed soil material and rock fragments in areas that have been excavated, graded, or filled. It occurs throughout the county. Slopes range from 0 to 80 percent.

This map unit commonly consists of gray, brown, and yellow soil material that generally is mottled. In most areas the material is loamy, but in a few areas it is sandy. Depth to bedrock is variable but is commonly more than 60 inches in filled areas.

Included in this unit in mapping are a few small areas of the well drained Berks, Cedarcreek, Chavies, Kaymine, Pineville, and Yeager soils and the somewhat excessively drained Itmann and Sewell soils. Also included are a few small areas that have a seasonal high water table and areas of Urban land.

Due to the variable nature of Udorthents, it is not practical to estimate physical or chemical properties. Runoff ranges from slow to very rapid, depending on slope. The natural fertility of the soil material is generally low.

This map unit is not used for cultivated crops, hay, or pasture. Some areas support grasses, legumes, weeds, or young trees, such as black locust, red maple, sumac, and yellow-poplar.

Due to the variable composition of this map unit, onsite investigation and testing is necessary to determine the suitabilities and limitations of the unit for any purpose. Removal of vegetative cover should be kept to a minimum on construction sites. Establishing a plant cover in unprotected areas and providing a proper disposal system for surface water help to control erosion and sedimentation.

This map unit is not assigned a capability subclass.

Ur—Urban land-Chavies complex

This map unit consists of areas of Urban land and areas of the nearly level, well drained Chavies soil. It occurs on high flood plains of streams throughout the county. This unit is subject to rare flooding, except where urban areas are developed on fill material above the normal level of the Chavies soil. Slopes range from 0 to 3 percent. This unit is about 45 percent Urban land, 35 percent Chavies soil, and 20 percent included soils. The areas of Urban land and Chavies soil are so intermingled that it was not practical to map them separately.

Urban land consists of land covered by highways, streets, parking lots, buildings, railroad tracks, coal cleaning plants, and other structures of urban development.

Typically, the surface layer of the Chavies soil is very dark grayish brown loam about 4 inches thick. The subsoil extends to a depth of 40 inches. The upper part of the subsoil is dark brown fine sandy loam 5 inches thick. The lower part is dark yellowish brown fine sandy loam and sandy loam 31 inches thick. The substratum extends to a depth of 65 inches or more and is dark yellowish brown to yellowish brown loamy fine sand and fine sandy loam.

Included in this unit in mapping are a few small areas of the somewhat excessively drained Itmann soils, areas of the occasionally flooded Yeager soils on low flood plains, areas of the well drained Pineville soils on foot slopes, areas of soils that have more than 35 percent rock fragments in the solum, and areas of soils that have slopes of more than 3 percent. Also included are a few small areas of soils that have a high water table within a depth of 2.5 feet.

The available water capacity of the Chavies soil is moderate or high. Natural fertility is medium. Permeability is moderately rapid. Runoff is slow or medium. The soil ranges from strongly acid to neutral in the topsoil and the upper part of the subsoil and from very strongly acid to moderately acid in the lower part of the subsoil and in the substratum. Depth to bedrock is more than 60 inches.

Most areas of this map unit are used for homesites and industrial or commercial structures. Some areas of the Chavies soil are used for gardens, and a few small areas are wooded or idle.

The Chavies soil is well suited to gardens. It can produce a variety of early and late season garden crops. Late spring frosts are a management concern because of poor air drainage in the narrow mountain valleys. Growing cover crops, delaying tillage until the soil is relatively dry, and mixing crop residue into the soil helps to maintain fertility and tilth.

Recreational development for camp areas is limited on the Chavies soil due to the hazard of flooding. Selecting sites in the included areas above the flood plain helps to overcome this limitation. The Chavies soil is well suited to picnic areas, paths, and playgrounds.

The hazard of flooding is the main limitation affecting community development on the Chavies soil. Establishing a plant cover in unprotected areas and providing a proper disposal system for surface water help to control stream scouring and sedimentation.

This map unit is not assigned a capability subclass.

Ye—Yeager fine sandy loam

This map unit consists of a nearly level, well drained soil. It occurs on low flood plains of streams throughout the county and is subject to occasional flooding. Slopes range from 0 to 3 percent.

Typically, the surface layer is dark brown fine sandy loam about 4 inches thick. The substratum extends to a depth of 65 inches or more. The upper part of the substratum is dark yellowish brown fine sandy loam and loamy fine sand 10 inches. The next part is yellowish brown and dark yellowish brown loamy sand and loamy fine sand 42 inches thick. The lower part, about 9 inches thick, is dark yellowish brown cobbly loamy sand and cobbly sandy loam having redoximorphic features.

Included with this soil in mapping are a few small areas of the rarely flooded Chavies soils, areas of frequently flooded soils, soils that have a surface layer of loamy sand, areas of fill material, areas of soils that have more than 35 percent rock fragments, and areas of soils that have slopes of more than 3 percent. Also included are a few small areas of soils in depressions at the base of foot slopes that have a seasonal high water table and are commonly less than 2 acres in size. Included areas make up about 25 percent of this map unit.

The available water capacity of the Yeager soil is very low to moderate. Natural fertility is moderate. Permeability is moderately rapid or rapid. Runoff is slow or medium. The soil ranges from strongly acid to mildly alkaline. Depth to bedrock is more than 60 inches.

Many areas of this soil are wooded. Some areas are used for cultivated crops or hay and pasture. A few areas are used for homesites or recreation (fig. 6).

Figure 6.—An area of Yeager fine sandy loam used as a golf course.

This soil is suited to cultivated crops, hay, and pasture. It can produce a variety of early and late season garden crops. It is easily tilled and can be worked at many moisture levels. Late spring frosts are a management concern because of poor air drainage in the narrow mountain valleys. This soil may not have a sufficient moisture-holding capacity for some crops during dry years. Crops in some areas are subject to damage from flooding; however, most flooding occurs during winter and early spring. Growing cover crops and mixing crop residue into the soil helps to maintain fertility and tilth. Proper stocking rates, rotational grazing, and deferment of grazing until the soil is relatively firm are major needs in pasture management.

This soil has high potential productivity for trees. Common tree species include yellow-poplar, sycamore, river birch, red maple, sugar maple, white ash, and American beech and, in some stands, red oak and black oak. Plant competition is a management concern. Intensive management that prevents undesirable plants from competing with native plants or planted seedlings is necessary for the establishment of a desirable stand. Areas of this soil used for log landings are subject to rutting unless they are strengthened with gravel. Establishing wide filter strips next to streams and seeding landings after use help to control erosion and sedimentation.

Recreational development for camp areas is severely limited on this soil because of the flooding. The flooding is a moderate limitation affecting playground development. Selecting sites in the included areas above the flood plain that do not have surface stones helps to overcome this limitation. This map unit is suited to picnic areas and to hiking paths and trails.

The hazard of flooding is the main limitation affecting dwellings and septic tank absorption fields on this soil. The moderately rapid or rapid permeability is another limitation affecting septic tank absorption fields. Selecting a site on better suited soils that are protected from flooding helps to overcome this limitation. Establishing a plant cover in unprotected areas and providing a proper disposal system for surface water help to control stream scouring and sedimentation.

The capability subclass is IIw.

Use and Management of the Soils

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

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

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

Generally, the soils in McDowell County that are well suited to crops are also well suited to urban uses. The data concerning specific soils in the county can be used in planning future land use patterns. The potential for farming should be considered relative to any soil limitations and the potential for nonfarm development.

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

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

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

Crops and Pasture

Richard Heaslip, State Resource Conservationist, Natural Resources Conservation Service, helped prepare this section.

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

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under “Detailed Soil Map Units.” Specific information can be obtained from the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Some general principles of management apply to all soils suitable for farm crops and pasture, although individual soils or groups of soils require different kinds of management.

Most of the soils in McDowell County have a medium or low supply of basic plant nutrients, and applications of lime and fertilizer are needed. The amounts to be applied depend on the soil, cropping history, type of crop grown, level of desired yields, and results of soil tests and analyses.

The organic matter content is low in most cultivated soils in the county, and building it to a higher amount generally is not feasible. It is important, however, to maintain current amounts by adding farm manure, using crop residue, and growing sod crops, cover crops, and green manure crops. Because the recycling and composting of materials traditionally considered waste increases the organic matter content, maintenance and improvement may become more feasible on some soils. Land application of organic materials presents new opportunities and challenges which require increased levels of management. In some cases, such as the land application of sewage sludge, planning and consultation with government health and environmental regulatory agencies may be necessary.

Tillage tends to break down soil structure and should be kept to a minimum, only that needed to prepare the seedbed and control weeds. Maintaining the organic matter content of the plow layer also helps to maintain soil structure.

Runoff and erosion occur mainly during the growing season or soon after a crop has been harvested. The larger the area of soil exposed to precipitation and runoff, the greater the occurrence of erosion. All of the gently sloping and steeper soils that are cultivated are subject to erosion and thus require a suitable cropping system for erosion control. The main management needs of such a system are proper rotation of crops, conservation tillage, crop residue management, the use of cover crops and green manure crops, and application of lime and fertilizer. Other major erosion-control practices are contour cultivation, diversions for runoff, and grassed waterways. The effectiveness of a particular combination of these measures differs from one soil to another, but different combinations can be equally effective on the same soil.

Using the soils for pasture can be effective in controlling erosion in most areas. However, a high level of pasture management, including the application of lime and fertilizer, controlled grazing, and careful selection of pasture mixtures, is needed to provide enough ground cover to prevent erosion. Good forage cover is maintained by limiting grazing to a minimum height of 3 inches, rotating pastures in use by livestock to allow forage regrowth, and using reasonable stocking rates. For some soils, plant mixtures that require minimal renovation are needed to maintain good ground cover and forage for grazing. On many soils deferred grazing is needed during dry periods to achieve maximum forage production and erosion protection.

Several areas in McDowell County have very productive orchards (fig. 7). On strongly sloping or steeper soils, runoff, erosion, and drift from pesticides are significant management concerns. Areas of bare soil between rows and individual trees and on access roads increase the hazards of runoff and erosion and reduce the amount of moisture available to crop trees. Maintaining ground cover helps to control erosion and the subsequent loss of nutrients in runoff and helps to increase the infiltration rate. As a result, more nutrients and moisture can be available to crop trees. Properly constructing roads so that the flow of runoff is controlled helps to reduce the erosion hazard and make road maintenance and use easier. Where orchards are on sloping ridgetops and upper side slopes, minimizing pesticide use and spraying during periods of low winds help to prevent damage caused by the drift of agricultural chemicals.

Many small areas in McDowell County are used for home gardens. Good garden soils are nearly level or gently sloping, loamy, and moderately permeable and have a high available water capacity. Maintaining or improving the organic matter content by addition of compost or by methods used for cultivated crops improves fertility, tilth, and the moisture-holding capacity. Most soils in the survey area require additions of lime to obtain the desired pH level. Soil reaction should be kept between 6.0 and 7.0 for most garden plants. Rotation of different garden plants and garden plots and the use of cover crops during idle periods or fallow years help to maintain fertility and minimize disease. Erosion is a major management concern where gardens are on sloping, cultivated soils. Surface water diversions, contour cultivation, the use of cover crops and green manure crops, and additions of lime and fertilizer help to control erosion and maintain fertility and tilth.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in the table.

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

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

A high level of management includes maintaining proper soil reaction and fertility levels as indicated by standard soil tests. The application rate of nitrogen for corn on soils that have a yield potential of 125 to 150 bushels per acre should be 140 to 160 pounds per

Figure 7.—An apple orchard in winter that is maintained on the contour, in an area of Gilpin and Lily soils, 15 to 35 percent slopes. Carefully maintaining roads on the contour allows access to orchards, helps to slow runoff and thus conserve moisture, and minimizes erosion and sedimentation.

acre. If the yield potential for corn is 100 bushels per acre or less, a rate of 100 to 120 pounds of nitrogen per acre should be used. The application of nitrogen in excess of that required for potential yields generally is not recommended. The excess nitrogen fertilizer that is not utilized by the crop is an unnecessary expense and causes a hazard of water pollution. If corn or cotton is grown after the harvest of soybeans or peanuts, nitrogen rates can be reduced by about 20 to 30 pounds per acre. Because nitrogen can be readily leached from sandy soils, applications may be needed on these soils more than once during the growing season.

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

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

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

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit. Only class and subclass are used in this survey.

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

Class I soils have few limitations that restrict their use.

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

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

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

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

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

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

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

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

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

The acreage of soils in each capability class and subclass is shown in table 6. The capability classification of each map unit is given in the section "Detailed Soil Map Units" and in the yields table.

Prime Farmland

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

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

The survey area has about 385 acres that meet the soil requirements for prime farmland. This acreage makes up about 0.1 percent of the county. Areas of this land are scattered along streams and rivers. Because this land is of relatively small extent, it does not account for a dominant portion of the agricultural output in McDowell County.

The map unit in the survey area that meets the requirements for prime farmland is Chavies loam. This does not constitute a recommendation for a particular land use. The extent of the map unit is shown in table 4. The location is shown on the detailed soil maps. The soil qualities that affect use and management are described under the heading “Detailed Soil Map Units.”

Woodland Management and Productivity

Lewis Rowan, State Staff Forester, Natural Resources Conservation Service, and Raymond Arnold, Service Forester, helped prepare this section.

Woodland in McDowell County makes up 312,900 acres, or about 91 percent of the total area *(3)*. The tracts range from small woodlots to corporate-owned forests consisting of several thousand acres. Panther Creek State Forest is the largest parcel of government-owned forest land in McDowell County.

The oak-hickory forest type is the dominant forest type in McDowell County. Many different tree species, however, occur in the county. They vary according to soil type, aspect, and landform. Oaks, hickories, beech, red maple, blackgum, cucumbertree, and basswood generally occur throughout the county. In coves hemlock, yellow-poplar, buckeye, and some white ash and sugar maple may occur. Along ridges chestnut oak, scarlet oak, black oak, Virginia pine, pitch pine, shortleaf pine, and red maple are dominant because they can tolerate wind and drought. Pioneer species such as sassafras, sourwood, dogwood, sumac, blackgum, red maple, black locust, redbud, and pines commonly grow in disturbed areas that have been revegetated. On strip mines, white pines and bigtooth aspen may be planted and many pioneer species occur. Other species that are relatively rare or occur in scattered areas are black cherry, black walnut, yellow oak, hackberry, and butternut.

Forests and forest products are an important part of the economy in McDowell County (fig. 8). Although there are no full-time sawmills currently in operation, much marketable lumber is harvested in the county and milled at other locations and the county has a number of smaller, part-time sawmills in operation. Kiln-dried lumber is produced in large quantities at a dry kiln near Roderfield *(14)*.

The single largest problem affecting forest productivity and quality in McDowell County is the recurrent forest fires. When leaf litter and understory burn, trees are damaged at all growth stages. Some fire-damaged trees die within a relatively short time. Most fire-damaged trees, however, are wounded, and whole stands are rendered worthless due to the onset of disease and the subsequent decline in quality and productivity. In addition, once leaf litter is burned off the very steep slopes, which occur throughout most of McDowell County, erosion is commonly very severe. As a result, site productivity declines even more and water quality is degraded due to sedimentation. Thus, forest fires commonly affect forest, soil, and water resources in McDowell County for many years after they occur. The West Virginia Division of Forestry currently has many programs in place in an effort to prevent and fight forest fires.

The aspect of most soils having slopes of more than 15 percent has a significant effect on the potential productivity for trees. North aspects face in any compass direction from 315 to 135 degrees; south aspects face in any compass direction from 135 to 315 degrees. A soil having a north aspect generally is more moist and subject to less extreme variation in temperature than a soil having a south aspect, and it has a productivity rating that is one unit greater than that of the same soil on a south aspect. Aspect also affects the occurrence of tree species and the degree of management concerns. In particular, soils on south aspects are more prone to forest fires, which usually burn hotter and more completely on south slopes than on north slopes. Thus, timber on soils having a south aspect commonly suffers more damage from fires than that on north-facing sites.

Many reclaimed surface mines and mine spoil areas have been planted to white pines and other species. Most of these stands of trees are relatively young and not of economic significance at present.

The map unit descriptions in this publication identify the typical dominant tree species in each map unit. In some cases, significant understory vegetation in the map unit is also identified.

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for an indicator tree species. The number indicates the volume, in cubic meters per hectare per year, that the indicator species can produce in a pure stand under natural conditions. The larger the number, the greater the potential productivity. The number 1 indicates low potential productivity; 2 or 3, moderate; 4 or 5, moderately high; 6 to 8, high; 9 to 11, very high; and 12 or more, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *R* indicates steep slopes; *X*,

Figure 8.—A relatively young stand of white oak in an area of Pineville-Berks association, very steep, extremely stony. Major forest management considerations for this map unit are erosion, fire prevention and control, and equipment limitations.

stones or rocks on the surface; *W*, excess water in or on the soil; *T*, excessive alkalinity, acidity, sodium salts, or other toxic substances in the soil; *D*, restricted rooting depth caused by bedrock, a hardpan, or other restrictive layer; *S*, sandy texture; and *F*, a high content of rock fragments in the soil. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, S, and F.

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

Erosion hazard is the probability that damage will occur as a result of site preparation or harvesting operations where the soil is exposed along roads, skid roads, and fire lanes and in log-handling areas. Forests that have been burned or overgrazed are also subject to erosion. Ratings of the erosion hazard are based on the percent of the slope and on the erosion factor K shown in table 15. A rating of *slight* indicates that under normal conditions no particular measures are needed to prevent erosion. A rating of *moderate* indicates that special precautions are needed to control erosion in most silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities.

The proper construction and maintenance of roads, trails, landings, and fire lanes and the use of alternative harvesting techniques, such as cable yarding, help to overcome the erosion hazard.

Equipment limitation reflects the characteristics and conditions of the soil that restrict the use of the equipment generally needed in woodland management and harvesting. The chief characteristics and conditions considered in the rating are slope, rock outcrops, texture of the surface layer, slippage, soil wetness, stones and boulders on the surface, and flooding. A rating of *slight* indicates that under normal conditions the kind of equipment and season of use are not significantly restricted by soil factors. Soil wetness can restrict equipment use, but the wet period does not exceed 3 months. A rating of *moderate* indicates that equipment use is moderately restricted because of one or more soil factors. If the soil is wet, the wetness restricts equipment use for a period of 3 to 6 months. A rating of *severe* indicates that equipment use is severely restricted either as to the kind of equipment that can be used or the season of use. If the soil is wet, the wetness restricts equipment use for more than 6 months. In McDowell County, slope is commonly a severe restriction to equipment operability.

Using the most appropriate equipment and timing harvesting and other management operations so that seasonal limitations are minimal help to overcome the equipment limitation. Innovative harvesting techniques, such as cable yarding, can help to overcome the equipment limitation on very steep soils.

Seedling mortality refers to the probability of death of naturally occurring or planted tree seedlings, as influenced by the kinds of soil or topographic conditions. The factors used in rating the soils for seedling mortality are texture of the surface layer, depth to a high water table and the length of the period when the water table is high, rock fragments in the surface layer, effective rooting depth, and slope aspect. A rating of *slight* indicates that under normal conditions expected seedling mortality is less than 25 percent. A rating of *moderate* indicates that the expected mortality is 25 to 50 percent. Extra precautions are advisable. A rating of *severe* indicates that the expected mortality is more than 50 percent. Extra precautions are important. Replanting may be necessary.

The use of special planting stock and special site preparation, such as bedding, furrowing, and surface drainage, help to reduce seedling mortality rates.

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

Adequate site preparation before planting the new crop can help to reduce plant competition. Where forest land is to be naturally regenerated by local species, harvesting practices other than strict diameter limit cuts or “high grading” can improve the success of desirable species. The West Virginia Division of Forestry can provide information on recommended forest management practices.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as *site index* and *average annual growth*. The site 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 natural, fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The average annual growth, which varies according to stand vigor and other factors, is equal to total volume growth at rotation age. Yield data are based on site indices of natural stands at age 50 using the International $^1/_4$ Log Rule and standard rough cords. This information should be used for planning only. The average annual growth is given for some of the common trees and is expressed as cubic feet, board feet, and cords per acre *(7)*.

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

Recreation

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

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

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

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

Wildlife Habitat

Gary A. Gwinn, State Biologist, Natural Resources Conservation Service, helped prepare this section.

McDowell County is primarily forest land; more than 90 percent of its area is under forest cover. Wildlife species inhabiting in the county are dominantly species that prefer woodland habitat. A little openland habitat exists and provides food and cover for such animals as cottontail rabbit and bobwhite quail. Areas of grasses and shrubs on reclaimed surface mines make up the most common form of openland and can provide important edge habitat in this heavily wooded county.

Common game species in McDowell County include gray squirrel, ruffed grouse, and relatively small but growing numbers of whitetail deer and wild turkey. Furbearers in the county include gray fox, raccoon, muskrat, and striped skunk and a few beaver, mink, and bobcats.

McDowell County has few cold-water streams that can support trout. The notable exceptions are Elkhorn Creek and Jacob’s Fork, which are known for their populations of rainbow trout and brown trout. Most of the other streams in the county are limited by their size and by pollution and cannot provide significant warm-water fisheries.

Several songbird species inhabit McDowell County, including numerous species of wood warblers. The county also has several species of reptiles and amphibians.

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 ratings in table 9 are intended to be used as a guide and are not site specific. Onsite investigation is needed for individual management plans.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

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

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

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

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and asters.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, yellow-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, mountain ash, viburnums, and crabapple.

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

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, cattail, Saint-John's-wort, 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, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include bobwhite quail, pheasant, whitetail deer, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, deer, and bear.

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

Engineering

Michael M. Blaine, State Conservation Engineer, Natural Resources Conservation Service, helped prepare this section.

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the “Soil Properties” section.

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

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

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

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

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

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

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

Building Site Development

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

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock 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 high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the high water table.

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

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock, depth to 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, depth to a high water table, depth to bedrock, and the available water capacity in the upper 40 inches affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

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

Table 11 also shows the suitability of the soils for use as daily cover for landfill. A rating of *good* indicates that soil properties and site features are favorable for the use and that 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, depth to a high water table, depth to bedrock, and flooding affect absorption of the effluent. Large stones and bedrock interfere with installation.

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

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. The animal waste lagoons commonly used in farming operations are not considered in the ratings. They are generally deeper than the lagoons referred to in the table and rely on anaerobic bacteria to decompose waste materials.

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, depth to a high water table, depth to bedrock, flooding, large stones, and content of organic matter.

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

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

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

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

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

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

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

Construction Materials

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

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

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

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

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

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

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

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale, siltstone, and weathered granite saprolite, 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 high water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a high 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 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 or stones, 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 or stones, have slopes of more than 15 percent, or have a high water table at or near the surface.

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

Water Management

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

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

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area. Ponds that are less than about 2 acres in size are not shown on the maps because of the scale of mapping.

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 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, mica, or salts or sodium. Depth to a high water table affects the amount of usable material. It also affects trafficability.

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

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

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

Soil Properties

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

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps.

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

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

Engineering Index Properties

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

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under the heading “Soil Series and Their Morphology.”

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages, by weight, of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. “Loam,” for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is more than 15 percent, by volume, 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.

Rock fragments 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

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

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

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

Physical and Chemical Properties

Table 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, or component, 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 the shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

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

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

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage in each major soil layer is stated in inches of water per inch of soil. 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. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time. It is the difference between the amount of soil water at field moisture capacity and the amount at wilting point.

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

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

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

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

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion. Losses are expressed in tons per acre per year. These estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.02 to 0.64. 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 over a sustained period without affecting crop productivity. The rate is expressed in tons per acre per year.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 15, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained 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 plants.

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 are assigned to one of four groups. They are grouped according to the infiltration of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep or very 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 to very 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 covering of the soil surface by flowing water, is caused by overflowing streams, by runoff from adjacent slopes, or by inflow from high tides. Shallow water standing or flowing for short periods after rainfall or snowmelt is not considered flooding. Standing water in swamps and marshes or in a closed depression is considered ponding.

Table 16 gives the frequency of flooding, generally expressed as none, rare, occasional, or frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of flooding is more than 50 percent in any year). *Common* is used when occasional and frequent classes are grouped for certain purposes.

The information on flooding is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

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

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

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

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

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is 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 high water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

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

For concrete, the risk of corrosion is also expressed as *low, moderate,* or *high*. It is based on soil texture, acidity, and the 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 *(9, 12)*. 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 on laboratory measurements. Table 17 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

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

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

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

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hapludults.

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

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

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The location of the typical pedon is described, and coordinates generally are identified by longitude and latitude. The detailed description of each soil horizon follows standards in the “Soil Survey Manual” *(11)*. Many of the technical terms used in the descriptions are defined in “Soil Taxonomy” *(9)* and in “Keys to Soil Taxonomy” *(12)*. 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

The Berks series consists of moderately deep, well drained soils that formed in material weathered from interbedded siltstone, shale, and fine-grained sandstone. These soils are on side slopes and ridgetops throughout most of the county. Slope ranges from 35 to 80 percent.

Berks soils are associated on the landscape with the well drained Dekalb and Pineville soils. The Berks soils are less sandy than Dekalb soils. They are shallower to bedrock than Pineville soils.

Typical pedon of Berks very channery loam in an area of Pineville-Berks association, very steep, extremely stony; about 2.5 miles southeast of West Virginia Route 16 and 2 miles south of U.S. Route 52 near Welch, in a wooded area; USGS Welch topographic quadrangle; lat. 37 degrees 24 minutes 08 seconds N. and long. 81 degrees 38 minutes 27 seconds W.

Oe—1 inch to 0; decomposed hardwood leaf litter.

A—0 to 3 inches; dark brown (10YR 3/3) channery loam; weak fine granular structure; very friable; many fine roots; 25 percent rock fragments; very strongly acid; abrupt smooth boundary.

BA—3 to 8 inches; yellowish brown (10YR 5/4) very channery loam; weak fine and medium subangular blocky structure; friable; common fine and very fine roots; 40 percent rock fragments; very strongly acid; clear wavy boundary.

Bw—8 to 16 inches; yellowish brown (10YR 5/6) very channery silt loam; weak medium subangular blocky structure; friable; common very fine to coarse roots; 50 percent rock fragments; strongly acid; clear wavy boundary.

C—16 to 24 inches; yellowish brown (10YR 5/6) extremely channery silt loam; weak medium subangular blocky structure; firm; common very fine to coarse roots; 75 percent rock fragments; strongly acid; abrupt wavy boundary.

Cr—24 inches; soft, rippable, fractured brown siltstone and fine-grained sandstone; many roots along fractured planes.

The thickness of the solum ranges from 18 to 40 inches. Depth to bedrock ranges from 20 to 40 inches. Rock fragments of siltstone, fine-grained sandstone, and shale make up 10 to 50 percent, by volume, of the A horizon, 15 to 75 percent of individual subhorizons of the B horizon, and 35 to 90 percent of the C horizon. The average content of rock fragments in the control section is 35 to 60 percent. Reaction ranges from extremely acid to slightly acid in the A horizon and from extremely acid to moderately acid in the B and C horizons.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 to 4.

The BA and Bw horizons have hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 4 to 8. The fine-earth material is loam or silt loam.

The C horizon has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 2 to 6. The fine-earth material is loam or silt loam.

Cedarcreek Series

The Cedarcreek series consists of very deep, well drained soils that formed in partially weathered sandstone, siltstone, shale, and some coal from surface mining. These soils are on ridgetops, benches, and side slopes throughout the county. Slope ranges from 3 to 80 percent.

Cedarcreek soils are associated on the landscape with the well drained Dekalb and Kaymine soils and the somewhat excessively drained Itmann and Sewell soils. The Cedarcreek soils are deeper to bedrock than Dekalb soils. They are more acid than Kaymine soils. They contain more clay in the substratum than Itmann and Sewell soils.

Typical pedon of Cedarcreek very channery loam in an area of Kaymine-Cedarcreek-Dekalb complex, very steep, extremely stony; about 0.5 mile northeast of U.S. Route 52 at Keystone, in a wooded area; USGS Keystone topographic quadrangle; lat. 37 degrees 24 minutes 53 seconds N. and long. 81 degrees 27 minutes 28 seconds W.

A—0 to 2 inches; brown (10YR 4/3) very channery loam; moderate fine granular structure parting to weak medium subangular blocky; friable; many fine and very fine roots; 50 percent channers and stones (60 percent mudstone, 30 percent shale, and 10 percent sandstone); strongly acid; clear wavy boundary.

C1—2 to 16 inches; grayish brown (2.5Y 5/2) very channery loam; massive; friable; common fine and very fine roots; 55 percent channers and stones (55 percent mudstone, 30 percent shale, and 15 percent sandstone); very strongly acid; clear wavy boundary.

C2—16 to 38 inches; grayish brown (2.5Y 5/2) extremely channery loam; massive; friable; 70 percent channers and stones (50 percent mudstone, 35 percent sandstone, and 15 percent shale); very strongly acid; gradual wavy boundary.

C3—38 to 65 inches; yellowish brown (10YR 5/4) extremely channery loam; massive; firm; 65 percent channers and stones (50 percent sandstone, 40 percent mudstone, and 10 percent shale); very strongly acid.

Depth to bedrock is more than 60 inches. Reaction ranges from extremely acid to strongly acid except where the surface layer has been limed. Rock fragments range from 35 to 80 percent, by volume, throughout the profile. They consist of sandstone, siltstone, shale, and coal, and the percentage of each is less than 65 percent of the total content of rock fragments in the control section. Rock fragments are mostly channers but include stones and a few boulders. Many pedons have red, brown, yellow, or gray lithochromic mottles in some or all horizons.

The A horizon is neutral in hue or has hue of 7.5YR to 2.5Y, has value of 2 to 5, and has chroma of 1 to 6. In some pedons this horizon was formed by stockpiling natural surficial soil and spreading it over the land surface. In these pedons the horizon is 4 to 20 inches thick and contains 10 to 35 percent channers.

The C horizon is neutral in hue or has hue of 7.5YR to 2.5Y, has value of 2 to 6, and has chroma of 1 to 8. The fine-earth material is loam or silt loam, but individual layers of sandy loam are included.

Chavies Series

The Chavies series consists of very deep, well drained, moderately rapidly permeable soils that formed in alluvial material washed from upland soils. These soils are on high flood plains and terraces of streams throughout the county. They are subject to rare flooding. Slope ranges from 0 to 3 percent.

Chavies soils are associated on the landscape with the well drained Yeager soils. The Chavies soils have less sand than Yeager soils and are flooded less frequently.

Typical pedon of Chavies loam; 75 feet south of the Tug Fork River, about 2,000 feet east of the confluence of Rock Branch and the Tug Fork River, in an area of idle land; USGS Iaeger topographic quadrangle; lat. 37 degrees 28 minutes 23 seconds N. and long. 81 degrees 49 minutes 17 seconds W.

Oe—2 inches to 0; undecomposed and partially decomposed leaf litter.

A—0 to 4 inches; very dark grayish brown (10YR 3/2) loam; weak medium granular structure; very friable; common fine and medium roots; slightly acid; abrupt smooth boundary.

BA—4 to 9 inches; dark brown (10YR 4/3) fine sandy loam; weak medium subangular blocky structure; very friable; common fine to coarse roots; strongly acid; clear smooth boundary.

Bt1—9 to 17 inches; dark yellowish brown (10YR 4/6) fine sandy loam; weak fine and medium subangular blocky structure; very friable; few medium and coarse dark yellowish brown (10YR 4/4) organic stains on faces of peds; common fine roots; few thin discontinuous clay films on faces of peds; strongly acid; gradual wavy boundary.

Bt2—17 to 31 inches; dark yellowish brown (10YR 4/6) sandy loam; weak medium subangular blocky structure; very friable; few fine roots; few thin discontinuous clay films on faces of peds; strongly acid; gradual wavy boundary.

BC—31 to 40 inches; dark yellowish brown (10YR 4/6) fine sandy loam that has few coarse pockets of yellowish brown (10YR 5/6) loamy fine sand; weak medium subangular blocky structure; very friable; few very fine and fine roots; strongly acid; clear wavy boundary.

C1—40 to 52 inches; dark yellowish brown (10YR 4/6) and yellowish brown (10YR 5/6) loamy fine sand; single grain; loose; few very fine and fine roots; strongly acid; clear wavy boundary.

C2—52 to 65 inches; dark yellowish brown (10YR 4/6) fine sandy loam; massive; very friable; common fine and medium brown (10YR 5/3), dark yellowish brown (10YR 4/4), and strong brown (7.5YR 5/6) redoximorphic features; strongly acid.

The thickness of the solum ranges from 30 to 50 inches. Depth to bedrock is more than 60 inches. Rock fragments make up less than 15 percent, by volume, of the profile. In unlimed areas reaction ranges from strongly acid to neutral in the topsoil and the upper part of the subsoil and from very strongly acid to moderately acid in the lower part of the subsoil and in the substratum.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 to 4. It is fine sandy loam, loam, or sandy loam.

The BA, Bt, and BC horizons have hue of 10YR, value of 4 or 5, and chroma of 4 or 6. They are fine sandy loam, sandy loam, or loam. In some pedons pockets of loamy sand occur in the lower part of the solum.

The C horizon has hue of 10YR, value of 4 to 6, and chroma of 3 to 6. It is fine sandy loam, sandy loam, or loamy sand.

Dekalb Series

The Dekalb series consists of moderately deep, well drained soils that formed in material weathered from sandstone and some interbedded siltstone. These soils are on narrow ridgetops, ridge points, and upper side slopes throughout the county. Slope ranges from 35 to 80 percent.

Dekalb soils are associated on the landscape with the well drained Berks, Cedarcreek, Gilpin, Kaymine, Lily, and Pineville soils. The Dekalb soils are shallower to bedrock than Cedarcreek, Kaymine, and Pineville soils. They contain more rock fragments in the subsoil than Gilpin and Lily soils. They have more sand in the solum than Berks soils.

Typical pedon of Dekalb channery sandy loam in an area of Kaymine-Cedarcreek-Dekalb complex, very steep, extremely stony; about 0.5 mile west of West Virginia Route 161, about 1.3 miles north of the intersection of West Virginia Route 161 and U.S. Route 52 at Elkhorn, in a wooded area; USGS Anawalt topographic quadrangle; lat. 37 degrees 22 minutes 09 seconds N. and long. 81 degrees 24 minutes 27 seconds W.

Oi—0 to 1 inch; undecomposed hardwood leaf litter.

Oe—1 to 2 inches; partially decomposed hardwood leaf litter.

A—2 to 5 inches; very dark gray (10YR 3/1) channery sandy loam; weak fine granular structure; very friable; many very fine to medium roots; 15 percent rock fragments; very strongly acid; clear wavy boundary.

BA—5 to 7 inches; dark yellowish brown (10YR 4/4) channery sandy loam; weak fine and medium granular structure; very friable; many very fine to coarse roots; 25 percent rock fragments; very strongly acid; clear wavy boundary.

Bw1—7 to 16 inches; light yellowish brown (10YR 6/4) very channery sandy loam; weak fine and medium subangular blocky structure; friable; many very fine to coarse roots; 35 percent rock fragments; very strongly acid; gradual wavy boundary.

Bw2—16 to 24 inches; light yellowish brown (10YR 6/4) very channery sandy loam; weak fine and medium subangular blocky structure; friable; common very fine to medium roots; 50 percent rock fragments; very strongly acid; gradual wavy boundary.

C—24 to 30 inches; yellowish brown (10YR 5/4) very channery sandy loam; single grain; loose; common very fine and fine roots; 50 percent rock fragments; very strongly acid; abrupt wavy boundary.

R—30 inches; hard, weathered brown sandstone.

The thickness of the solum and depth to bedrock range from 20 to 40 inches. Rock fragments make up 15 to 60 percent, by volume, of individual horizons of the solum and 50 to 90 percent of the C horizon. Reaction ranges from extremely acid to strongly acid throughout the profile.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The fine-earth material is loam or sandy loam.

Some pedons have an E horizon. This horizon has hue of 10YR, value of 5 or 6, and chroma of 1 to 4. The fine-earth material is sandy loam or loam.

The BA horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. The fine-earth material is sandy loam, loam, or fine sandy loam.

The Bw horizon has hue of 10YR, value of 5 or 6, and chroma of 4 to 8. The fine-earth material is loam, sandy loam, or fine sandy loam.

The C horizon has hue of 10YR, value of 5 or 6, and chroma of 4 to 6. The fine-earth material is sandy loam or loamy sand.

Gilpin Series

The Gilpin series consists of moderately deep, well drained, moderately permeable soils that formed in material weathered from interbedded shale, siltstone, and sandstone. These soils are on ridgetops throughout the county. Slope ranges from 15 to 35 percent.

Gilpin soils are associated on the landscape with the well drained Dekalb and Lily soils. The Gilpin soils have less rock fragments in the subsoil than Dekalb soils. They have more silt in the solum than Lily soils.

Typical pedon of Gilpin silt loam in an area of Gilpin and Lily soils, 15 to 35 percent slopes; about 300 feet north of County Road 13/2, about 3.5 miles southwest of County Road 13 at Ream, West Virginia, in a wooded area; USGS Gary topographic quadrangle; lat. 37 degrees 19 minutes 50 seconds N. and long. 81 degrees 34 minutes 52 seconds W.

Oe—1 inch to 0; undecomposed and partially decomposed leaf litter.

A—0 to 3 inches; dark brown (10YR 3/3) silt loam; weak fine and medium granular structure; very friable; many very fine to coarse roots; 10 percent rock fragments; slightly acid; clear smooth boundary.

BA—3 to 6 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine subangular blocky structure; friable; common fine to coarse roots; 10 percent rock fragments; strongly acid; gradual wavy boundary.

Bt1—6 to 14 inches; yellowish brown (10YR 5/6) channery silt loam; weak medium subangular blocky structure; friable; few faint discontinuous clay films on faces of peds; common fine and medium roots; 15 percent rock fragments; very strongly acid; gradual wavy boundary.

Bt2—14 to 24 inches; strong brown (7.5YR 5/6) and yellowish brown (10YR 5/6) silt loam; moderate medium subangular blocky structure; friable;

common distinct discontinuous clay films on faces of peds; common fine to coarse roots; 10 percent rock fragments; very strongly acid; gradual wavy boundary.

BC—24 to 31 inches; strong brown (7.5YR 5/6) and yellowish brown (10YR 5/6) channery silt loam; weak medium subangular blocky structure; friable; common distinct discontinuous clay films on faces of peds and rock fragments; few fine and medium roots; 25 percent rock fragments; very strongly acid; clear wavy boundary.

C—31 to 37 inches; strong brown (7.5YR 5/6) and yellowish brown (10YR 5/6) very channery silt loam; massive; friable; few fine and medium roots; 40 percent rock fragments; very strongly acid; clear wavy boundary.

Cr—37 inches; yellowish brown (10YR 5/6) and light olive brown (2.5Y 5/6) weathered, rippable siltstone bedrock; very strongly acid.

The thickness of the solum ranges from 18 to 36 inches. Depth to bedrock ranges from 20 to 40 inches. Rock fragments of siltstone, shale, and sandstone make up 5 to 40 percent, by volume, of individual horizons of the solum and 30 to 90 percent of the C horizon. In unlimed areas reaction ranges from extremely acid to strongly acid. In many areas the surface layer is slightly acid due to repeated burning.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 to 4. The fine-earth material is loam or silt loam.

The BA, Bt, and BC horizons have hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 4 to 8. The fine-earth material is silt loam, loam, or silty clay loam.

The C horizon has hue of 7.5YR to 2.5Y, value of 3 to 5, and chroma of 2 to 6. The fine-earth material is silt loam, loam, or silty clay loam.

Itmann Series

The Itmann series consists of very deep, somewhat excessively drained soils that formed mostly from coal and high-carbon shales and from small amounts of siltstone and sandstone. These soils are on side slopes and in valleys near coal mines or coal cleaning plants. Slope ranges from 0 to 80 percent.

Itmann soils are associated on the landscape with the well drained Cedarcreek and Kaymine soils and the somewhat excessively drained Sewell soils. The Itmann soils have a clay average in the control section that is less than that of these associated soils.

Typical pedon of Itmann extremely channery sandy loam, very steep; about 0.5 mile northeast of U.S. Route 52 at Algoma, in an area that is mostly barren but has a few scattered sweet birch trees; USGS Keystone topographic quadrangle; lat. 37 degrees 25 minutes 26 seconds N. and long. 81 degrees 25 minutes 18 seconds W.

A—0 to 2 inches; black (N 2/0) extremely channery sandy loam; weak moderate granular structure; loose; common fine and medium roots; 80 percent channers (70 percent carbolith and 30 percent siltstone); very strongly acid; clear smooth boundary.

C1—2 to 24 inches; black (N 2/0) extremely channery loam; single grain; loose; few fine roots; 80 percent channers (65 percent carbolith, 30 percent siltstone, and 5 percent sandstone); very strongly acid; gradual wavy boundary.

C2—24 to 65 inches; black (N 2/0) extremely channery sandy loam; single grain; friable; 80 percent channers (65 percent carbolith, 30 percent siltstone, and 5 percent sandstone); very strongly acid.

Depth to bedrock is more than 60 inches. Channers of carbolith, siltstone, sandstone, and shale range from 35 to 80 percent, by volume, throughout the profile. Carbolith fragments make up more than 50 percent of the total content of rock fragments in the control section. Reaction ranges from extremely acid to strongly acid except where the surface layer has been limed.

The A horizon typically is neutral in hue or has hue of 10YR, has value of 2 or 3, and has chroma of 1 or 2. In some pedons this horizon was formed by stockpiling original soil and spreading it over the land surface. In these pedons the horizon is 6 to 20 inches thick, contains 10 to 35 percent channers, and has value of 4 or 5 and chroma of 3 to 6.

The C horizon is neutral in hue or has hue of 10YR, has value of 2 or 3, and has chroma of 1 or 2. The fine-earth material is sandy loam or loam. Thin layers or pockets of loamy sand occur in some pedons.

Kaymine Series

The Kaymine series consists of very deep, well drained soils that formed in partially weathered siltstone, sandstone, shale, and some coal from the surface mining of coal. These soils are on benches and side slopes throughout the county. Slope ranges from 0 to 80 percent.

Kaymine soils are associated on the landscape with the well drained Cedarcreek and Dekalb soils and the somewhat excessively drained Sewell and Itmann soils. The Kaymine soils are less acid in the control section than Cedarcreek, Itmann, and Sewell soils. They are deeper to bedrock than Dekalb soils.

Typical pedon of Kaymine very channery loam in an area of Kaymine-Cedarcreek-Dekalb complex, very steep, extremely stony; about 1.2 miles southeast of U.S. Route 52 at the Stevens Clinic Hospital in Welch, in an area of grasses and legumes; USGS Welch topographic quadrangle; lat. 37 degrees 25 minutes 22 seconds N. and long. 81 degrees 33 minutes 31 seconds W.

A—0 to 4 inches; dark grayish brown (10YR 4/2) very channery loam; weak fine granular structure; very friable; many fine and very fine roots; 45 percent channers and stones (50 percent mudstone, 45 percent sandstone, and 5 percent coal); neutral; clear wavy boundary.

C1—4 to 14 inches; dark grayish brown (10YR 4/2) very channery loam; weak medium subangular blocky structure; friable; common fine and very fine roots; 55 percent channers and stones (55 percent mudstone and 45 percent sandstone); neutral; gradual wavy boundary.

C2—14 to 26 inches; dark grayish brown (2.5Y 4/2) extremely channery loam; massive; friable; few fine and very fine roots to a depth of 30 inches; 65 percent channers and stones (45 percent mudstone and 55 percent sandstone); neutral; gradual wavy boundary.

C3—26 to 65 inches; dark grayish brown (10YR 4/2) extremely channery loam; massive; friable; very few fine and very fine roots to a depth of 40 inches; 75 percent channers and stones (55 percent mudstone and 45 percent sandstone); neutral.

Depth to bedrock is more than 60 inches. Reaction ranges from moderately acid to mildly alkaline. Rock fragments range from 35 to 80 percent, by volume, throughout the profile. They consist of siltstone, sandstone, shale, and coal, and the percentage of each is less than 65 percent of the total content of rock fragments in the control section. Rock fragments are mostly channers but include stones and a few boulders. Many pedons have red, brown, yellow, or gray lithochromic mottles in some or all horizons.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 1 to 4. The fine-earth material is loam or silt loam. In some pedons the horizon was formed by stockpiling original soil and spreading it over the land surface. In these pedons, the A horizon is 4 to 20 inches thick and contains 10 to 35 percent channers.

The C horizon is neutral in hue or has hue of 10YR or 2.5Y, has value of 2 to 5, and has chroma of 1 to 6. The fine-earth material is loam or silt loam.

Lily Series

The Lily series consists of moderately deep, well drained soils that formed in material weathered from sandstone and some interbedded siltstone. These soils are on ridgetops and lower side slopes throughout the county. Slope ranges from 3 to 35 percent.

Lily soils are associated on the landscape with the well drained Dekalb, Gilpin, and Pineville soils. The Lily soils have more sand in the control section than Gilpin soils and contain fewer rock fragments in the control section than Dekalb soils. They are shallower to bedrock than Pineville soils.

Typical pedon of Lily loam in an area of Gilpin and Lily soils, 15 to 35 percent slopes; about 2.25 miles southeast of U.S. Route 52 at Eckman, in a wooded area; USGS Keystone topographic quadrangle; lat. 37 degrees 23 minutes 07 seconds N. and long. 81 degrees 26 minutes 38 seconds W.

Oe—1 inch to 0; decomposed and undecomposed hardwood leaf litter.

A—0 to 4 inches; very dark grayish brown (10YR 3/2) loam; weak fine granular structure; very friable; many fine to coarse roots; 5 percent rock fragments; strongly acid; abrupt wavy boundary.

BA—4 to 11 inches; yellowish brown (10YR 5/6) loam; weak fine subangular blocky structure; friable; common fine to coarse roots; 10 percent rock fragments; strongly acid; clear wavy boundary.

Bt1—11 to 18 inches; yellowish brown (10YR 5/6) channery loam; moderate medium subangular blocky structure; friable; many fine to coarse roots; 15 percent rock fragments; few faint discontinuous clay films on faces of peds and in pores; strongly acid; gradual wavy boundary.

Bt2—18 to 32 inches; yellowish brown (10YR 5/6) channery loam; moderate medium subangular blocky structure; friable; many fine to coarse roots; 30 percent rock fragments; few faint discontinuous clay films on faces of peds and in pores; strongly acid; gradual wavy boundary.

C—32 to 38 inches; yellowish brown (10YR 5/6) very channery loam; weak medium subangular blocky structure; friable; few fine and medium roots; 35 percent rock fragments; strongly acid; abrupt wavy boundary.

R—38 inches; moderately hard, fractured brown sandstone bedrock.

The thickness of the solum and depth to bedrock range from 20 to 40 inches. Rock fragments of sandstone and siltstone make up 0 to 30 percent, by volume, of individual horizons of the solum and 10 to

35 percent of the C horizon. In unlimed areas reaction ranges from extremely acid to strongly acid throughout the profile.

The A horizon has hue of 7.5YR or 10YR, value of 2 to 5, and chroma of 1 to 3.

The BA and Bt horizons have hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 4 to 8. The fine-earth material is loam, sandy clay loam, or clay loam.

The C horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 4 to 8. The fine-earth material is loam or sandy loam.

Pineville Series

The Pineville series consists of very deep, well drained soils that formed in acid colluvial material that moved downslope from soils on uplands underlain by sandstone, siltstone, and shale. These soils are on mountain side slopes and foot slopes. Slope ranges from 15 to 80 percent.

Pineville soils are associated on the landscape with the well drained Berks, Dekalb, and Lily soils. The Pineville soils are deeper to bedrock than these associated soils.

Typical pedon of Pineville channery loam in an area of Pineville-Berks association, very steep, extremely stony; about 0.25 mile north of West Virginia Route 161 and 3.5 miles north of Horsepen, in a wooded area; USGS Gary topographic quadrangle; lat. 37 degrees 15 minutes 38 seconds N. and long. 81 degrees 30 minutes 15 seconds W.

Oe—1 inch to 0; undecomposed and slightly decomposed oak and yellow-poplar leaves.

A—0 to 4 inches; very dark brown (10YR 2/2) channery loam; moderate fine granular structure; very friable; many fine and medium roots; 15 percent rock fragments; moderately acid; abrupt wavy boundary.

BA—4 to 8 inches; brown (10YR 4/4) channery loam; weak fine subangular blocky structure; many fine and medium roots; 15 percent rock fragments; strongly acid; clear wavy boundary.

Bt1—8 to 20 inches; yellowish brown (10YR 5/6) channery loam; moderate medium subangular blocky structure; friable; common fine to coarse roots; few faint discontinuous clay films on faces of peds and in pores; 15 percent rock fragments; strongly acid; clear wavy boundary.

Bt2—20 to 33 inches; yellowish brown (10YR 5/6) channery loam; moderate medium subangular blocky structure; friable; common fine and medium roots; many faint discontinuous clay films on faces of peds and in pores; 15 percent rock fragments; very strongly acid; gradual wavy boundary.

BC—33 to 44 inches; yellowish brown (10YR 5/6) channery loam; moderate coarse subangular blocky structure; friable; few fine and medium roots; 20 percent rock fragments; very strongly acid; gradual wavy boundary.

C—44 to 65 inches; dark yellowish brown (10YR 4/6) very channery sandy loam; massive; friable to firm; 35 percent rock fragments; few faint brownish yellow (10YR 6/8) redoximorphic concentrations; very strongly acid.

The thickness of the solum ranges from 40 to 60 inches. Depth to bedrock is more than 60 inches. Rock fragments range from 10 to 60 percent, by volume, in individual horizons but average 15 to 35 percent in the control section. Reaction ranges from extremely acid to neutral in the A horizon and from extremely acid to strongly acid in the B and C horizons.

The A horizon has hue of 7.5YR or 10YR, value of 2 to 4, and chroma of 1 to 3. The fine-earth material is loam.

The BA, Bt, and BC horizons have hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 4 to 8. The fine-earth material is loam, clay loam, or sandy loam.

The C horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 4 to 8. The fine-earth material is loam, sandy loam, or clay loam. In some pedons brown and yellow redoximorphic concentrations occur below a depth of 40 inches.

Sewell Series

The Sewell series consists of very deep, somewhat excessively drained soils that formed dominantly from partially weathered sandstone and from some siltstone, shale, and coal from surface mine operations. These soils are on ridgetops and contour surface mines in the central and eastern parts of the county. Slope ranges from 3 to 80 percent.

Sewell soils are associated on the landscape with the well drained Cedarcreek and Kaymine soils and the somewhat excessively drained Itmann soils. The Sewell soils contain less clay in the substratum than Cedarcreek and Kaymine soils. They are lighter in color and have less carbolithic material than Itmann soils.

Typical pedon of Sewell channery sandy loam in an area of Sewell-Rock outcrop complex, very steep, extremely stony; about 0.9 mile west of U.S. Route 52 at Powhatan, in a grassed area; USGS Keystone topographic quadrangle; lat. 37 degrees 24 minutes 10 seconds N. and long. 81 degrees 25 minutes 18 seconds W.

A—0 to 7 inches; yellowish brown (10YR 5/6) extremely channery sandy loam; weak fine granular structure; very friable; many fine and very fine roots; 65 percent stones, channers, and boulders (100 percent micaceous sandstone); very strongly acid; clear wavy boundary.

C1—7 to 31 inches; dark yellowish brown (10YR 4/6) extremely channery sandy loam; single grain; loose; very friable; few very fine roots; 65 percent stones, channers, and boulders (95 percent micaceous sandstone and 5 percent siltstone); very strongly acid; gradual wavy boundary.

C2—31 to 65 inches; yellowish brown (10YR 5/6) extremely channery sandy loam; single grain; loose; friable; 75 percent stones, channers, and boulders (100 percent micaceous sandstone); very strongly acid.

Depth to bedrock is more than 60 inches. Rock fragments range from 35 to 80 percent, by volume, throughout the profile. They are 65 percent or more sandstone and small amounts of siltstone, shale, and coal. Rock fragments are mostly stones but include channers and boulders. In unlimed areas reaction ranges from extremely acid to strongly acid.

The A horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 6. The fine-earth material is sandy loam. In some pedons the horizon was formed by spreading stockpiled original soil over the reclaimed land surface. In these pedons, the A horizon is 4 to 20 inches thick and contains 15 to 35 percent channers.

The C horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 1 to 8. The fine-earth fraction is loam or sandy loam. In some pedons the horizon has thin layers or pockets of material that consists of loamy sand or that contains up to 20 percent coal fragments.

Udorthents

Udorthents consist of a mixture of soil and rock fragments in areas that have been excavated, graded, or filled. They are generally very deep and well drained. They occur throughout the county.

Because of the variability of Udorthents, a typical pedon is not described. Depth to bedrock is generally more than 60 inches. Rock fragments of sandstone, mudstone, shale, and coal vary in size and amount. The fine-earth material is loamy sand, sandy loam, loam, silt loam, or clay loam.

Yeager Series

The Yeager series consists of very deep, well drained, rapidly permeable soils that formed in sandy alluvium washed from upland soils. These soils are on narrow, low flood plains of streams throughout the county. They are subject to occasional flooding. Slope ranges from 0 to 3 percent.

Yeager soils are associated on the landscape with the well drained Chavies soils. The Yeager soils have more sand in the control section than Chavies soils.

Typical pedon of Yeager fine sandy loam; about 1,300 feet south of U.S. Route 52, in a wooded area along Clear Fork; USGS Davy topographic quadrangle; lat. 37 degrees 26 minutes 52 seconds N. and long. 81 degrees 44 minutes 12 seconds W.

Oe—1 inch to 0; undecomposed and partially decomposed leaf litter.

A1—0 to 4 inches; dark brown (10YR 3/3) fine sandy loam; weak fine and medium granular structure; very friable; many very fine to coarse roots; moderately acid; clear wavy boundary.

A2—4 to 7 inches; dark yellowish brown (10YR 4/4) fine sandy loam and dark yellowish brown (10YR 4/6) loamy fine sand; weak medium granular structure; very friable; many very fine to coarse roots; strongly acid; clear wavy boundary.

C1—7 to 14 inches; dark yellowish brown (10YR 4/6) loamy fine sand; single grain; loose; many very fine to coarse roots; strongly acid; clear wavy boundary.

C2—14 to 22 inches; yellowish brown (10YR 5/4) loamy sand; single grain; loose; common very fine to coarse roots; moderately acid; abrupt wavy boundary.

C3—22 to 26 inches; yellowish brown (10YR 5/6) fine sandy loam and dark yellowish brown (10YR 4/6) loamy fine sand; massive; very friable; many very fine to coarse roots; moderately acid; clear wavy boundary.

C4—26 to 42 inches; yellowish brown (10YR 5/4) and dark yellowish brown (10YR 4/6) loamy fine sand; single grain; loose; many fine and medium roots; slightly acid; clear wavy boundary.

2C5—42 to 56 inches; yellowish brown (10YR 5/4) loamy fine sand; single grain; loose; common light yellowish brown (10YR 6/4) sand pockets; few fine and medium roots; 5 percent rock fragments; slightly acid; clear wavy boundary.

2C6—56 to 62 inches; dark yellowish brown (10YR 4/6) cobbly loamy sand; single grain; loose; few fine roots; 20 percent rock fragments; few medium grayish brown (2.5Y 5/2) iron depletions and strong brown (7.5YR 4/6) masses of iron accumulation; neutral; clear wavy boundary.

2C7—62 to 65 inches; dark yellowish brown (10YR 4/6) and yellowish brown (10YR 5/4) cobbly sandy loam; massive; very friable; 30 percent rock fragments; many medium and coarse grayish brown (2.5Y 5/2) iron depletions and few medium strong brown (7.5YR 4/6) masses of iron accumulation; neutral.

Depth to bedrock is more than 60 inches. The content of rock fragments is less than 15 percent, by volume, above a depth of 40 inches and ranges from 0 to 50 percent below a depth of 40 inches. In unlimed areas reaction ranges from strongly acid to mildly alkaline.

The A horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4. It is fine sandy loam, loam, or loamy fine sand. In some areas the horizon may have loamy sand or sand overwash from recent flooding.

The C horizon has hue of 2.5Y or 10YR, value of 3 to 5, and chroma of 2 to 6. Above a depth of 40 inches, it is fine sandy loam, loamy sand, or sand. In some pedons, below a depth of 40 inches, loamy, silty, or cobbly sediments occur. Redoximorphic features in shades of gray to red occur below a depth of 48 inches in many pedons.

Formation of the Soils

The development of the soils in McDowell County is explained in this section. The five major factors of soil formation are identified, and their influence on the soils in the county is described. Also discussed is the morphology of the soils.

Factors of Soil Formation

The soils in McDowell County formed as a result of the interaction of the five major factors of soil formation—parent material, time, climate, living organisms, and topography *(6)*. Each factor influences the effect of the others. Differences in parent material, topography, and time have resulted in the major differences among the soils in the county. Generally, climate and living organisms influence soil formation relatively uniformly over broad areas.

Parent Material, Time, and Climate

The characteristics of the parent material strongly influence the amount of time required for soil formation and the characteristics of the soil that forms. The soils in McDowell County formed in residual, colluvial, and alluvial parent materials. They formed from material weathered from interbedded shale, siltstone, and sandstone. For example, Gilpin soils formed in material weathered from interbedded shale, siltstone, and fine-grained sandstone and Lily soils formed in material weathered from sandstone.

Residual material formed from the physical and chemical weathering of geologic materials in place. Residuum is the oldest parent material in the county. Soil formation in residuum has been limited by resistant rock, slope, and constant erosion.

Colluvial material occurs along foot slopes, on side slopes, and at the head of drainageways. This material moved downslope from areas of residual soil over varying periods of time. The colluvial Pineville soils formed below areas of the residual Berks, Dekalb, Gilpin, and Lily soils.

Alluvial material, which washed from soils on uplands, occurs on low terraces and flood plains. The soil-forming processes have acted on the material on low terraces for a considerable amount of time. Chavies soils, which are on low terraces and high flood plains, exhibit more profile development than Yeager soils, which occur on low flood plains. Yeager soils, the youngest natural soils mapped in McDowell County, formed in relatively recent deposits of alluvial material.

The climate is relatively uniform throughout the survey area. Although rainfall and temperature are significant in soil formation, they do not vary sufficiently across the county to cause differences in soil development. A detailed description of climate is given in the section “General Nature of the County.”

Living Organisms

Living organisms, including plants, animals, bacteria, fungi, and humans, affect soil formation. The kind and amount of vegetation are generally responsible for the organic content matter and color of the surface layer and are partly responsible for the content of plant nutrients in the soil. Earthworms and burrowing animals keep the soil open and porous and can be a significant source of organic matter and plant nutrients. By moving soil to the surface and creating passageways underground, they mix mineral and organic matter. Fungi and bacteria decompose organic matter, releasing plant nutrients.

Human activities also influence soil formation. Soil characteristics are disturbed by such activities as deforestation, plowing, and mining. Human activities have added fertilizer, mixed some of the soil horizons, and moved soil and rock from place to place. Soils have been disturbed on more than 17,500 acres in McDowell County by the surface mining of coal. The process of excavation and mixing of original soils and underlying bedrock, followed by reclamation activities, results in a newly formed soil having very little profile development. Kaymine soils are an example of very deep, nonacid soils that result from surface mining.

Topography

Topography affects soil formation by controlling the amount of water moving through the soil and the amount and rate of water moving over the soil as runoff. The topographic position on the landscape determines whether or not a soil forms in a depositional or erosional environment.

Large amounts of water have moved through gently sloping and strongly sloping soils. As a result, these soils have a moderately developed to well developed profile. On steep and very steep mountain side slopes, less water moves through the soil profile and the amount and rate of runoff are greater. In these areas, soil material may be washed away nearly as rapidly as it forms. The complex interaction of slope, runoff, and percolation over long periods of time and through changes in climate produces the patterns of residual, colluvial, and alluvial soils as they occur on the landscape.

The topography of McDowell County favors the formation of flood plains. Soils on flood plains are weakly developed because too little time has elapsed for the development of well defined soil horizons.

Morphology of the Soils

The results of the soil-forming processes are evident in the different layers, or horizons, in the soil profile. The profile extends from the surface downward to material that is relatively unaltered by the soil-forming processes. Most soils have three major horizons, called the A, B, and C horizons.

The A horizon is the surface layer and generally has the maximum amount of organic matter, which makes it darker than the underlying horizons. It is the layer of maximum leaching, or eluviation, of clay and iron.

The B horizon underlies the A horizon and is commonly called the subsoil. It is characterized by blocky structure and is firmer and lighter in color than the A horizon. It is the layer of maximum accumulation, or illuviation, of clay, iron, aluminum, and other constituents leached from the overlying layers.

The C horizon occurs below the A and B horizons. It is composed of weathered material that is little changed by the soil-forming processes.

Soil horizons are formed by the interaction of many processes. Some of the more important ones are the accumulation of organic matter; the leaching of soluble salts; the reduction, transport, and oxidation of iron; the formation and translocation of clay minerals; and the formation of soil structure. These processes have been taking place for thousands of years.

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Glossary

Access road. A road constructed to facilitate the use and management of the land. Access roads are designed for limited traffic and typically consist of a cut slope, a roadbed, and a fill outslope.

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.

Alluvial fan. The fanlike deposit of a stream where it issues from a gorge upon a plain or of a tributary stream near or at its junction with its main stream.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Alpha,alpha-dipyridyl. A dye that when dissolved in 1N ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction indicates a type of redoximorphic feature.

Animal unit month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Aquifer. A water-bearing bed or stratum of permeable rock, sand, or gravel capable of fielding considerable quantities of water to wells or springs.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Aspect. The direction in which a slope faces. Generally, cool aspects are north- to east-facing and warm aspects are south- to west-facing.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Atterberg limits. Atterberg limits are measured for soil materials passing the No. 40 sieve. They include the liquid limit (LL), which is the moisture content at which the soil passes from a plastic to a liquid state, and the plasticity index (PI), which is the water content corresponding to an arbitrary limit between the plastic and semisolid states of consistency of a soil.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 40-inch profile or to a limiting layer is expressed as:

Very low	0 to 2.4
Low	2.4 to 3.2
Moderate	3.2 to 5.2
High	more than 5.2

Back slope. The geomorphic component that forms the steepest inclined surface and principal element of many hillsides. Back slopes in profile are commonly steep, are linear, and may or may not include cliff segments.

Basal area. The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Bedding planes. Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedding system. A drainage system made by plowing, grading, or otherwise shaping the surface of a flat field. It consists of a series of low ridges separated by shallow, parallel dead furrows.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Bedrock escarpment. An intermittent to continuous band of rock outcrop commonly more than 50 feet in length and 5 feet wide. Commonly associated with moderately steep to very steep soils.

Benchmark soil. A soil of large extent that holds a key position in the soil classification system or is of special significance to farming, engineering, forestry, or other uses.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Breast height. An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Brush management. Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Cable yarding. A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, felled trees generally are reeled in while one end is lifted or the entire log is suspended.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Canyon. A long, deep, narrow, very steep-sided valley with high, precipitous walls in an area of high local relief.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Carbolith. Dark-colored sedimentary rock that makes a black or very dark (Munsell value of 3 or less) streak or powder. It includes coal, bone coal, high-carbon shales, and high-carbon mudstone. Generally, this material contains at least 25 percent carbonaceous matter oxidizable at 350 to 400 degrees C.

Catena. A sequence, or “chain,” of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Cement rock. Shaly limestone used in the manufacture of cement.

Channery soil material. Soil material that is, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a channer.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions. Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese and the removal of iron, manganese, and clay. A type of redoximorphic depletion.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that is 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane. They typically take the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.

Congeliturbate. Soil material disturbed by frost action.

Conglomerate. A coarse-grained, clastic rock composed of rounded or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer textured material. Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the “Soil Survey Manual.”

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cove. The steep or very steep, concave colluvial area at the head of drainageways in piedmont and mountainous areas. Coves commonly have higher tree site indexes than surrounding slopes.

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.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Culmination of the mean annual increment (CMAI). The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Dbh (diameter at breast height). The diameter of a tree at 4.5 feet above the ground level on the uphill side.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Delineation. The process of drawing or plotting features on a map with lines and symbols.

Delta. A body of alluvium having a surface that is nearly flat and fan shaped; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Dip slope. A slope of the land surface, roughly determined by and approximately conforming to the dip of the underlying bedrock.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divided-slope farming. A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the slope to reduce the hazard of water erosion. One strip is in a close-growing crop that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit a full stripcropping pattern to be used.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained*. These classes are defined in the “Soil Survey Manual.”

Drainage, surface. Runoff, or surface flow of water, from an area.

Draw. A small stream valley that generally is more open and has broader bottom land than a ravine or gulch.

Duff. A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Engineering index test data. Laboratory test and mechanical analysis of selected soils in the county.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Exposed material is hard or soft bedrock. Areas identified on the detailed soil maps by a special symbol typically are long, narrow bands that are less than 2 acres in size. Synonym: scarp.

Evapotranspiration. The combined loss of water from a given area through surface evaporation and through transpiration by plants during a specified period.

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 grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fan terrace. A relict alluvial fan, no longer a site of active deposition, incised by younger and lower alluvial surfaces.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity*.

Fill slope. A sloping surface consisting of excavated soil material from a road cut. It commonly is on the downhill side of the road.

Fine textured soil. Sandy clay, silty clay, or clay.

Firebreak. An area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flaggy soil material. Material that is, by volume, 15 to 35 percent flagstones. Very flaggy soil material is 35 to 60 percent flagstones, and extremely flaggy soil material is more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flooding. The temporary covering of the soil surface by flowing water from any source, such as overflowing streams, runoff from adjacent or surrounding slopes, and inflow from high tides. The frequency of flooding generally is expressed as none, rare, occasional, or frequent. *None* means that flooding is not probable. *Rare* means that flooding is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year). *Occasional* means that flooding occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year). *Frequent* means that flooding occurs often under normal weather conditions (the chance of flooding is more than 50 percent in any year). The duration of flooding is expressed as *very brief* (less than 2 days), *brief* (2 to 7 days), *long* (7 days to 1 month), and *very long* (more than 1 month).

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.

Foothill. A steeply sloping upland that has relief of as much as 1,000 feet (300 meters) and fringes a mountain range or high-plateau escarpment.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors which differentiate it from other stands.

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.

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.

Gilgai. Commonly, a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of clayey soils that shrink and swell considerably with changes in moisture content.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of the material below the water table.

Gully. A very small channel with steep sides cut by running water and through which water ordinarily runs only after rainfall, icemelt, or snowmelt. 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. Areas identified on the detailed soil maps by a special symbol typically are less than 2 acres in size.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head out. To form a flower head.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-residue crops. Such crops as small grain and corn that are used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above the surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the “Soil Survey Manual.” The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Iron depletions. Low-chroma zones that have a low content of iron and manganese oxide because of chemical reduction and removal but also have a clay content similar to that of the adjacent matrix. A type of redoximorphic depletion.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Knoll. A small, low, rounded hill rising above adjacent landforms.

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Lithochromic mottles. Mottles that have colors derived from the parent rocks, as exposed to pedogenic processes.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine-grained material, dominantly of silt-sized particles, deposited by the wind.

Low-residue crops. Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.

Mean annual increment. The average annual volume of a stand of trees from the year of origin to the age under consideration.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

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.

Mine or quarry (map symbol). An open excavation from which the soil and underlying material have been removed, exposing bedrock; or the surface opening to underground mines. Areas identified on the detailed soil maps by a special symbol typically are less than 2 acres in size.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Mine soil. A relatively young soil that formed in earthy materials from deep or surface mining of coal.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Mountain. A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of restricted summit area (relative to a plateau), and generally having steep sides. A mountain can occur as a single, isolated mass or in a group forming a chain or range.

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mudstone. Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules. Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. If formed in place, nodules of iron oxide or manganese oxide are considered types of redoximorphic concentrations.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outslope. The exposed area sloping down and away from the bench section of a surface mine.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it generally is low in relief.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called “a soil.” A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Permafrost. Layers of soil, or even bedrock, occurring in arctic or subarctic regions, in which a temperature below freezing has existed continuously for a long time.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as "saturated hydraulic conductivity," which is defined in the "Soil Survey Manual." In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as "permeability." Terms describing permeability, measured in inches per hour, are as follows:

Extremely slow	0.0 to 0.01 inch
Very slow	0.01 to 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plateau. An extensive upland mass having a relatively flat summit area that is considerably elevated (more than 100 meters) above adjacent lowlands and separated from them on one or more sides by escarpments.

Playa. The generally dry and nearly level lake plain that occupies the lowest parts of closed depressional areas, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid or very rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse-grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Potential native plant community. See Climax plant community.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. Deliberately burning an area for specific management purposes, under the appropriate weather conditions and soil moisture conditions and at the proper time of day.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Red beds. Sedimentary strata that are mainly red and are made up largely of sandstone and shale.

Redoximorphic concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. They indicate chemical reduction and oxidation resulting from saturation.

Redoximorphic depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. They indicate the chemical reduction of iron resulting from saturation.

Redoximorphic features. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation. Descriptive terms for concentrations and depletions 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).

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.

Reforestation. The process in which tree seedlings are planted or become naturally established in an area that was once forested.

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Ridge. A long, narrow elevation of the land surface, commonly having a sharp crest and steep sides.

Rill. A steep-sided channel resulting from accelerated erosion. A rill generally is a few inches deep and not wide enough to be an obstacle to farm machinery.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rock outcrop. An area of exposed bedrock in a map unit that has less than 0.1 percent exposed bedrock. Areas identified on the detailed soil maps by a special symbol typically are less than 2 acres in size.

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 ranging from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saprolite. Unconsolidated residual material underlying the soil and grading to hard bedrock below.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Second bottom. The first terrace above the normal flood plain (or first bottom) of a river.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Side slope. The landscape position that is directly below the shoulder and directly above the toe slope. It makes up most of the mountainside or hillside.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

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.

Silviculture. A branch of forestry concerned with the maintenance and development of forests for the sustained production of forest products.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Skidding. A method of moving felled trees to a nearby central area for transport to a processing facility. Most systems involve pulling the trees with wire cables attached to a bulldozer or a rubber-tired tractor. Generally, felled trees are skidded or pulled with one end lifted to reduce friction and soil disturbance.

Skid trails. The paths left by skidding logs and the bulldozer or tractor used to pull them.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey, classes for simple slopes are as follows:

Nearly level	0 to 3 percent
Gently sloping	3 to 8 percent
Strongly sloping	8 to 15 percent
Moderately steep	15 to 25 percent
Steep	25 to 35 percent
Very steep	35 to 55 percent
Extremely steep	35 to 80 percent and higher

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil creep. The slow mass movement of soil and soil materials downslope, primarily under the influence of gravity, facilitated by water saturation and by alternating periods of freezing and thawing.

Soil map unit. A kind of soil or miscellaneous area or a combination of two or more soils or one or more soils and one or more miscellaneous areas that can be shown at the scale of mapping for the defined purposes and objectives of the soil survey. Soil map units generally are designed to reflect significant differences in use and management among the soils of a survey area.

Soil sample site (map symbol). The location of a typifying pedon in the survey area.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Soil strength. The load-supporting capacity of a soil at specific moisture and density conditions.

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Spoil area. An area where earthy material has been piled and either smoothed or left uneven. Areas identified on the detailed soil maps by a special symbol typically are less than 2 acres in size.

Stand density. The degree to which an area is covered with living trees. It is usually expressed in units of basal areas per acre, number of trees per acre, or the percentage of ground covered by the tree canopy as viewed from above.

Stone line. A concentration of rock fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer. 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.”

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Talus. Fragments of rock and other soil material accumulated by gravity at the foot of cliffs or steep slopes.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying “coarse,” “fine,” or “very fine.”

Thin layer (in tables). Otherwise suitable soil material that is too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topography. The relative positions and elevations of the natural or manmade features of an area that describe the configuration of its surface.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Understory. The trees and other woody species growing under a more or less continuous cover of branches and foliage formed collectively by the upper portions of adjacent trees and other woody growth.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and to divert water off and away from the road surface. Water bars can be easily driven over if they are constructed properly.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse-grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The uprooting and tipping over of trees by the wind.

Yarding paths. The paths left by cable-yarded logs as they were pulled uphill or downhill to a nearby area.

Yield (forest land). The volume of wood fiber from trees harvested in a certain unit of area. Yield is usually measured in board feet or cubic feet per acre.

Tables

Table 1.—Temperature and Precipitation

(Recorded in the period 1951-86 at Gary, West Virginia)

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January-----	43.1	20.8	32.0	71	-8	64	3.03	1.67	4.00	8	6.2
February----	46.8	22.6	34.7	73	-1	69	3.05	1.65	3.99	8	5.7
March-------	55.6	29.9	42.8	82	10	173	3.69	1.94	5.11	9	2.7
April-------	67.2	38.6	52.9	88	21	387	3.56	2.14	4.67	9	.2
May---------	75.8	47.6	61.7	90	29	673	4.00	2.66	5.22	9	.0
June--------	82.1	55.9	69.0	92	40	870	3.49	1.91	4.67	8	.0
July--------	85.4	60.8	73.1	95	47	1,026	4.49	2.76	5.92	9	.0
August------	84.5	60.1	72.3	94	47	1,001	3.91	2.71	5.00	7	.0
September---	79.1	53.2	66.2	92	35	786	2.98	1.23	4.11	6	.0
October-----	68.7	40.8	54.8	85	21	464	2.68	1.07	3.95	6	.0
November----	57.4	31.3	44.4	79	13	176	2.86	1.72	3.77	7	.8
December----	47.3	24.5	35.9	74	1	84	2.80	1.40	3.82	7	3.3
Yearly:											
Average---	66.1	40.5	53.3	---	---	---	---	---	---	---	---
Extreme---	---	---	---	96	-8	---	---	---	---	---	---
Total-----	---	---	---	---	---	5,773	40.54	35.37	44.98	93	18.9

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40 degrees F).

Table 2.—Freeze Dates in Spring and Fall

(Recorded in the period 1951-86 at Gary, West Virginia)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	Apr. 21	May 5	May 19
2 years in 10 later than--	Apr. 16	Apr. 29	May 13
5 years in 10 later than--	Apr. 6	Apr. 18	May 1
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 20	Oct. 15	Sept. 30
2 years in 10 earlier than--	Oct. 25	Oct. 19	Oct. 5
5 years in 10 earlier than--	Nov. 1	Oct. 26	Oct. 15

Table 3.—Growing Season

(Recorded in the period 1951-86 at Gary, West 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	190	169	142
8 years in 10	197	176	150
5 years in 10	209	190	166
2 years in 10	221	204	182
1 year in 10	228	212	191

Table 4.—Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
BrF	Berks-Rock outcrop complex, extremely steep, extremely stony	13,820	4.0
CeB	Cedarcreek very channery loam, 3 to 15 percent slopes, very stony	760	0.2
CrF	Cedarcreek-Rock outcrop complex, very steep, extremely stony	2,720	0.8
Cv	Chavies loam	385	0.1
GlE	Gilpin and Lily soils, 15 to 35 percent slopes	13,865	4.0
ItF	Itmann extremely channery sandy loam, very steep	2,060	0.6
KaB	Kaymine very channery loam, 3 to 15 percent slopes, very stony	590	0.2
KcF	Kaymine-Cedarcreek-Dekalb complex, very steep, extremely stony	15,960	4.7
KrF	Kaymine-Rock outcrop complex, very steep, extremely stony	3,645	1.1
LlC	Lily loam, 3 to 15 percent slopes	930	0.3
PBF	Pineville-Berks association, very steep, extremely stony	275,215	80.4
PlE	Pineville-Lily complex, 15 to 35 percent slopes, very stony	3,370	1.0
SeB	Sewell extremely channery sandy loam, 3 to 15 percent slopes, very stony	260	0.1
SrF	Sewell-Rock outcrop complex, very steep, extremely stony	330	0.1
Ud	Udorthents, smoothed	645	0.2
Ur	Urban land-Chavies complex	5,360	1.5
Ye	Yeager fine sandy loam	2,130	0.6
	Areas of water	355	0.1
	Total	342,400	100.0

Table 5.—Land Capability and Yields per Acre of Crops and Pasture

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Land capability	Corn	Wheat	Grass-legume hay	Kentucky bluegrass
		Bu	Bu	Tons	AUM*
BrF: Berks-Rock outcrop	VIIs	---	---	---	---
CeB: Cedarcreek	VIs	---	---	---	3.0
CrF: Cedarcreek-Rock outcrop	VIIs	---	---	---	---
Cv: Chavies	I	120	45	3.5	5.5
GlE: Gilpin and Lily	VIe	---	---	2.5	4.0
ItF: Itmann	VIIs	---	---	---	---
KaB: Kaymine	VIs	---	---	---	3.0
KcF: Kaymine-Cedarcreek-Dekalb	VIIs	---	---	---	---
KrF: Kaymine-Rock outcrop	VIIs	---	---	---	---
LlC: Lily	IIIe	85	30	3.0	4.5
PBF: Pineville-Berks	VIIs	---	---	---	---
PlE: Pineville-Lily	VIIs	---	---	---	---
SeB: Sewell	VIs	---	---	---	2.5
SrF: Sewell-Rock outcrop	VIIs	---	---	---	---
Ud. Udorthents					
Ur. Urban land-Chavies					
Ye: Yeager	IIw	90	30	3.5	5.0

* Animal unit month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

Table 6.—Capability Classes and Subclasses

(Miscellaneous areas are excluded. Absence of an entry indicates no acreage)

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I	385	---	---	---
II	2,130	---	2,130	---
III	930	930	---	---
IV	---	---	---	---
V	---	---	---	---
VI	15,475	13,865	---	1,610
VII	315,060	---	---	315,060
VIII	2,060	---	---	2,060

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. For map units having slopes of more than 15 percent, site index is given for north aspects. Site index on south aspects generally is 5 to 10 points lower)

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Plant competition	Potential productivity: Common trees	Site index	Average annual growth*: Cubic feet/acre	Board feet/acre	Cords/acre
BrF**:										
Berks	4R	Severe	Severe	Moderate	Moderate	Northern red oak	75	57	215	0.74
						Black oak	71	53	187	0.68
						Yellow-poplar	103	112	622	1.29
						White oak	71	53	187	0.68
						Red maple	---	---	---	---
						Chestnut oak	---	---	---	---
Rock outcrop.										
CeB: Cedarcreek	4F	Slight	Slight	Moderate	Moderate	Northern red oak	80	62	250	0.81
						Eastern white pine	94	174	780	---
						Yellow-poplar	105	115	650	1.32
						American sycamore	90	---	---	---
						Black locust	100	---	---	---
						Red maple	---	---	---	---
						Sourwood	---	---	---	---
						Virginia pine	---	---	---	---
CrF**:										
Cedarcreek	4R	Severe	Severe	Severe	Moderate	Northern red oak	80	62	250	0.81
						Eastern white pine	94	174	780	---
						Yellow-poplar	105	115	650	1.32
						American sycamore	90	---	---	---
						Black locust	---	---	---	---
						Red maple	---	---	---	---
						Sourwood	---	---	---	---
						Virginia pine	---	---	---	---
Rock outcrop.										
Cv: Chavies	5A	Slight	Slight	Slight	Severe	Northern red oak	86	68	292	0.89
						Yellow-poplar	96	100	524	1.15
						Black cherry	---	---	---	---
						White oak	---	---	---	---
						American sycamore	---	---	---	---
GlE**:										
Gilpin	5R	Moderate	Moderate	Moderate	Moderate	Northern red oak	84	66	278	0.87
						Yellow-poplar	95	98	510	1.14
						Black oak	82	64	264	0.84
						White oak	75	63	257	0.82
						Scarlet oak	81	57	215	0.74
Lily	5R	Moderate	Moderate	Moderate	Moderate	Northern red oak	84	66	278	0.87
						Black oak	85	67	285	0.88
						White oak	80	62	250	0.81
						Chestnut oak	76	58	222	0.75
						Yellow-poplar	95	98	510	1.14
						Scarlet oak	90	72	320	0.95

See footnotes at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordi-nation symbol	Management concerns: Erosion hazard	Management concerns: Equip-ment limita-tion	Management concerns: Seedling mortal-ity	Management concerns: Plant competi-tion	Potential productivity: Common trees	Potential productivity: Site index	Average annual growth*: Cubic feet/ acre	Average annual growth*: Board feet/ acre	Average annual growth*: Cords/ acre
ItF------------ Itmann	---	Severe	Severe	Severe	Moderate	Red maple----------	---	---	---	---
						Sweet birch---------	---	---	---	---
						Black locust--------	---	---	---	---
						Virginia pine-------	---	---	---	---
						Shortleaf pine------	---	---	---	---
KaB------------ Kaymine	4F	Slight	Slight	Moderate	Moderate	Northern red oak----	80	62	250	0.81
						Eastern white pine--	94	174	780	---
						Yellow-poplar-------	105	115	650	1.32
						American sycamore---	90	---	---	---
						Black locust--------	100	---	---	---
						Red maple-----------	---	---	---	---
KcF**:										
Kaymine--------	4R	Severe	Severe	Severe	Moderate	Northern red oak----	80	62	250	0.81
						Eastern white pine--	94	174	780	---
						Yellow-poplar-------	105	115	650	1.32
						American sycamore---	90	---	---	---
						Black locust--------	---	---	---	---
						Red maple-----------	---	---	---	---
Cedarcreek-----	4R	Severe	Severe	Severe	Moderate	Northern red oak----	80	62	250	0.81
						Eastern white pine--	94	174	780	---
						Yellow-poplar-------	105	115	650	1.32
						American sycamore---	90	---	---	---
						Black locust--------	---	---	---	---
						Red maple-----------	---	---	---	---
						Sourwood------------	---	---	---	---
						Virginia pine-------	---	---	---	---
Dekalb---------	4R	Severe	Severe	Moderate	Moderate	Northern red oak----	73	55	201	0.71
						Black oak-----------	71	53	187	0.68
						Scarlet oak---------	74	56	208	0.73
						Yellow-poplar-------	---	---	---	---
						Chestnut oak--------	---	---	---	---
						Red maple-----------	---	---	---	---
KrF**:										
Kaymine--------	4R	Severe	Severe	Severe	Moderate	Northern red oak----	80	62	250	0.81
						Eastern white pine--	94	174	780	---
						Yellow-poplar-------	105	115	650	1.32
						American sycamore---	90	---	---	---
						Black locust--------	---	---	---	---
						Red maple-----------	---	---	---	---
Rock outcrop.										
LlC------------ Lily	5A	Slight	Slight	Slight	Severe	Northern red oak----	84	66	278	0.87
						Virginia pine-------	---	---	---	---
						Black oak-----------	85	67	285	0.88
						White oak-----------	80	62	250	0.81
						Chestnut oak--------	76	58	222	0.75
						Yellow-poplar-------	95	98	510	1.14
						Scarlet oak---------	90	72	320	0.95

See footnotes at end of table.

Table 7.—Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Potential productivity: Common trees	Site index	Average annual growth*: Cubic feet/acre	Board feet/acre	Cords/acre
PBF**:										
Pineville	5R	Severe	Severe	Moderate	Severe	Northern red oak	90	72	320	0.95
						Yellow-poplar	108	121	692	1.38
						Black oak	85	67	285	0.88
						Basswood	---	---	---	---
						Hickory	---	---	---	---
						White oak	80	62	250	0.81
						White ash	---	---	---	---
Berks	4R	Severe	Severe	Moderate	Moderate	Northern red oak	75	57	215	0.74
						Black oak	71	53	187	0.68
						White oak	71	53	187	0.68
						Yellow-poplar	103	112	622	1.29
						Scarlet oak	---	---	---	---
						Chestnut oak	---	---	---	---
PlE**:										
Pineville	5R	Moderate	Moderate	Moderate	Severe	Northern red oak	90	72	320	0.95
						Yellow-poplar	108	121	692	1.38
						Black oak	85	67	285	0.88
						Hickory	---	---	---	---
						White oak	85	67	285	0.88
						White ash	---	---	---	---
Lily	5R	Moderate	Moderate	Moderate	Severe	Northern red oak	84	66	278	0.87
						Scarlet oak	90	72	320	0.95
						Black oak	85	67	285	0.88
						White oak	80	62	250	0.81
						Hickory	---	---	---	---
						Red maple	---	---	---	---
						Chestnut oak	76	58	222	0.75
						Yellow-poplar	95	98	510	1.14
SeB: Sewell	4F	Slight	Slight	Severe	Moderate	Northern red oak	75	57	215	0.74
						Eastern white pine	94	174	780	---
						Yellow-poplar	95	98	510	1.14
						American sycamore	90	---	---	---
						Black locust	---	---	---	---
						Red maple	---	---	---	---
						Sourwood	---	---	---	---
						Virginia pine	---	---	---	---
SrF**:										
Sewell	4R	Severe	Severe	Severe	Moderate	Northern red oak	75	57	215	0.74
						Eastern white pine	94	174	780	---
						Yellow-poplar	95	98	510	1.14
						American sycamore	90	---	---	---
						Black locust	---	---	---	---
						Red maple	---	---	---	---
						Sourwood	---	---	---	---
						Sassafras	---	---	---	---
						Virginia pine	---	---	---	---
Rock outcrop.										

See footnotes at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Potential productivity: Common trees	Site index	Average annual growth*: Cubic feet/acre	Board feet/acre	Cords/acre
Ur**:										
Urban land.										
Chavies----------	5A	Slight	Slight	Slight	Severe	Northern red oak----	86	68	292	0.89
						Yellow-poplar-------	96	100	524	1.15
						Black cherry--------	---	---	---	---
						White oak-----------	---	---	---	---
						American sycamore---	---	---	---	---
Ye-------------- Yeager	5A	Slight	Slight	Moderate	Severe	Northern red oak----	85	67	285	0.88
						Yellow-poplar-------	90	90	440	1.04
						Boxelder------------	---	---	---	---
						American beech------	---	---	---	---
						Black cherry--------	---	---	---	---
						American sycamore---	---	---	---	---

* Average annual growth is equal to total volume growth at rotation divided by rotation age. Actual annual growth varies with stand vigor and other factors. Yield data are based on site indices of natural stands at age 50 using the International 1/4 Log Rule and standard rough cords. This information should be used for planning only.

** 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
BrF*:					
Berks	Severe: slope, small stones.	Severe: slope, small stones.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: small stones, slope.
Rock outcrop.					
CeB Cedarcreek	Variable	Variable	Variable	Variable	Variable.
CrF*:					
Cedarcreek	Variable	Variable	Variable	Variable	Variable.
Rock outcrop.					
Cv Chavies	Severe: flooding.	Slight	Moderate: small stones.	Slight	Slight.
GlE*:					
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Moderate**: slope.	Severe: slope.
Lily	Severe: slope.	Severe: slope.	Severe: slope.	Moderate**: slope.	Severe: slope.
ItF Itmann	Variable	Variable	Variable	Variable	Variable.
KaB Kaymine	Variable	Variable	Variable	Variable	Variable.
KcF*:					
Kaymine	Variable	Variable	Variable	Variable	Variable.
Cedarcreek	Variable	Variable	Variable	Variable	Variable.
Dekalb	Severe: slope, small stones.	Severe: slope, small stones.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: small stones, slope.
KrF*:					
Kaymine	Variable	Variable	Variable	Variable	Variable.
Rock outcrop.					
LlC Lily	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope, depth to rock.

See footnotes at end of table.

Table 8.—Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
PBF*:					
Pineville	Slope, large stones.	Slope, large stones.	Severe: large stones, slope.	Severe: slope.	Severe: slope.
Berks	Severe: slope, small stones.	Severe: slope, small stones.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: small stones, slope.
PlE*:					
Pineville	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: slope.	Severe: slope.
Lily	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: slope.	Severe: slope.
SeB Sewell	Variable	Variable	Variable	Variable	Variable.
SrF*:					
Sewell	Variable	Variable	Variable	Variable	Variable.
Rock outcrop.					
Ud. Udorthents					
Ur*:					
Urban land	Variable	Variable	Variable	Variable	Variable.
Chavies	Severe: flooding.	Slight	Moderate: small stones.	Slight	Slight.
Ye Yeager	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: droughty, flooding.

* See description of the map unit for composition and behavior characteristics of the map unit.
** Rating is for areas where slopes are less than 35 percent.

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: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
BrF*:										
Berks	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Fair	Very poor.
Rock outcrop.										
CeB Cedarcreek	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
CrF*:										
Cedarcreek	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
Rock outcrop.										
Cv Chavies	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Poor.
GlE*:										
Gilpin	Very poor.	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Lily	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
ItF Itmann	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
KaB Kaymine	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
KcF*:										
Kaymine	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
Cedarcreek	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
Dekalb	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
KrF*:										
Kaymine	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
Rock outcrop.										
LlC Lily	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Fair	Very poor.
PBF*:										
Pineville	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.

See footnote at end of table.

Table 9.—Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
PBF*:										
Berks	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Fair	Very poor.
PlE*:										
Pineville	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Lily	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
SeB Sewell	Very poor.	Very poor.	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
SrF*:										
Sewell	Very poor.	Very poor.	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Rock outcrop.										
Ud. Udorthents										
Ur*: Urban land.										
Chavies	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Poor.
Ye Yeager	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 10.—Building Site Development

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
BrF*:						
Berks	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
Rock outcrop.						
CeB Cedarcreek	Variable	Variable	Variable	Variable	Variable	Variable.
CrF*:						
Cedarcreek	Variable	Variable	Variable	Variable	Variable	Variable.
Rock outcrop.						
Cv Chavies	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.
GlE*:						
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Lily	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
ItF Itmann	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Variable.
KaB Kaymine	Variable	Variable	Variable	Variable	Variable	Variable.
KcF*:						
Kaymine	Variable	Variable	Variable	Variable	Variable	Variable.
Cedarcreek	Variable	Variable	Variable	Variable	Variable	Variable.
Dekalb	Severe: depth to rock, cutbanks cave, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
KrF*:						
Kaymine	Variable	Variable	Variable	Variable	Variable	Variable.
Rock outcrop.						
LlC Lily	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Moderate: depth to rock, slope.	Moderate: depth to rock, slope.	Moderate: slope, depth to rock.
PBF*:						
Pineville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: 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
PBF*:						
Berks	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
PlE*:						
Pineville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Lily	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
SeB Sewell	Variable	Variable	Variable	Variable	Variable	Variable.
SrF*:						
Sewell	Variable	Variable	Variable	Variable	Variable	Variable.
Rock outcrop.						
Ud. Udorthents						
Ur*:						
Urban land	Variable	Variable	Variable	Variable	Variable	Variable.
Chavies	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.
Ye Yeager	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: droughty, flooding.

* 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 "moderate," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
BrF*:					
Berks	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, small stones, slope.
Rock outcrop.					
CeB Cedarcreek	Variable	Variable	Variable	Variable	Variable.
CrF*:					
Cedarcreek	Variable	Variable	Variable	Variable	Variable.
Rock outcrop.					
Cv Chavies	Moderate: flooding.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
GlE*:					
Gilpin	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Poor: slope, area reclaim, thin layer.
Lily	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, slope.
ItF Itmann	Variable	Variable	Variable	Variable	Variable.
KaB Kaymine	Variable	Variable	Variable	Variable	Variable.
KcF*:					
Kaymine	Variable	Variable	Variable	Variable	Variable.
Cedarcreek	Variable	Variable	Variable	Variable	Variable.
Dekalb	Severe: depth to rock, poor filter, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, small stones, slope.
KrF*:					
Kaymine	Variable	Variable	Variable	Variable	Variable.
Rock outcrop.					

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
LlC: Lily	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: depth to rock.
PBF*:					
Pineville	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
Berks	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, small stones, slope.
PlE*:					
Pineville	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
Lily	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, small stones, slope.
SeB: Sewell	Variable	Variable	Variable	Variable	Variable.
SrF*:					
Sewell	Variable	Variable	Variable	Variable	Variable.
Rock outcrop.					
Ud. Udorthents					
Ur*:					
Urban land	Variable	Variable	Variable	Variable	Variable.
Chavies	Moderate: flooding.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
Ye: Yeager	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage.	Poor: too sandy.

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 12.—Construction Materials

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
BrF*:				
Berks	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Rock outcrop.				
CeB Cedarcreek	Fair: large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
CrF*:				
Cedarcreek	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Rock outcrop.				
Cv Chavies	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
GlE*:				
Gilpin	Poor: thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Lily	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
ItF Itmann	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
KaB Kaymine	Fair: large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
KcF*:				
Kaymine	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Cedarcreek	Poor: 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
KcF*:				
Dekalb	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
KrF*:				
Kaymine	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Rock outcrop.				
LlC Lily	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones.
PBF*:				
Pineville	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Severe: small stones, slope.
Berks	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
PlE*:				
Pineville	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Severe: small stones, slope.
Lily	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
SeB Sewell	Poor: large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim.
SrF*:				
Sewell	Poor: large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.
Rock outcrop.				
Ud. Udorthents				
Ur*:				
Urban land	Variable	Variable	Variable	Variable.
Chavies	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
Ye Yeager	Good	Probable	Probable	Fair: too sandy.

* 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 "moderate" and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
BrF*:					
Berks	Severe: seepage, slope.	Severe: thin layer.	Deep to water	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Rock outcrop.					
CeB: Cedarcreek	Severe: seepage.	Moderate: large stones.	Deep to water	Slope, large stones.	Large stones, slope, droughty.
CrF*:					
Cedarcreek	Severe: seepage, slope.	Moderate: large stones.	Deep to water	Slope, large stones.	Large stones, slope, droughty.
Rock outcrop.					
Cv: Chavies	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing	Favorable.
GlE*:					
Gilpin	Severe: slope.	Severe: thin layer.	Deep to water	Slope, depth to rock.	Slope, depth to rock.
Lily	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, depth to rock.	Slope, depth to rock.
ItF: Itmann	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope	Slope, droughty.
KaB: Kaymine	Severe: seepage.	Moderate: large stones.	Deep to water	Slope, large stones.	Large stones, slope, droughty.
KcF*:					
Kaymine	Severe: seepage, slope.	Moderate: large stones.	Deep to water	Slope, large stones.	Large stones, slope, droughty.
Cedarcreek	Severe: seepage, slope.	Moderate: large stones.	Deep to water	Slope, large stones.	Large stones, slope, droughty.
Dekalb	Severe: seepage, slope.	Severe: piping, large stones.	Deep to water	Slope, large stones, depth to rock.	Large stones, slope, droughty.

See footnote at end of table.

Table 13.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
KrF*:					
Kaymine	Severe: seepage, slope.	Moderate: large stones.	Deep to water	Slope, large stones.	Large stones, slope, droughty.
Rock outcrop.					
LlC Lily	Severe: seepage.	Severe: piping.	Deep to water	Slope, depth to rock.	Slope, depth to rock.
PBF*:					
Pineville	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope	Slope, too stony.
Berks	Severe: seepage, slope.	Severe: thin layer.	Deep to water	Slope, large stones, depth to rock.	Too stony, slope, droughty.
PlE*:					
Pineville	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope	Slope, too stony.
Lily	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, large stones, depth to rock.	Too stony, slope, depth to rock.
SeB Sewell	Severe: seepage, slope.	Severe: seepage, large stones.	Deep to water	Slope, large stones.	Large stones, slope, droughty.
SrF*:					
Sewell	Severe: seepage, slope.	Severe: seepage, large stones.	Deep to water	Slope, large stones.	Large stones, slope, droughty.
Rock outcrop.					
Ud. Udorthents					
Ur*:					
Urban land	Variable	Variable	Variable	Variable	Variable.
Chavies	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing	Favorable.
Ye Yeager	Severe: seepage.	Severe: seepage, piping.	Deep to water	Soil blowing	Droughty, rooting depth.

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 14.—Engineering Index Properties

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
BrF*:											
Berks-----------	0-4	Extremely stony loam.	GM, SM, GC, SC	A-2, A-4	15-30	40-80	35-70	30-60	25-45	25-36	5-10
	4-17	Very channery loam, very channery silt loam, channery 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
	17-25	Extremely channery silt loam, very channery silt loam, very channery loam.	GM, SM, GC-GM, SC-SM	A-1, A-2	0-40	35-65	25-55	20-40	15-35	24-38	2-10
	25	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rock outcrop.											
CeB-------------- Cedarcreek	0-2	Very stony loam	GC	A-2, A-4, A-6	15-30	45-60	40-55	30-50	20-40	25-35	7-12
	2-65	Extremely channery loam, very channery silt loam, very channery loam.	GC	A-2, A-4	5-30	30-55	25-50	20-45	15-40	25-35	7-12
CrF*:											
Cedarcreek------	0-2	Very stony loam	GC	A-2, A-4, A-6	15-30	45-60	40-55	30-50	20-40	25-35	7-12
	2-65	Extremely channery loam, very channery silt loam, very channery loam.	GC	A-2, A-4	5-30	30-55	25-50	20-45	15-40	25-35	7-12
Rock outcrop.											
Cv--------------- Chavies	0-6	Loam-------------	SM, ML, CL-ML, SC-SM	A-4	0	85-100	75-100	40-90	40-75	<25	NP-5
	6-42	Fine sandy loam, sandy loam, loam.	SM, ML, SC-SM	A-4	0	85-100	75-100	65-100	45-85	<35	NP-8
	42-65	Fine sandy loam, gravelly fine sandy loam, loamy fine sand.	SM, ML, CL-ML, SC-SM	A-4, A-2, A-1-b	0-5	70-100	60-95	40-85	20-75	<25	NP-5

See footnote at end of table.

Table 14.—Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
GlE*:											
Gilpin----------	0-4	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	4-32	Channery silt loam, silt loam, silty clay loam.	GC, SC, CL, CL-ML	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	32-38	Channery loam, very channery silt loam, very channery silty clay loam.	GC, GM-GC	A-1, A-2, A-4, A-6	0-35	25-55	20-50	15-45	15-40	20-40	4-15
	38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Lily------------	0-5	Loam-------------	ML, CL-ML	A-4	0-5	90-100	85-100	70-95	55-80	<35	NP-10
	5-19	Loam, channery loam, clay loam.	SM, SC, ML, CL	A-4, A-6	0-10	80-100	75-100	70-100	40-80	<35	3-15
	19-39	Channery loam, loam, clay loam.	SM, SC, ML, CL	A-4, A-2, A-6, A-1-b	0-10	65-100	50-100	40-95	20-75	<35	3-15
	39	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
ItF-------------- Itmann	0-2	Extremely channery sandy loam.	GM, GM-GC	A-1, A-2	0-10	40-55	35-50	25-45	15-35	15-25	NP-7
	2-65	Extremely channery sandy loam, very channery sandy loam, very channery loam.	GM, GM-GC	A-1, A-2	0-15	30-55	25-50	20-45	10-35	15-25	NP-7
KaB-------------- Kaymine	0-4	Very stony loam	GC	A-2, A-4, A-6	15-30	45-60	40-55	30-50	20-40	25-35	7-12
	4-65	Extremely channery loam, very stony silt loam, very channery loam.	GC	A-2, A-4, A-6	5-30	30-55	25-50	20-45	15-40	25-35	7-12
KcF*:											
Kaymine---------	0-4	Extremely stony loam.	GC	A-2, A-4, A-6	15-30	45-60	40-55	30-50	20-40	25-35	7-12
	4-65	Extremely channery loam, very stony silt loam, very channery loam.	GC	A-2, A-4, A-6	5-30	30-55	25-50	20-45	15-40	25-35	7-12
Cedarcreek------	0-2	Extremely stony loam.	GC	A-2, A-4, A-6	15-30	45-60	40-55	30-50	20-40	25-35	7-12
	2-65	Extremely channery loam, very channery silt loam, very channery loam.	GC	A-2, A-4	5-30	30-55	25-50	20-45	15-40	25-35	7-12

See footnote at end of table.

Table 14.—Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
KcF*:											
Dekalb----------	0-5	Extremely stony loam.	SM, GM, ML, CL-ML	A-2, A-4, A-1	10-30	50-90	45-80	40-75	20-55	10-32	NP-10
	5-27	Very channery sandy loam, channery sandy loam, channery loam.	SM, GM, ML, GM-GC	A-2, A-4, A-1	5-40	50-85	40-75	40-75	20-55	15-32	NP-9
	27-30	Very channery sandy loam, very channery loam, very channery fine sandy loam.	SM, GM, SC, GM-GC	A-2, A-4, A-1	10-50	45-85	25-75	20-65	15-40	15-32	NP-9
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
KrF*:											
Kaymine---------	0-4	Very stony loam	GC	A-2, A-4, A-6	15-30	45-60	40-55	30-50	20-40	25-35	7-12
	4-65	Extremely channery loam, very stony silt loam, very channery loam.	GC	A-2, A-4, A-6	5-30	30-55	25-50	20-45	15-40	25-35	7-12
Rock outcrop.											
LlC--------------	0-5	Loam-------------	ML, CL-ML	A-4	0-5	90-100	85-100	70-95	55-80	<35	NP-10
Lily	5-19	Loam, channery loam, clay loam.	SM, SC, ML, CL	A-4, A-6	0-10	80-100	75-100	70-100	40-80	<35	3-15
	19-39	Channery loam, loam, clay loam.	SM, SC, ML, CL	A-4, A-2, A-6, A-1-b	0-10	65-100	50-100	40-95	20-75	<35	3-15
	39	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Pineville-------	0-5	Extremely stony loam.	ML, CL-ML, SM, SC-SM	A-2, A-4	15-30	55-90	50-85	45-80	30-75	25-35	4-10
	5-45	Channery loam, channery clay loam, very channery loam.	ML, CL-ML, SC, SC-SM	A-2, A-4, A-6	0-10	55-85	50-80	45-75	30-65	25-40	6-15
	45-65	Very channery sandy loam, very channery loam, very channery clay loam.	GM, GM-GC, SC, SC-SM	A-1, A-2, A-4, A-6	5-20	35-75	30-70	25-65	20-60	25-35	4-12

See footnote at end of table.

Table 14.—Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
PBF*:											
Berks-----------	0-4	Extremely stony loam.	GM, SM, GC, SC	A-2, A-4	15-30	40-80	35-70	30-60	25-45	25-36	5-10
	4-17	Very channery loam, channery loam, very channery 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
	17-25	Extremely channery silt loam, very channery silt loam, very channery loam.	GM, SM	A-1, A-2	0-40	35-65	25-55	20-40	15-35	24-38	2-10
	25	Weathered bedrock	---	---	---	---	---	---	---	---	---
PlE*:											
Pineville-------	0-5	Very stony loam	ML, CL-ML, SM, SC-SM	A-2, A-4	3-15	55-90	50-85	45-80	30-75	25-35	4-10
	5-45	Channery loam, channery clay loam, very channery loam.	ML, CL-ML, SC, SC-SM	A-2, A-4, A-6	0-10	55-85	50-80	45-75	30-65	25-40	6-15
	45-65	Very channery sandy loam, very channery loam, very channery clay loam.	GM, GM-GC, SC, SC-SM	A-1, A-2, A-4, A-6	5-20	35-75	30-70	25-65	20-60	25-35	4-12
Lily------------	0-5	Very stony loam	SM, ML	A-2, A-4	5-20	90-95	85-90	55-90	25-75	<35	NP-7
	5-19	Loam, channery loam, clay loam.	SM, SC, ML, CL	A-4, A-6	5-20	80-95	75-90	60-85	40-80	<35	3-15
	19-39	Channery loam, loam, clay loam.	SM, GC, ML, CL	A-2, A-4, A-6	5-20	65-95	60-90	50-85	20-75	<35	NP-15
	39	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
SeB------------- Sewell	0-7	Very stony sandy loam.	SM, SC-SM, GM-GC, GM	A-1, A-2	30-55	55-70	50-65	35-50	10-25	15-25	NP-7
	7-65	Extremely channery sandy loam, very channery sandy loam, very stony sandy loam.	GM, GP-GM, GM-GC	A-1, A-2	5-30	30-50	25-45	15-35	10-20	15-25	NP-7
SrF*:											
Sewell----------	0-7	Extremely stony sandy loam.	SM, SC-SM, GM-GC, GM	A-1, A-2	30-55	55-70	50-65	35-50	10-25	15-25	NP-7
	7-65	Extremely channery sandy loam, very channery sandy loam, very stony sandy loam.	GM, GP-GM, GM-GC	A-1, A-2	5-30	30-50	25-45	15-35	10-20	15-25	NP-7
Rock outcrop.											

See footnote at end of table.

Table 14.—Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
Ud. Udorthents											
Ur*: Urban land.											
Chavies---------	0-6	Loam-------------	SM, ML, CL-ML, SC-SM	A-4	0	85-100	75-100	40-90	40-75	<25	NP-5
	6-42	Fine sandy loam, sandy loam, loam.	SM, ML, SC-SM	A-4	0	85-100	75-100	65-100	45-85	<35	NP-8
	42-65	Fine sandy loam, gravelly fine sandy loam, loamy fine sand.	SM, ML, CL-ML, SC-SM	A-4, A-2, A-1-b	0-5	70-100	60-95	40-85	20-75	<25	NP-5
Ye--------------- Yeager	0-8	Fine sandy loam	SM, SC-SM	A-2-4, A-4	0	95-100	95-100	60-90	20-45	<25	NP-5
	8-57	Stratified loamy fine sand, loamy sand, sandy loam.	SP-SM, SM	A-2-4, A-3	0	95-100	75-100	55-80	5-35	<20	NP
	57-65	Sandy loam, cobbly loamy sand.	SP-SM, SM	A-2-4, A-3	0-5	85-100	40-100	40-80	5-35	<20	NP

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 15.--Physical and Chemical Properties of the Soils

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH				Pct
BrF*:										
Berks	0-4	5-23	1.20-1.50	0.6-6.0	0.08-0.12	3.6-6.5	Low	0.17	3	2-4
	4-17	5-32	1.20-1.60	0.6-6.0	0.04-0.10	3.6-6.0	Low	0.17		
	17-25	5-20	1.20-1.60	2.0-6.0	0.04-0.10	3.6-6.0	Low	0.17		
	25	---	---	---	---	---	-------------	----		
Rock outcrop.										
CeB Cedarcreek	0-2	18-27	1.35-1.65	0.6-6.0	0.07-0.16	3.6-5.5	Low	0.32	5	<.5
	2-65	18-27	1.35-1.65	0.6-6.0	0.07-0.16	3.6-5.5	Low	0.32		
CrF*:										
Cedarcreek	0-2	18-27	1.35-1.65	0.6-6.0	0.07-0.16	3.6-5.5	Low	0.32	5	<.5
	2-65	18-27	1.35-1.65	0.6-6.0	0.07-0.16	3.6-5.5	Low	0.32		
Rock outcrop.										
Cv Chavies	0-6	7-18	1.20-1.40	2.0-6.0	0.11-0.18	5.1-7.3	Low	0.24	4	.5-4
	6-42	7-18	1.20-1.40	2.0-6.0	0.11-0.20	4.5-6.0	Low	0.24		
	42-65	7-18	1.30-1.50	2.0-6.0	0.08-0.18	4.5-6.0	Low	0.24		
GlE*:										
Gilpin	0-4	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-6.5	Low	0.32	3	.5-4
	4-32	18-35	1.20-1.50	0.6-2.0	0.12-0.16	3.6-5.5	Low	0.24		
	32-38	15-35	1.20-1.50	0.6-2.0	0.08-0.12	3.6-5.5	Low	0.24		
	38	---	---	---	---	---	-------------	----		
Lily	0-5	7-27	1.20-1.40	0.6-6.0	0.13-0.18	3.6-5.5	Low	0.28	2	.5-4
	5-19	18-35	1.25-1.35	2.0-6.0	0.12-0.18	3.6-5.5	Low	0.28		
	19-39	20-35	1.25-1.35	2.0-6.0	0.08-0.17	3.6-5.5	Low	0.17		
	39	---	---	---	---	---	-------------	----		
ItF Itmann	0-2	4-15	1.00-1.30	2.0-20	0.05-0.12	3.6-5.5	Low	0.32	5	<.5
	2-65	4-15	1.00-1.30	2.0-20	0.05-0.12	3.6-5.5	Low	0.32		
KaB Kaymine	0-4	18-27	1.35-1.65	0.6-6.0	0.07-0.16	5.6-7.8	Low	0.32	5	<.5
	4-65	18-27	1.35-1.65	0.6-6.0	0.07-0.16	5.6-7.8	Low	0.32		
KcF*:										
Kaymine	0-4	18-27	1.35-1.65	0.6-6.0	0.07-0.16	5.6-7.8	Low	0.32	5	<.5
	4-65	18-27	1.35-1.65	0.6-6.0	0.07-0.16	5.6-7.8	Low	0.32		
Cedarcreek	0-2	18-27	1.35-1.65	0.6-6.0	0.07-0.16	3.6-5.5	Low	0.32	5	<.5
	2-65	18-27	1.35-1.65	0.6-6.0	0.07-0.16	3.6-5.5	Low	0.32		
Dekalb	0-5	10-20	1.20-1.50	6.0-20	0.08-0.12	3.6-5.5	Low	0.17	2	2-5
	5-27	7-18	1.20-1.50	6.0-20	0.06-0.12	3.6-5.5	Low	0.17		
	27-30	5-15	1.20-1.50	>6.0	0.05-0.10	3.6-5.5	Low	0.17		
	30	---	---	2.0-6.0	---	---	-------------	----		
KrF*:										
Kaymine	0-4	18-27	1.35-1.65	0.6-6.0	0.07-0.16	5.6-7.8	Low	0.32	5	<.5
	4-65	18-27	1.35-1.65	0.6-6.0	0.07-0.16	5.6-7.8	Low	0.32		
Rock outcrop.										

See footnote at end of table.

Table 15.—Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH				Pct
LlC-------------- Lily	0-5	7-27	1.20-1.40	0.6-6.0	0.13-0.18	3.6-5.5	Low----------	0.28	2	.5-4
	5-19	18-35	1.25-1.35	2.0-6.0	0.12-0.18	3.6-5.5	Low----------	0.28		
	19-39	20-35	1.25-1.35	2.0-6.0	0.08-0.17	3.6-5.5	Low----------	0.17		
	39	---	---	---	---	---	-------------	----		
PBF*:										
Pineville-------	0-5	15-25	1.00-1.30	0.6-2.0	0.10-0.16	3.6-7.3	Low----------	0.20	4	.5-5
	5-45	18-30	1.30-1.60	0.6-2.0	0.08-0.14	3.6-5.5	Low----------	0.15		
	45-65	15-30	1.30-1.60	0.6-6.0	0.06-0.14	3.6-5.5	Low----------	0.15		
Berks-----------	0-4	5-23	1.20-1.50	0.6-6.0	0.08-0.12	3.6-6.5	Low----------	0.17	3	2-4
	4-17	5-32	1.20-1.60	0.6-6.0	0.04-0.10	3.6-6.0	Low----------	0.17		
	17-25	5-20	1.20-1.60	2.0-6.0	0.04-0.10	3.6-6.0	Low----------	0.17		
	25	---	---	---	---	---	-------------	----		
PlE*:										
Pineville-------	0-5	15-25	1.00-1.30	0.6-2.0	0.12-0.18	3.6-7.3	Low----------	0.20	4	.5-5
	5-45	18-30	1.30-1.60	0.6-2.0	0.08-0.14	3.6-5.5	Low----------	0.15		
	45-65	15-30	1.30-1.60	0.6-6.0	0.06-0.14	3.6-5.5	Low----------	0.15		
Lily------------	0-5	5-25	1.20-1.40	0.6-6.0	0.09-0.16	3.6-5.5	Low----------	0.24	2	.5-4
	5-19	18-35	1.25-1.55	2.0-6.0	0.12-0.18	3.6-5.5	Low----------	0.24		
	19-39	18-35	1.25-1.55	2.0-6.0	0.08-0.17	3.6-5.5	Low----------	0.17		
	39	---	---	0.0-0.2	---	---	-------------	----		
SeB-------------- Sewell	0-7	5-18	1.35-1.65	2.0-20	0.05-0.12	3.6-5.5	Low----------	0.32	5	<.5
	7-65	5-18	1.35-1.65	2.0-20	0.05-0.12	3.6-5.5	Low----------	0.32		
SrF*:										
Sewell----------	0-7	5-18	1.35-1.65	2.0-20	0.05-0.12	3.6-5.5	Low----------	0.32	5	<.5
	7-65	5-18	1.35-1.65	2.0-20	0.05-0.12	3.6-5.5	Low----------	0.32		
Rock outcrop.										
Ud. Udorthents										
Ur*: Urban land.										
Chavies---------	0-6	7-18	1.20-1.40	2.0-6.0	0.11-0.18	5.1-7.3	Low----------	0.24	4	.5-4
	6-42	7-18	1.20-1.40	2.0-6.0	0.11-0.20	4.5-6.0	Low----------	0.24		
	42-65	7-18	1.30-1.50	2.0-6.0	0.08-0.18	4.5-6.0	Low----------	0.24		
Ye--------------- Yeager	0-8	3-12	1.40-1.60	2.0-6.0	0.08-0.14	5.1-7.3	Low----------	0.17	5	2-5
	8-57	2-10	1.40-1.70	2.0-20	0.05-0.10	5.1-7.3	Low----------	0.15		
	57-65	2-18	1.40-1.70	2.0-20	0.05-0.10	5.1-7.3	Low----------	0.15		

* 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," "occasional," and "apparent" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydro-logic group	Flooding frequency	High water table			Bedrock		Potential frost action	Risk of corrosion	
			Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
			Ft			In				
BrF*:										
Berks	C	None	>6.0	---	---	20-40	Soft	Moderate	Low	High.
Rock outcrop	D	---	---	---	---	0	Hard	---	---	---
CeB Cedarcreek	C	None	>6.0	---	---	>60	---	Moderate	Moderate	High.
CrF*:										
Cedarcreek	C	None	>6.0	---	---	>60	---	Moderate	Moderate	High.
Rock outcrop	D	---	---	---	---	0	Hard	---	---	---
Cv Chavies	B	Rare	>6.0	---	---	>60	---	Moderate	Low	Moderate.
GlE*:										
Gilpin	C	None	>6.0	---	---	20-40	Soft	Moderate	Low	High.
Lily	B	None	>6.0	---	---	20-40	Hard	Moderate	Moderate	High.
ItF Itmann	C	None	>6.0	---	---	>60	---	Moderate	High	High.
KaB Kaymine	C	None	>6.0	---	---	>60	---	Moderate	Low	Low.
KcF*:										
Kaymine	C	None	>6.0	---	---	>60	---	Moderate	Low	Low.
Cedarcreek	C	None	>6.0	---	---	>60	---	Moderate	Moderate	High.
Dekalb	C	None	>6.0	---	---	20-40	Hard	Low	Low	High.
KrF*:										
Kaymine	C	None	>6.0	---	---	>60	---	Moderate	Low	Low.
Rock outcrop	D	---	---	---	---	0	Hard	---	---	---
LlC Lily	B	None	>6.0	---	---	20-40	Hard	Moderate	Moderate	High.
PBF*:										
Pineville	B	None	>6.0	---	---	>60	---	Moderate	Low	High.
Berks	C	None	>6.0	---	---	20-40	Soft	Moderate	Low	High.
PlE*:										
Pineville	B	None	>6.0	---	---	>60	---	Moderate	Low	High.
Lily	B	None	>6.0	---	---	20-40	Hard	Moderate	Moderate	High.
SeB Sewell	C	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	Hydro-logic group	Flooding frequency	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hardness	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
			Ft			In				
SrF*:										
Sewell	C	None	>6.0	---	---	>60	---	Moderate	Moderate	High.
Rock outcrop	D	---	---	---	---	0	Hard	---	---	---
Ud. Udorthents										
Ur*: Urban land.										
Chavies	B	Rare	>6.0	---	---	>60	---	Moderate	Low	Moderate.
Ye Yeager	A	Occasional	4.0-6.0	Apparent	Dec-May	>60	---	Low	Low	High.

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 17.—Classification of the Soils

Soil name	Family or higher taxonomic class
Berks	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
Cedarcreek	Loamy-skeletal, mixed, acid, mesic Typic Udorthents
Chavies	Coarse-loamy, mixed, mesic Ultic Hapludalfs
Dekalb	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
Gilpin	Fine-loamy, mixed, mesic Typic Hapludults
Itmann	Loamy-skeletal, mixed, acid, mesic Typic Udorthents
Kaymine	Loamy-skeletal, mixed, nonacid, mesic Typic Udorthents
Lily	Fine-loamy, siliceous, mesic Typic Hapludults
Pineville	Fine-loamy, mixed, mesic Typic Hapludults
Sewell	Loamy-skeletal, mixed, acid, mesic Typic Udorthents
Udorthents	Udorthents
Yeager	Sandy, mixed, mesic Typic Udifluvents

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